Jawaharlal Nehru at the Opening Ceremony of the Central Scientific Instruments Organisation, Chandigarh. (18.12.1963)

JAWAHARLAL NEHRU ON SCIENCE AND SOCIETY

A Collection of his Writings and Speeches

Edited by
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PREFACE

The present volume entitled "Jawaharlal Nehru on Science and Society" is the second of the proposed series of publications under the Nehru Memorial Museum and Library Project "Jawaharlal Nehru and the Modernisation of India" sub-theme "Jawaharlal Nehru's Contribution to Promotion of Science and Technology". For a realistic assessment and definition of Jawaharlal Nehru's role and contribution in the field of science and technology, it is essential to assiduously trace the evolution of his own ideas on the role of science in India's industrial and economic development. Besides, there is need to understand his repeated stress on the adoption of scientific method and a scientific approach to the nation's social, cultural and political problems; the induction of scientific temper and rational behaviour at individual and collective levels.

In attempting this in the 'Introduction', it appeared interesting to study, in some detail, his earlier contacts with science subjects in his childhood days and later at Harrow and Cambridge in U.K. These were essentially to prepare him for a Civil Service career and had nothing to do with his understanding and commitment to the role of science in national development and to a scientific approach, at a later stage. This helped to dispel the impression that his childhood tutor F.E. Brooks influenced his taking science subjects for Tripos at Cambridge or the eminent scientists like Lord Rutherford, Thompson and others at the Cavendish Laboratory were the source of his inspiration and interest in science. Actually, his liberal and secular family background, his visits to Europe and the Soviet Union in 1926-27, 1935-36 and 1938 and his intensive study of a wide variety of subjects during his various sojourns in prison structured Jawaharlal Nehru's thoughts and philosophy – the contribution of prison incarceration being the most significant. It is the study, deliberation and thinking which contributed to his emergence as an enlightened scientific and rational thinker and an outstanding national leader equipped to play the role of the main architect of India's development and modernisation. So far as his dedication to science and scientific thought is concerned, Jawaharlal Nehru was essentially his own teacher.

I have drawn heavily on the student days correspondence of Jawaharlal Nehru with his father Motilal Nehru. Effort has been made to follow his career after return from England highlighting the factors that made impact on developing of his secular and scientific outlook combined with a passion for planning. Narration has been carried till his assumption of the reins of power in the interim Government in 1946. Subsequent to this his writings and speeches amply describe the story.

In the present volume, the writings and speeches of Jawaharlal Nehru on scientific and socio-scientific subjects starting from some articles in his first major publication of *Glimpses of World History* in 1933 upto his last, address to the 2nd Convocation of the All India Institute of Medical Sciences in 1964, have been brought together. These include his speeches at laying of the foundation-stone and inauguration ceremonies of the national laboratories and various other scientific institutions, his addresses at functions of the Ato-

mic Energy Commission and his main presentation of Resolutions and Bills on matters of scientific importance in the Indian Parliament. Also included in this volume are his notes to the Cabinet on such topics as the 'Reorganization of Scientific Research', Scientific Manpower', 'Defence Science Policy' and his attitude to atomic power. Thus this volume represents the major contributions of Jawaharlal Nehru on science and his crusading advocacy of a scientific and rational approach to the national, economic, social and political problems. The present volume, however, does not include Jawaharlal Nehru's addresses at the various annual sessions of the Indian Science Congress, which have been published earlier. The volume includes a list of events concerned with scientific functions for which details of his speech/address are either not available or the subject matter makes only general reference to scientific matters. Also included is a list (not complete) of some of the books on scientific subjects studied by Jawaharlal Nehru which presumably formed the background of his philosophy on scientific and socio-scientific matters.

There is a significant difference in Jawaharlal Nehru's language as between his writings and speeches. In the former, the language is chaste and generally follows the rules of grammar: in the latter the language is subordinated to the needs of communication suiting the variety of his audience. It is more of a dialogue with the listners. In editing his speeches, a minimum of change in language or grammar has been attempted, in order to preserve the flavour of his style of communication.

I have received invaluable help and assistance from my colleague Shri Dinesh Bhushan who has meticulously gone through the manuscript and the proofs. I am indeed obliged to Dr. Ravinder Kumar for his continuing support and encouragement throughout my efforts. I am also grateful to the staff of the Nehru Memorial Museum and Libary for their unstinted cooperation and assistance.

November 19, 1987
New Delhi.

Baldev Singh

(Baldev Singh)

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CORRIGENDUM

1. Item nos. 23 and 24 in the text pertain to Section "PRIOR TO SCIENTIFIC POLICY RESOLUTION"

2. p.53. For 'CONTRO' read 'CONTROL'

3. Photograph facing page 104. In the caption, for 'Zaherr' read 'Zaheer'.

4. Photograph (top) facing page 172. In the caption, for 'oernor' read 'Governor'.

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INTRODUCTION

Jawaharlal Nehru and Emergence of his Scientific Approach

Jawaharlal Nehru is recognised as the main architect of modern India. He was undoubtedly amongst the most enlightened of the political leaders of India's national movement for Independence. Jawaharlal Nehru called himself a devotee of science. After Independence and as Prime Minister he gave his full backing and support to the establishment of a number of scientific institutions and strengthening of science education and research in the country. But more important, he emerged as a crusader in the cause of scientific and rational approach to the country's social, economic and political problems. While advocating retention of what is best and constructive in India's ancient tradition and culture, he fought against the hegemony of religious dogma, mysticism and orthodoxy as forces obstructive to the country's progress, development and modernisation. What were the factors that contributed to the development of Jawaharlal Nehru's scientific outlook? What influenced his thinking in respect of science as a prime factor in India's socio-economic development — these are interesting questions to ponder over.

First Contacts with Science

Jawaharlal Nehru's first contacts with science were in his childhood. When only about eleven years of age (1901), his father Motilal Nehru, on the advice of Mrs. Annie Besant, engaged Ferdinand T. Brooks, a theosophist, as his tutor. Jawaharlal Nehru relates that "Brooks also initiated me into the mysteries of science. We rigged up a little laboratory and there I used to spend long and interesting hours working out experiments in elementary physics and chemistry". Apart from science, Brooks "brought a new influence to bear upon me which affected me powerfully for a while. This was Theosophy". Also "Brooks developed in me a taste for reading and I read a great many English books,..." Among the books read were H.G. Wells's *Romances*. Attending theosophical meetings, metaphysical arguments, discussions about astral and other supernatural bodies, thinking about religion and other worlds bestowed upon Nehru the habit of thinking, dreaming and a powerful imagination. He writes, "I dreamt of astral bodies and imagined myself flying vast distances. This dream of flying high up in air (without any appliance) has indeed been a frequent one throughout my life; and sometimes it has been vivid and realistic and the countryside seemed to lie underneath me in a vast panorama". Nehru lost touch with theosophy after Brooks left (1904) and partly because he "went to school in England". Later he outgrew the philosophical concepts and ideas of theosophy and while acknowledging his debt to Brooks, he says, "I am afraid that theosophists have since then gone down in my estimation." (*Autobiography*, p. 16). The reading habit, however, lasted him throughout his life-time and stood him in good stead during the later years of incarceration.

The atmosphere in the Nehru household also contributed to Jawaharlal Nehru's scientific and secular outlook in the later years. Nehru was equally exposed to Hindu and Muslim orthodox influences: at a tender age he was tutored in Hindi and Sanskrit by a Pandit and in Persian and Arabic by a Maulvi. Besides he interacted with cooks and domestics drawn from Muslim, Christian and Hindu religions who served in the household at Anand Bhawan. Motilal Nehru combined in himself the virtues of a staunch nationalist but deeply influenced

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Abbreviations used

MLN - *Selected Works of Motilal Nehru*; JLN - *Selected Works of Jawaharlal Nehru (First Series)*; GWH - *Glimpses of World History*; NMML - Nehru Memorial Museum and Library.

and appreciative of western thought, culture and mode of living. The early schooling of children was by European tutors at their residence, Anand Bhavan. Motilal Nehru was a firm opponent of orthodoxy and when his fellow Kashmiri Brahmins as a community wanted him to do *"prayaschit"* (repentance) for having gone overseas to Europe, he staunchly defied them (1899).

Science in the School Years

Jawaharlal Nehru's next contact with science was when he was entered by his father Motilal Nehru at Harrow for schooling in July 1905. He had as subjects, Arithmetic, Algebra, Geometry, French Prose and Drawing. In the first half-term, Jawaharlal Nehru did very well. Congratulating him his father writes, "You have not only secured the first place in your form but stand at the top in each individual subject." Motilal Nehru was anxious that Jawaharlal Nehru takes up Science and he queried, "I find that Science column is left blank in the Report. Perhaps you will take it up next term. As you know, I want you specially to develop a taste for Science and Mathematics. You are no doubt doing all that can be done and nothing will please me more than to have in you the first Senior Wrangler of your year. The I.C.S. will then be child's play for you". (MLN. Vol. I, pp. 94-95). Jawaharlal Nehru explained that only "in the higher school we can take up German or Science and I think you would prefer me to take up the latter". (JLN. Vol. 1, p. 6). Motilal Nehru had set his heart at Civil Service as the future career for his son is evident from the time-table he draws up for the different stages which his son is to traverse — "different terms at Harrow till 1908 (Age: 18 years and 5 months), Cambridge 3 years (Age: 21-5) and "ICS to follow". Motilal Nehru was equally clear that exposure to "Western ideal" in Harrow was the right thing and he did not "quite agree with the 'Hindu Ideal' school in this matter". (MLN. Vol. I, p. 109 - October 24, 1906).

The choice of science at Harrow (and later at Cambridge) was in pursuance of Motilal Nehru's plan for preparing Jawaharlal Nehru for a career in the Civil Service. There is no evidence to support, as suggested by some European authors, that it was probably due to the initial experience and the laboratory which they set up at Anand Bhavan that Nehru decided to specialise in natural sciences at Cambridge some years later. The decision at that stage did not lie with Jawaharlal Nehru in any case.

During the vacation (probably August - September 1906), at the insistence of parents, Jawaharlal Nehru visited India. This must have adversely affected his studies because Motilal Nehru writes "I was from the very beginning very doubtful of the wisdom of the step I was taking in calling you home for the vacation". (MLN. Vol. I, p. 108 - October 24, 1906).

Was young Jawaharlal Nehru somewhat nervous at the examinations? — It would appear so. In December 1906, he wrote to his father, "The Trials have begun in right earnest. I had two of them today, Trigonometry and Practical Chemistry, and in neither of them did I do very well. In the former perhaps I did as well as was to be expected as ours is the lowest division doing the papers. This was my first term at Trigonometry here and my absence for a fortnight handicapped me very much. For that was about the only time they did Trig., afterwards Algebra and Arithmetic took up most of the time. (JLN. Vol. I, p. 14 - December 6, 1906). When the Report comes, he had actually done quite well and he writes, "My divs. in various subjects are good this term.... So, I suppose I must have done well". (JLN. Vol. 1, p. 17 - January 30, 1907).

Jawaharlal Nehru spent only two years at Harrow and then under advice from his father, started preparations to join Cambridge.

Preparing for Cambridge

Motilal Nehru's decision to advance his earlier time-table for Jawaharlal Nehru by a year was to enable more time for preparation for the ICS Examination. The idea to cut short

his stay at Harrow must have been discussed with Jawaharlal Nehru during his visit to India in the vacation, since Motilal Nehru wrote to Dr. Wood (Headmaster at Harrow) to provide necessary coaching to enable Jawaharlal Nehru to appear for the 'Little Go', the first public examination at Cambridge in March or June 1907 (MLN, Vol. I, p. 109 - October 24, 1906). He explained to Jawaharlal Nehru that "I had to enter you at Trinity College, as having regard to your age and the limits imposed by the I.C.S. regulations, there was no time to lose. I have told him (Dr. Wood) about your having to pass Part I of the Previous in March and Part II in June. I have also said that you know already much of what is required for these examinations and that there was little you had to learn but that to be on the safe side both you and I *thought that some coaching would be helpful*.... (MLN, Vol. I, p. 110 - October 27, 1906).

Later Motilal Nehru appears to have had second thoughts about advancing the programme of Jawaharlal Nehru's entry into Cambridge and he writes, "The last mail brought me a very short note from you and there was a strain of disappointment running through it. You were neither satisfied with your specials nor with the ordinary Form (at Harrow) work and not quite know how to manage either. I am beginning to fear that Wood may turn out to be right in what he said about its being too early for you to go to Cambridge next year. You have lots of time at your disposal and it was *as much on account of your desire to get out of Harrow as my own inclination against keeping you there longer than I could help that induced me to enter you at Trinity*. I am now afraid that it is putting you under a greater strain than either you or I had imagined and I am not sure if it is not wise to reconsider our decision. If you cannot be quite ready for the Little Go Part I by March next it is no use trying for it and thus losing a good place in Form (at Harrow) in addition to courting failure at the Examination.... There is not much time between now and March next and I would on no account work you harder than it is possible for you to do easily. You cannot appear for the I.C.S. before August 1912 and you have 5 years and 9 months at your disposal. If you go to Cambridge in October next you will have finished your three years' course by the end of the summer vacation of 1910 and will have quite 2 years to give to the special subjects for the I.C.S. This would no doubt be more satisfactory than having only one year for the I.C.S., but if it cannot be, one must not think of it". (MLN, Vol. I, pp. 113-114 - December 20, 1906). In spite of the vacillation, Jawaharlal Nehru appears to have done quite well at his last term in Harrow and Motilal Nehru notes that "The last mail also brought your school report which assigned you as distinguished a position in Form work and the other subjects as its predecessor had done and what is more there was the same chorus of praise in the remarks columns with the addition of a pious wish that you may be successful in the examination at Cambridge!" (MLN, Vol. I, p. 123 - April 19, 1907). Motilal Nehru's idea of entering Jawaharlal Nehru early at Cambridge was to give him ample time of two years after Tripos to make preparation for the Civil Service Examination.

Cambridge and Second Thoughts on I.C.S.

After some initial coaching, Jawaharlal Nehru appeared for Part I of the 'Little Go' in March 1907. The same streak of diffidence is reflected in his letter to his father, he writes, "I haven't heard the result of the Little Go yet. It is near the end of the week now and Fletcher said the result would be out sometime in the beginning of this week. *I have little doubt of my not getting through* but still I should like to make sure". (JLN, Vol. 1, p. 23 - March 28, 1907).

However, he got his remove and was to appear for Part II of the Little Go and the Additional Subject in June. He took mechanics for the Additional Subject and had some private lessons. Later, he thought of giving it up and says, "I have given up the idea of appearing for the Additional Subject in June. I have got quite enough to do without appear-

ing for it". (JLN. Vol. 1, p. 25 - May 17, 1907). For the Previous, he had Logic and Mathematics and was permitted to do an English Essay instead of Greek. He must have done well because Motilal Nehru writes, "I was delighted to learn from your last letter that you had done so well at Part II of the Previous. You have thus closed your career at School with every success and credit that one could possibly expect". (MLN. Vol. I, p. 128 - July 26, 1907).

Jawaharlal Nehru entered Cambridge in August 1907. There must have been some confusion about the choice of subjects because Motilal Nehru writes, "I think it was decided when I was in England last that you were to take the Science Tripos. I am not aware of anything having happened since to *induce me to change that decision*.... If you find that your knowledge of mathematics falls short of what is required to give you a good grasp of your science subjects go to a coach at once. In selecting your subjects *please do not forget what is required for the I.C.S.*" At the same time, he desired Jawaharlal Nehru to qualify for the Bar and enquired if he had any "special inclination about any particular Inn or Temple", (MLN. Vol. I, p. 129 - July 26, 1907).

Having entered Cambridge, Jawaharlal Nehru appears to have gone on visits to Dublin, taken a good deal of interest in rowing, attended political lectures — notably one by George Bernard Shaw on 'Socialism and the University Man' which he found interesting and instructive, (JLN. Vol. 1, p. 35 - October 24, 1907), spent Christmas Holidays at Harrogate, joined a horse-riding school and only mentions in passing that he dropped one of the chemistry lectures to find time for doing practical physics. (JLN. Vol. 1, p. 43 - January 16, 1908). He had probably been asked by Motilal Nehru to come to India in June 1908 but that was examination time and he intimated that he could hardly leave before second week of June. Again, he displays his diffidence about his examinations in June, "They will be in all the three subjects I have taken up. In Chemistry I know little, but let that pass; in Geology I know less, but I am expected to know little. The Geol. Practical I have only just started and I have to know the names and be able to recognise by the end of the month over 100 fossils with most weird names and scores of rocks and minerals. Still this does not trouble me half so much as Physics. I have attended several lectures on various parts of it since I came up but hardly one of them has been comprehensible. I have been heartily regretting having taken up the subject at all. I wish I had taken Botany instead. But it is better to stick to it now." (JLN. Vol. 1, pp. 51-52 - May 7, 1908). In the meantime, he also 'engaged a Tennis Court' where he could go and play at a convenient time. Jawaharlal Nehru got hold of some papers that had been set in three or four earlier examinations and concludes, "To my surprise and disgust I found that they were far harder than I had expected. I might have done a question here and there out of the Chemistry and the Geology papers, but I could hardly do a single question satisfactorily in Physics." (JLN. Vol. 1, p. 53 - May 14, 1908). About the actual examinations, he felt he was doing badly and writes "I have six papers altogether, a theoretical and a practical in each subject, and every paper is on a separate day. I have already had the first two — Chemistry and Geology. The latter (Geology) was meant for both first and second year men and I do not know what standard I was expected to attain in it. But I do not know that I did very badly in it..... In Chemistry the fault, I must confess, lay entirely with me and not with others. The paper was an easy one and I could have done a considerable part of it at Harrow. Here, however, I made a mess of the whole thing.

These two subjects were the ones which I expected to do well in — and you see the result. Tomorrow is the Physics paper and I do not expect to do brilliantly in it". (JLN. Vol. 1, p. 57 - June 4, 1908).

He was hooked to sail for India in June middle and spend the vacation with his family. He returned to Cambridge late for the term. On return Jawaharlal Nehru toyed with the idea of taking Botany as the fourth subject (in addition to Chemistry, Physics and Geology), but his Director of Studies did not consider it desirable. He also took steps to apply for

joining the Inner Temple. He continued with lessons at the riding school.

May be it was due to the break in studies caused by his trip to India, but he felt that he was not doing well in Physics and he wrote to his father "I have often written to you how I do not feel very interested in Physics and cannot get along well with it. If I had known enough Mathematics all might have been well but as it is I would have to do a good deal of maths before I could proceed with Physics. Under the circumstances I thought it would be best to part company with Physics, even though I have only five more terms before the trip. I thought Fletcher (Director of Studies) would object to this but he at once suggested my taking one other science instead of it. Botany was the one we agreed upon. I do not know a word of Botany so far. I shall try to read something about it in the vac. and I might coach in it next term." (JLN, Vol. 1, p. 61 – December 3, 1908).

Motilal Nehru's response is an indication of his acceptance that Jawaharlal Nehru may not make for I.C.S. and he writes "If your tutor recommends that course, as you say he does, my opinion one way or the other is not worth much. All I would ask you to do is to make up your mind at once and not go on thinking of changing your subject till the 11th hour..... *What I expect from you is a first class*, I do not care in what subject or subjects. To obtain this you are at liberty to have any tuition or coaching that may be available regardless of all expense. The I.C.S. is not the goal of my ambition. What I want is thoroughness (MLN, Vol. I, p. 141 – December 31, 1908).

Jawaharlal Nehru is not at all confident of getting a first and would like to safeguard against a subsequent disappointment to the parent and he writes "You distress me greatly by confidently expecting me to get a first. It is very very improbable that I shall do so, specially as I have just started Botany. Next term I have my second year Mays, which are almost as hard as the trip. How I am to get through with my Botany is more than I can tell. Still I am not sorry I took it. With Physics I would have done worse.... *If you would not be so sure of seeing me get a first it would be all right.* As it is, if I do badly in the trip, as I am more than likely to do, you will be very disappointed...." (JLN, Vol. 1, p. 64 - January 23, 1909).

It is about this time that Motilal Nehru, a shrewd judge of men appears to have recognised that Jawaharlal Nehru was not cut for I.C.S. nor for a scientific career, and would be better off in following the legal profession of the parent. In a letter to his elder brother Bansi Dhar Nehru dealing with the studies and progress of the latter's son Shridhar also at Cambridge, he writes "His (Shridhar) proper sphere of work lies in the great scientific laboratories of the West where he can devote himself to original research and give mankind in general the benefit of his labours. But the I.C.S. is considered a great thing in India. For him it is a walkover. I have advised him to go through it but without losing sight of the one object of his ambition, *i.e.* to enlighten humanity." He continues "Joe (pet name of Jawaharlal Nehru) is made of different stuff but if my knowledge of human nature does not deceive me I think he is bound to rise in his father's profession. He has already begun to like it and in deciding that he should devote his energies to the study of law I have only followed the bent of his own mind". (MLN, Vol. I, p. 144 - January 30, 1910). Incidentally, Shridhar did qualify and join the I.C.S.

1910 was Jawaharlal Nehru's last year in Cambridge and he appeared for his final term for Tripos in May. His diffidence at the Examination surfaces again and he writes, "A third of the trip is over and I have done very badly in it..... I have had five papers so far. The first was an Essay paper and in this I did not excel. The idea of the essay apparently is to test the candidate's capability of writing a scientific paper. Fortunately, it does not carry many marks. The next two papers were in Chemistry. I rather fancied myself at that subject and hoped to do a good paper. I lived to learn how extremely little I really know. It was a bad beginning but far worse was to follow. The Botany papers came next and thoroughly damped my ardour. Apart from my knowledge or want of knowledge of the subject I was in such a bad mood on the day that I could hardly understand the questions. A headache is hardly calculated to help one in an exam. You will understand my state of

mind when I tell you that in one question I actually went to the length of describing a totally different family of plants from the one asked for! And all this due to a slight misapprehension of the question. The result was that I did a perfectly vile paper which could not have been worse by any manner or means. Unless I do something to redeem myself in Geology and in the practicals, my doom is sealed." (JLN. Vol. 1, pp. 72-73 - May 27, 1910). At the conclusion of the examination he describes the position, "I have not done a single paper in a satisfactory manner, I have not done the Geology papers as badly as I did the Botany ones. But then it was hardly possible to sink so low again. I have now finished with Geology altogether, and that is some consolation. The only subjects left are the practicals in Chemistry and Botany. These come off early next week. The Chemistry one is in the nature of a trial of endurance. It lasts continuously from 9 in the morning to 4 — a period of seven hours. Personally I feel very tired after three hours practical and so I am not exactly looking forward to Tuesday next." (JLN. Vol. 1, p. 73 - June 3, 1910).

He did not do as badly as he feared and his father having prepared himself for the worst, is sufficiently enthused to write "What a fraud you are. The despondent tone of your letters.... After all the time you spent with me on the Continent and in England I could not reasonably hope for a first but I had sufficient confidence in you to be sure of a second and this is exactly what has come to pass" (MLN. Vol. I, p. 148 - June 24, 1910).

Plans for the Future

Motilal Nehru then outlines his plans for the future of Jawaharlal Nehru and changes his stand about the I.C.S. His disillusionment with I.C.S. was also due to the politicalisation of the service. He writes, "There are no prospects at all in the I.C.S. and the deserving and undeserving are all herded together. Every opportunity is taken to humiliate the Indian members of the I.C.S. The one occasion any notice is taken of you is when you secure a good place in the competition. You come back here, are posted to some outlandish district and are soon forgotten. The Bar on the other hand, offers the highest position and rank to the really deserving members of it." (MLN. Vol. I, p. 149 - June 24, 1910). He then outlines the future academic course as taking a Law Trips, followed by an LL.D., and says "With a school training at Harrow and an M.A., LL.D. (Cantab) you will be worth half a dozen civilians any day. As for success at the Bar leave that to me." He then strikes a sentimental note, "You have to acquire thoroughness and if you do not succeed at the Bar after that it will be my fault and not yours. But I have no misgivings as to either and can see the future as plainly as if it were written in a book. I can almost see you installed in my place in the profession and myself feeling quite happy and contented in retirement." (MLN. Vol. I, p. 149 - June 24, 1910).

By this time Jawaharlal Nehru appears to have been rather fed up with the idea of appearing for any examination. He is disinclined to go for B.C.L. in Cambridge and LL.D. and writes, "The B.C.L. is hardly possible as it is a very hard exam." There was some discriminatory treatment against Indians joining Cambridge and he writes. "Cambridge is becoming too full of Indians, in spite of the fact that the position of Indians is becoming more and more impossible every year." (JLN. Vol. 1, pp. 76-77 - July 16, 1910). He expressed a desire to shift to Oxford and spend a year there, or in the eventuality of not getting a place, spend a year at Cambridge and take a course in Economics. He applied to various colleges in Oxford but did not get a favourable response. Motilal Nehru did not consider a further academical honours at Oxford and Cambridge of much practical value. Realizing Jawaharlal Nehru's reluctance about B.C.L., and LL.D., Motilal Nehru advised him to move to London and attend lectures there with attention and care to win distinction at the Bar examinations. Later Jawaharlal Nehru could "attend chambers of a good equity lawyer and also a good common law man" to be "further improved by working with me in the field". He concludes "This is not perhaps so bright a picture as the one I

painted the other day when I talked of your having M.A. and LL.D. (Cantab) after your name but it means future success in life when academical honours will be forgotten and every man will stand or fall by that which is in him and not what follows his name on paper." (MLN. Vol. I, p. 151 - August 10, 1910).

By this time Jawaharlal Nehru had also come to the same conclusion and "decided to remain in London and so a discussion on the subject can have no practical interest. I intend doing Law, and law alone, for the next few months. I shall see what progress I make in it and, if I think I can spare the time, I shall joint the School of Economics. However, that can be seen later on." (JLN. Vol. 1, p. 80 - September 22, 1910). Later, he discovered that it would be difficult to cope up with the lecture programme of the School, "I can hardly afford to do that as long as law remains my principal subject." (JLN. Vol. 1, p. 91 - August 10, 1911). Motilal Nehru completely agreed since he was doubtful that "any good will come out of a short course of economics or attending chambers in London". (MLN. Vol. I, p. 171 - June 20, 1912). Jawaharlal Nehru was called to Bar on June 19, 1912 and became a barrister-at-law. In his letter to his brother Bansi Dhar Nehru, Motilal Nehru sums up his findings as "Jawahar's passing the Final is not a very great achievement. It is however a great source of satisfaction that it marks the near approach of his return to India after such a long absence." (MLN. Vol. I, p. 172 - June 22, 1912). Does one detect a note of disappointment compared to early expectation in this statement?

At this stage, it is possible to correct some erroneous impressions about Nehru's association with science and scientific thought in the early stages of his career. A few examples of such statements are quoted below:

1. *"Nehru - A Political Biography"*, Michael Edwardes, Allen Lane The Penguin Press, London, W.1., 1971, pp. 19-20.

> "It was also to Brooks that Jawaharlal owed his first interest in science. A small laboratory was fixed up in one of the rooms at Anand Bhawan and the simple experiments carried out there were a thrilling introduction to science. The long and interesting hours spent working out experiments in elementary chemistry and physics probably decided Nehru's choice of natural sciences when some years later he went to Cambridge."

2. *"Jawaharlal Nehru – A Biography"*, Frank Moraes, The MacMillan Company, New York, 1956, p. 36.

> "Cambridge then excelled in the teaching of natural sciences, economics and philosophy. At the Cavendish Laboratory was the celebrated physicist Sir J.J. Thompson, absorbed in his epoch-making research into the conduction of electricity through gases, the determination of the charge and the mass of the electron and the analysis of positive rays. Nehru, with his attachment to science, chose the Natural Science Tripos, his subjects being chemistry, geology and botany."

3. *"Studies on Nehru"*, Sterling Publishers Pvt. Ltd., New Delhi 1987, Nehru and Science: *The Vision of New India* – Ward Morehouse, p. 287.

> "Nehru's own interest in science goes back at least to his days as a university student in England where he studied at Trinity College in Cambridge and took the natural science tripos in chemistry, geology and botany. This provided him with opportunity for some contact with the Cavendish Laboratory where many of the leading British scientists in the late nineteenth and early twentieth century worked – men, such as James Jeans, Arthur Eddington, J.J. Thompson, and Lord Rutherford. While he abandoned active scientific studies when he left Cambridge in 1910 for studies in law at the Inner Temple and for almost four decades of political activism

in India's freedom struggle, his university studies in science, along with other fundamental intellectual dispositions, which we shall explore further in considering different aspects of his own thought as they bear upon the role of science in modern Indian society, clearly left a strong commitment to science as an important means of solving man's problems."

It is doubtful if the teaching of Brooks enthused Jawaharlal Nehru to the extent of becoming a factor in his choosing science subjects in Cambridge, three years later in 1907. The historian S. Gopal writes, "Brooks would seem to have been more interested in spreading Theosophy in Allahabad, where he founded three lodges, than in coaching his pupil; but he had considerable influence on his impressionable charge", and later "Dissatisfied with private tuition, and in particular with Brooks, in May 1905 Motilal took his family to Britain and secured admission for his son at Harrow." (*'Jawaharlal Nehru – A Biography'*, Sarvepalli Gopal, Oxford University Press, Bombay 1975, Vol. I, pp. 18-19).

Choice of science subjects for study at Cambridge was at the behest of his father who had set his mind to see his son as a member of the Civil Service. At a later stage, he realized the futility of pushing Jawaharlal Nehru for the Civil Service and toyed with the idea of his taking high degrees (B.C.L. and LL.D.) in Law. Jawaharlal Nehru was unenthusiastic and Motilal Nehru reconciled to Jawaharlal Nehru qualifying for the Bar and joining him in practice.

At no stage did Jawaharlal Nehru give any inkling of particular attachment or interest in the science subjects. Nor did he or his father visualise for Jawaharlal Nehru science as a career. Since science was not the chosen field for his future career, it is unlikely that he established any contacts or drew inspiration from the leading British scientists mentioned by Morse or Ward Morehouse. In fact, Jawaharlal Nehru does not mention any of these names in his autobiography nor does he refer to them in the letters he wrote regularly to his father.

However, there are two aspects of Jawaharlal Nehru's life which were independent of the father. First, the reading habit inculcated since childhood. He read extensively in English literature, philosophy, psychology, politics, economics and other subjects. Secondly, he took an active interest in the political developments in the country, the international situation, associated with, met and listened to the speeches of different leaders of the Indian freedom movement who visited England. He came under the influence of socialist ideas, heard a speech by George Bernard Shaw, followed developments in British politics, was influenced by Fabians, and the father and son continuously exchanged news and views. Motilal Nehru sent to him copies of his addresses, articles and speeches, comments of critics and newspapers, etc. Jawaharlal Nehru responded with comments, praise or criticism of his father's writings and speeches. Jawaharlal Nehru emerged as a radical and was severely critical of Motilal Nehru's 'moderate' policies which at times tended to express faith in the British rulers.

Return to India; Bar and Politics (1912-1919)

The next phase of Jawaharlal Nehru's career starts with his return to India in September 1912 and joining the two activities, the course of which had already been charted, even before his leaving England, *viz.* practice at the Bar as associate with his father and nationalist politics. He joined the United Provinces Congress Organization in 1913 but was not very active. He married in 1916. His first public speech was in 1915 at Allahabad against the Press Act of 1910. He later addressed meetings against repression in Punjab and United Provinces, prepared notes and letters to newspapers like *The Leader*, *The Independent*, participated in the activities of the Indian National Congress and the Home Rule League. Though not against the British, the initial German victories in World War I did give him a

feeling of exhilaration. Along with Gandhi he was for giving support to the British Empire during their struggle against German militarism, but the price asked was India's freedom. Writing about this period Jawaharlal Nehru says, "I was a pure nationalist, my vague socialist ideas of college days having sunk into the background... yet fresh reading was again stirring the embers of socialist ideas in my head. They were vague ideas, more humanitarian and utopian than scientific." (*Autobiography*, p. 35).

Political Activity and First and Second Terms in Jail (1920-1926).

Mahatma Gandhi started his first campaign of non-violent non-cooperation against the British on August 1, 1920. Jawaharlal Nehru had actively campaigned in United Provinces and along with his father, he was arrested on December 6, 1921 and detained at the District Jail, Lucknow, till March 3, 1922, serving for 87 days. In his capacity as Secretary of the U.P. Congress Committee he wrote detailed instructions, messages and advice to the District, Town and Tehsil Committees, volunteers and members of the Congress Committees. He was arrested again on May 11, 1922 on charge of intimidating cloth merchants and organizing picketing against the sale of foreign cloth and was in Allahabad and Lucknow District Jails till January 30, 1923 (8 months and 20 days). The confinement in jail provided an opportunity to indulge in serious study of books on a variety of subjects, religion, history, politics, economics, English literature and poetry, travel and some works of George Bernard Shaw and H.G. Wells. His prison diary gives a list of 147 books. (JLN. Vol. 1, p. 259). Besides, he was a regular reader of the *Leader* (Allahabad) and was getting the *Nation and New Statesman* from abroad every week. He kept himself regularly posted with news and developments of the movement through letters, newspapers and interviews. After release, we have reports of his speeches at Allahabad and Bareilly District Conferences, interviews with papers and correspondence with other national leaders. Jawaharlal Nehru was again arrested at Nabha on September 19, 1923 where he had gone to witness the repression on Akali agitators on behalf of the Congress but was released after 15 days on October 4, 1923. The following years were of intense political activity under the leadership of Gandhiji till Jawaharlal Nehru accompanied by his wife and daughter sailed for Europe in March 1926 for medical treatment of his wife, Kamala. He was away for nearly two years returning to India in December 1927.

During his stay and travels in Europe, he met the Nobel Laureate Romain Rolland, visited Berlin and a number of industrial concerns, discussed Indo-German relations including trade with a new firm called Indo-Germaine, visited numerous places in Switzerland and published articles discussing in detail, with facts and figures, the negative impact of the British colonial rule on the growth and development of India and the goals and aspirations of Indian nationalism.

Emergence as an International Statesman

But the most significant event during his trip to Europe was his participation in the Congress held by the 'League against Oppression in the Colonies' at Brussels on February 10, 1927, as representative of the Indian National Congress. Messages to the Congress had been received from Gandhi, Einstein, Romain Rolland, Madame Sun Yat Sen and Lansbury. Here he established personal contacts with international leaders of the left parties and working class organizations from various countries and met numerous delegations and representatives from Egypt, Persia, Syria, Dutch East Indies, Amman, China, Korea, Morocco, French North Africa, South Africa, United States, Mexico, States of Central and South America apart from England and several European countries. He was elected a member of the Presidium and presided over one of the Sessions. He was actively associated in framing of the resolutions and the follow-up action. He made a detailed report on the Congress to the

Working Committee of the Indian National Congress and advocated exchange of the delegations with China. He later attended the meeting of the Executive Committee of the 'League against Imperialism' at Amsterdam on March 29-30, 1927 and discussed India's participation in future activities of the League. He visited London and Belgium, read a Paper on "Evolution of British Policy in India" at the Summer School of the "International League of Women for Peace and Liberty" at Gland in Switzerland in September 1927. His articles after his visit to Europe on "The Situation in China and India's Duty", "A Foreign Policy for India", "Victory over the Air" show how his studies of various books and his contact and exchanges with International personalities had deepened and broadened his outlook on national and international affairs.

On way back from Europe, Jawaharlal Nehru along with his family spent some time in Paris and later spent a few days in Moscow at the invitation of the 'Society for Cultural Relations with Foreign Countries' on the occasion of the tenth anniversary celebrations of the Russian Revolution. Also, present at the celebrations were "many professors, scientists and distinguished individuals". (*JLN.* Vol. 2, p. 384). The family travelled via Poland to Berlin and Montreaux and then sailed from Marseilles on December 2, 1927 to Madras. Jawaharlal Nehru was impressed by what he saw of the Soviet Union and writes, "The picture I carry away from Russia is one of admiration for the men who have accomplished within a few years in spite of all disadvantages that one can imagine. We are always complaining of the poor human material we have in India, yet in Russia it is or was no better". This two-year stay and travel in Europe, visits to industrial concerns ending with the visit to the Soviet Union appears to have contributed more to the 'evolution of Jawaharlal'. From a national politician, he emerged as a mature international statesman with a mission of freeing and modernising his country.

He wrote in detail of his travels to his sister (Smt. Vijayalakshmi Pandit) and contributed a series of articles on various facets of life, philosophy and progress in the Soviet Union to the *'Hindu'* of Madras and *'Young India'*. In his article on 'Education in the Soviet Union', he makes a mention of 'research institutes, technical schools, technical short courses, workers' faculties, peasant schools, schools for defectives (deaf, blind etc.), art and music schools' in Russia. He also attended a banquet given by scientists and professors in Moscow. Seeing the progress in Europe and the Soviet Union, he was convinced of the need for large-scale development of industry. In expressing his differences on this subject with Gandhiji, he wrote "You have stated somewhere that India has nothing to learn from the West and that she has reached a pinnacle of wisdom in the past. I entirely disagree with this viewpoint and I neither think that the so-called *Rama Raj* was very good in the past, nor do I want it back. I think the western or rather industrial civilisation is bound to conquer India, may be with many changes and adaptations, but nonetheless in the main based on industrialism. (JLN. Vol. 3, p. 14 - Letter to Mahatma Gandhi, January 11, 1928).

In his presidential address to the All-Bengal Students' Conference on September 22, 1928, Jawaharlal Nehru also made a reference to the role of science in national development. In outlining the oppressive nature of imperialism and pointing to the compatibility of science to socialism and internationalism, he said:

"And so the youth of the world probed deeper into the cause of present-day misery. They studied the economic and the social conditions of the people, and they saw that although science and the changes that science had brought, had in a few generations covered the track of centuries, the minds of men still lagged behind the thought in terms of a dead past. Science had made the world international and interdependent, but national rivalries continued and resulted in war. Science had vastly increased production and there was enough for all and to spare but poverty continued and the contrasts between luxury and misery were more marked than ever before". (JLN. Vol. 3, p. 190 - September 22, 1928).

The year 1928 marks a definite change in the style and content of Jawaharlal Nehru's speeches and writings. These embrace the perspective of linking the movement of India's independence (Jawaharlal Nehru was firmly opposed to the compromise for Dominion Status and was active in leadership of 'Independence of India League') as part of the struggle against imperialism and colonialism; maintaining contacts with independence movements in Java, Sumatra, Latin America and other countries and starting branches of the Indian National Congress in London, New York and Kobe in Japan and contacts with Indian students' organisation in Berlin. In 1929, All India Congress Committee decided to organize a foreign department. Jawaharlal Nehru was also elected president of the All India Trade Union Congress for the year. Congress also sent a representative to the 'Second World Congress of the League against Imperialism' in Berlin. In an article sent for publication to *Anti-Imperialist Review* on May 22, 1929, Jawaharlal Nehru wrote:

"Another feature of the national movement is the broader and more international vision that is gradually animating it. This is the direct consequence of its association with the League against Imperialism.... The Congress at its last session received a large number of messages of greetings from foreign countries and organizations. This was a welcome evidence of foreign contacts that the National Congress is developing. In order to further them the Congress has started a foreign department" and further in the same article he says "India is beginning to realise that her problem is not merely the national problem of gaining political independence but an international problem of ridding the world of exploitation", (JLN. Vol. 3, pp. 304-306).

Jawaharlal Nehru returned from his visit to Europe and the Soviet Union in December 1927 with a marked bent towards socialism and radicalism. At home, he became an uncompromising advocate for full independence. As the Editorial Note to Vol. 3 of *Selected Works of Jawaharlal Nehru* (First Series) says, "The impact of this visit can be seen in the new tone of radicalism and the clear understanding of international affairs which inspired his activities". Besides, he got a fair exposure to the processes of economic and industrial progress and development in capitalist and socialist economy countries and the role of machine in speeding economic progress.

Political Interlude

From 1928 to early 1930, he was again completely engrossed in political affairs concerned with India League, boycott of the Simon Commission, addresses to conferences and Congress party meetings, protests against Public Safety Bills, the Meerut Conspiracy case, etc. He wrote a number of articles on kisan movement, labour unions, land reforms, minorities and development of industries etc. Even in his preoccupations with the political tasks, he kept on with his reading and study of books on politics, economics, science etc. An example of his reading may be seen from the 49 books on various subjects ordered by Jawaharlal Nehru from the Times Book Club, London, on February 14, 1929. (JLN. Vol. 3, p. 425).

Second Term in Jail and Flowering of Science Consciousness

This activity lasted till April 1930 when he was jailed till end of January 1931 (9 months and 6 days) in connection with the Civil Disobedience Movement and again from December 26, 1931 till end of August 1933 (1 year 8 months and 5 days). The prison once again provided opportunity for intensive study of books and in 9 months, he went through over 70 books. (JLN. Vol. 4, pp. 364, 387 and 462). We have no record of his reading material between December 1931 and August 1933 but undoubtedly it would have been formidable. "After his release he gave special attention to the formulation of ideas which would rapidly

advance economic development and social change". (JLN. Vol. 5, Editorial Note). These two years also provided an opportunity for serious intellectual output and resulted in his first major monumental publication *"Glimpses of World History"* which is actually in the form of educative letters (October 26, 1930 to August 9, 1933 - 196 letters, postscript November 14, 1938) addressed to his daughter, but equally an exercise to concretise his own grasp of the historical process. In his preface, he writes:

"Nearly six years ago, when my daughter was ten years old, I wrote a number of letters to her containing a brief and simple account of the early days of the world. These early letters were subsequently published in book form and they had a generous reception. The idea of continuing them hovered in my mind, but a busy life full of political activity prevented it from taking shape. Prison gave me the chance I needed, and I seized it.

Prison-life has its advantages; it brings both leisure and a measure of detachment. But the disadvantages are obvious. There are no libraries or reference books at the command of the prisoner, and, under these conditions, to write on any subject, and especially history, is a foolhardy undertaking. A number of books came to me, but they could not be kept. They came and went. Twelve years ago, however, when in common with large number of my countrymen and countrywomen, I started my pilgrimages to prison, I developed the habit of making notes of the books I read. My notebooks grew in number and they came to my rescue when I started writing. Other books of course helped me greatly, among them inevitably, H.G. Wells' *Outline of History*. But the lack of good reference books was very real, and because of this the narrative had often to be slurred over, or particular periods skipped". (GWH, Preface).

Paying an indirect tribute to the prison-going in helping him update his knowledge, he says, "It was only after I left college that I read some real history. *Fortunately*, my visits to prison have given me a chance of improving my knowledge" (GWH, p. 9) and again he writes, "I have had time enough here in Naini Prison to read or write what I wanted to". (GWH, p. 4).

The studies during the years 1930-1933, the years after return from Europe and the Soviet Union, really mark the emergence of the scientist in Jawaharlal Nehru. His letters entitled "Darwin and the Triumph of Science" (February 3, 1933), "Science Goes Ahead" (July 13, 1933) and "The Good and Bad Applications of Science" (July 14, 1933) bear ample evidence to the impact on his thought and perspective of the writings of George Bernard Shaw, H.G. Wells, Bertrand Russel, Sir James Jeans and of his visit to the Soviet Union. His letter to Aldous Huxley of September 1933 is as much an elucidation of his own views on science, industry and development as a defence against Huxley's denigration of the Gandhian approach of "return to Nature". (JLN. Vol. 5, pp. 510-514, September 1, 1933).

At this stage, Jawaharlal Nehru also displayed full awareness of the importance of science in education of the individual and the role of science in social and economic development. He also recalled his own association with science in his student days, which would have helped him to appreciate the writings of the scientific authors. On July 12, 1934, he wrote from Dehra Dun jail to his daughter:

"But art and general culture without anything else are apt to make us rather helpless persons in the present-day world. To understand it we have to possess technical knowledge, for the modern world is based on science and technical appliances. No person can call himself educated today unless he or she knows something of science and economics and technology.

It was because of this that I suggested your taking up two science subjects - chemistry and another. I was very glad to learn from you that you had done well in your chemistry paper at Bombay. This shows that you have a bent that way and it is desirable to keep it up. My own subjects at college, as you perhaps know, were scientific ones — chemistry, botany and geology with some physics. Physics is the oldest of sciences, the basic one

Then comes chemistry, and then biology which is popular now. We should know something of all three of these and then we can specialize later" (JLN. Vol. 6, pp. 263-264) and again from jail on July 27, 1934.

"I think you have done well to take chemistry instead of logic. It is true that one science by itself is somewhat out of place but no science would have been worse. It is my belief that a person who does not know something about science is incomplete in the modern world". (JLN. Vol. 6, p. 267).

By 1933, he had accepted science and scientific method as the enlightened approach to social, political and economic problems and considered socialism as the logical approach to economic development consistent with the scientific methodology. Jawaharlal Nehru was released on August 30, 1933. In early October 1933, in his series of articles entitled *Whither India?* Jawaharlal Nehru analysed the Indian situation as he saw it and advocated the application of scientific method to politics. He wrote:

"Our politics must either be those of magic or of science. The former of course requires no argument or logic; the latter is in theory at least entirely based on clarity of thought and reasoning and has no room for vague idealistic or religious or sentimental processes which confuse and befog the mind. Personally, I have no faith in or use for the ways of magic and religion and I can only consider the question on *scientific grounds*". (JLN. Vol. 6, p. 3). On the economic development, he points to the crisis in the system of capitalism, where scarcity exists amidst plenty and says, "Repeated international conferences have failed to find a way out because they represented the interests of vested interests and dared not touch the system itself. They grope blindly in the dark in their stuffy rooms while the foundations of the house they built are being sapped by the advance of *science and economic events*. Everywhere thinkers have recognised the utter inadequacy of the existing system, though they have differed as to the remedies. Communists and socialists point with confidence to the way of socialism and they are an ever growing power for they have *science and logic* on their side." (JLN. Vol. 6, p. 11).

Third Term in Prison and Further Studies

Jawaharlal Nehru was back in prison on February 12, 1934. The incarceration lasted till September 3, 1935 (1 year 6 months and 23 days) with nearly two-weeks parole (August 12 to 23, 1934) due to his wife's serious condition. He read extensively in prison and made a list of 188 books he read. Among these are science books by Sir James Jeans, E.B. Havell, H.G. Wells, Aldous Huxley, Bertrand Russel, J.B.S. Haldane, A. Pinkevich, Bernard Shaw, Gerald Heard, Patrick Geddes besides a variety of books on peace, education, philosophy, history, economics, politics, fiction, poetry and literature. (JLN. Vol. 6, p. 420-427). And he writes:

"It has also become necessary that we read and know about the present state of other countries — the European countries, Russia, America, China, Japan, Egypt and many others. It is impossible to understand the present state of affairs without a knowledge of the past. All the questions we face today have their roots in the past. So the knowledge of history becomes necessary, and not merely the history of a nation (or two) but of the whole world.

We also have to keep in mind that the present-day world and our lives are yoked to science. Therefore, we have to understand the basic principles and the new ideas of science. I have been very interested in this, particularly physics and its new theories — relativity and quantum theory — biology, sociology, psychology and psychoanalysis.

On all these subjects thousands of books are being brought out these days in America and Europe." (JLN. Vol. 6, pp. 440-441, Almora District Jail, July 28, 1935).

During his incarceration Jawaharlal Nehru started his 'Autobiography' in June 1934 and finished it while still in jail in February 1935 (less than 8 months), the 'autobiographical

narrative" was written to help "in engaging my mind in a definite task and to diverting it from worry and depression". His wife's illness, and the depressing turn of national events are reflected in what is essentially a political and personal document. Even in the narrative he recognizes that science would be a powerful instrument in India's future development. Although political freedom was still shrouded in the distant and uncertain future, he visualises that:

"It is a futile task to consider the 'ifs' and possibilities of history. I feel sure that it was a good thing for India to come in contact with the scientific and industrial West. Science was the great gift of the West, and India lacked this, and without it she was doomed to decay. The manner of our contacts was unfortunate, and yet, perhaps, only a succession of violent shocks could shake us out of our torpor." (*Autobiography*, p. 436).

While thinking of the future science relationships after Independence, he writes:

"Whenever India becomes free, and in a position to build her new life as she wants to, she will necessarily require the best of her sons and daughters for this purpose. Good human material is always rare, and in India it is rarer still because of our lack of opportunities under British rule. We shall want the help of many foreign experts in many departments of public activity, particularly in those which require *special technical and scientific knowledge*". (*Autobiography*, p. 445).

And he advances a hope that:

"Let us have done with the past and its bickering and face the future. To the British we must be grateful for one splendid gift of which they were the bearers, the *gift of science and its rich offspring*." (*Autobiography*, p. 449).

Preliminary Application of Science to Development

Jawaharlal Nehru was released from prison on September 3, 1935 and flew to Switzerland to be with his ailing wife, Kamala Nehru, who expired on February 28, 1936. During his stay in Europe, he visited London and renewed his contacts with British personalities in the political and economic field. On return, he took up the Presidentship of the Congress and plunged into politics. During 1936, his addresses, speeches and writings bear the imprint of his conviction that socialism was the right approach to India's problems of poverty and backwardness. He also visualised the role that science may play in India's industrialisation and progress. In his article published in *Asia* (New York, June 1936) entitled "Before India is Reborn", he deals at length with India's problems under the British and expresses that "In almost every country in the world the educational and material progress has been tremendous during the past century because of science and industrialism..." and that "we suggest that some such technical progress would have come to us anyhow in this industrial age, and even without British rule"; (JLN. Vol. 7, p. 636).

Though earlier opposed to it, in August 1936, the Indian National Congress decided to contest the provincial elections under the Government of India Act of 1935 with a view to fighting the Act from within the Assemblies. Jawaharlal Nehru became deeply engrossed in the election campaign. In February 1937, in a mass upsurge, Congress won handsomely in the elections in six provinces and Jawaharlal Nehru felt that "The days of imperialism are numbered. The people have spoken and pronounced its doom." (JLN. Vol. 8, p. 27) and that "They (the Indian people) have given notice to British imperialism to quit." (JLN. Vol. 8; p. 64). After a prolonged period of indecision and great deal of debate and deliberation, the Working Committee of the Congress under Jawaharlal Nehru's presidentship resolved on July 7, 1937 to accept office and form ministries in the provinces. Notwithstanding the Congress resolve to wreck the working of the Constitution, this period also marks a further advance in Jawaharlal Nehru's approach to science — from recognition of science as a positive force for progress, he moved on to make contacts and take the initiative for association with scientists

and scientific organisations. While in Calcutta on June 14, 1937, he visited the Indian Institute of Medical Research and recorded a message of support and encouragement in his own hand-writing. For the first time, the Congress savoured the power to govern and Jawaharlal Nehru felt that "And yet we have a new opportunity for serving and strengthening the masses and perhaps easing their many burdens a little". (JLN. Vol. 8, p. 109). "At his suggestion the Congress Working Committee called on the new Congress governments in the summer of 1937 to appoint committees of experts to devise machinery for planning." (*Nehru – A Political Biography*, Michael Brecher, p. 236). On December 26, 1937, he sent a message on the occasion of the Silver Jubilee of the Indian Science Congress at Calcutta, which is titled "Science and Planning". Recognising the role of science, he says "Even more than the present, the future belongs to science and to those who make friends with science and seek its help for the advancement of humanity". To establish rapport with the scientific community, he recalls "the days when, as a student, I haunted the laboratories of that home of science, Cambridge". Tracing the path of his return to science he says, "In later years, through devious processes, I arrived again at science, when I realized that science was not only a pleasant diversion and abstraction, but was of the very texture of life, without which our modern world would vanish away..... starving people." He comments on the futility of fragmented plans and asks, "Can we plan on a limited scale for limited objectives?" He declares himself in favour of "a State organisation of research" and that "we have to build India on a scientific foundation". (JLN. Vol. 8, pp. 806-808). He addressed the National Academy of Sciences at Allahabad on March 5, 1938 and recalled with nostalgia "For I too have worshipped at the shrine of science and counted myself as one of its votaries". He traced the development of science as a force for national development and read out the resolution of the Working Committee addressed to Congress Ministries "which should interest scientists and experts", "on the appointment of a Committee of *experts* to consider urgent and vital problems, the solution of which is necessary to any scheme of national reconstruction and social planning". He invited them "to take a lead in all such matters and advise the Government thereon". (JLN. Vol. 8, pp. 811-812).

Science and National Planning

Not satisfied with the working of the Congress Ministries in the provinces and feeling stale, Jawaharlal Nehru left for Europe in June 1938. He travelled and stayed in Europe returning in November 1938. This was the period of aggressive advance of Nazism under Hitler and surrender of Czechoslovakia to Germany by the compromising British and French Governments. Jawaharlal Nehru came out clearly against Nazism and condemned the British and French Governments for their unprincipled surrender. He visited various countries in Europe including France and Hungary and paid a visit to Spain where the Republicans were waging a heroic struggle against the joint attack of Italian and Spanish Fascism. He contributed a number of articles to various British and Indian journals and came convinced that in any future war against Fascism, India could only participate as a free country. In October 1938, he was appointed by Subhas Bose, the then Congress President, as Chairman of the National Planning Committee.

Jawaharlal Nehru's appointment as Chairman of the National Planning Committee was the result of the confluence of two independent streams of thought. In 1937, at the instance of Jawaharlal Nehru, the then President of the Indian National Congress, the Congress Working Committee had directed the Congress Ministries to appoint committees of experts to devise machinery for planning. In his message to the Silver Jubilee Session of the Indian Science Congress in January 1938, Jawaharlal Nehru had stated "I believe that without such planning little that is worthwhile can be done". (JLN. Vol. 8, p. 807).

During this very period a group of scientists in Calcutta, under the leadership of Prof. Meghnad Saha, inspired by the Soviet example, were formulating plans for the application of science and technology for national development. In his Presidential Address to the 21st Session of the Indian Science Congress at Bombay in 1934, Prof. Saha had for the first time advocated large-scale application of science and technology to national life. The Calcutta scientists had also started a monthly journal "Science & Culture" in 1935. In his articles and notes in the journal Prof. Saha had forcefully pleaded for the establishment of a National Research Council and a Defence Science Organization. In 1936, Prof. Saha had been in contact with Jawaharlal Nehru. (Letter from Meghnad Saha to Jawaharlal Nehru dated December 22, 1954, NMML.) In 1938, when Subhas Bose became President of the Indian National Congress, Prof. Saha persuaded him to set up the National Planning Committee and insisted on a national leader of stature being its Chairman, (*Meghnad Saha*, Santimay Chatterji and Enakshi Chatterji, p. 65) that was Jawaharlal Nehru. Prof. Saha was a member of the National Planning Committee and Chairman of two of the sub-committees. Some differences surfaced due to Prof. Saha's mis-apprehension regarding the position of the Congress and Jawaharlal Nehru on the role of large-scale basic and heavy industry. Jawaharlal Nehru was "personally a believer in the development of large-scale industries. Nevertheless I have wholeheartedly supported the khadi movement as well as the wider village industries movement for political, social and economic reasons". (JLN Vol. 10, pp. 539-540). Another scientist who figures in Jawaharlal Nehru's early contacts is Prof. P.C. Mahalanobis who offered his co-operation to the National Planning Committee (N.P.C.). Jawaharlal Nehru writes in his note to members of the N.P.C. on August 1, 1940:

"Fortunately we have in India an efficient Statistical Institute and the Statistical Laboratory of Calcutta. Professor P.C. Mahalanobis, who is in charge of this Laboratory, has kindly offered his co-operation to us in every way and has sent us two notes on the subject, which are being circulated to members.

I have gratefully accepted the offer made by Professor P.C. Mahalanobis to examine all our sub-committees' reports from a purely statistical point of view and to send us his suggestions thereon. Copies of these reports have been sent to him." (JLN. Vol. 11, p. 293). There were a number of other scientists who participated in the work of the National Planning Committee. Sir M. Visveswaraya was a member of the National Planning Committee but resigned at an early stage since he did not contribute to the concept of overall national planning and wished it to be restricted to industry. (*Mainstream*, October 10, 1987, p. 27).

The year 1938-39 represented a peculiar and somewhat of a transitional phase. The Indian National Congress was recognized internationally as the future rulers and Jawaharlal Nehru writes:

"One fact that is worth noting is that India seems to have acquired a new status in international affairs. In international conferences and elsewhere, by which I do not mean the League of Nations, India functions practically on a level with the independent nations, and Indian nationalist opinion is valued greatly. There is a general feeling that India is on the threshold of independence and so the goodwill and friendship of India are considered worthwhile". (JLN, Vol. 9, p. 204). Presumably, it was this very feeling that was reflected in his note circulated to members of the National Planning Committee on June 4, 1939 which says "Our plan for national development must, therefore, be drawn up for a free and independent India. This does not mean that we must wait for independence before doing anything towards the development of a planned economy. Even under existing conditions we must make every effort to adopt all measures and policies which develop the resources of the country and raise the standard of our people. All such efforts, however, must be directed towards the realisation of the plan we have drawn up for a free India". (JLN, Vol. 9, p. 377). In planning, industrial and social development he calls science as a prime factor and says "Science is a great force in the present age. You should imbibe the

spirit of science and think on scientific lines". (JLN. Vol. 9, p. 372).

Nehru's study of the thinkers and philosophers of science gave him a wide perspective and interpretation of science – as a rational approach, as a method and as means of modern progressive development of the nation and the human beings. In his address to the Cultural Conference of Students at Calcutta on January 3, 1939, he says, "There cannot be any doubt that we cannot progress nationally or individually unless we profit by the lessons of science.... We have to think presumably not of science as applied in the fields of industry or politics but science in its wider connotation. What is science? It is a certain way of approaching problems, a certain way of seeking the truth. It is a certain empirical way whereby we get prepared to reject anything if we cannot establish or prove it". He elaborated this further, "You cannot apply science in your industries keeping other departments of your life free from it. The whole scheme is unscientific. Therefore, if we want to consider various problems that face us as an individual and as a social group, the right way to consider those problems is to adopt the method of science". For Jawaharlal Nehru science and socialism (and planning) were co-related and he says "I am a socialist because I feel that socialism is a scientific approach to the world's problems." (JLN. Vol. 9, p. 616).

There were phases of intense political activity, meetings, demonstrations, speeches and correspondence with other political leaders and contemporary personalities on political matters. Simultaneously, there were periods or aspects of activity concerned with planning and development, when Nehru's thoughts turned to science and its role in social, industrial and economic development. During 1939, Nazi Germany invaded Poland and Britain and France declared war on Germany. India was dragged into the war and a period of intense political activity ensued to determine the role of the Indian National Congress in opposing Nazism while at the same time waging a struggle for national freedom.

The Congress Working Committee in September 1939 called upon the British Government to unequivocally declare their war aims in regard to democracy and imperialism and demanded those aims to be applied to India and given effect to in the present. India offered cooperation with dignity and freedom. The British Government was at best agreeable to hold consultations at the end of war and form a Consultative Committee of representatives of various parties for associating public opinion with the conduct of war. This position was rejected by the Congress.

The Congress Ministries resigned in November 1939 and there were serious obstacles to the functioning of N.P.C. and its sub-committees. The Congress's negotiations with the Viceroy and the Government of India for an understanding of India's position of non-participation in the war were rejected and Congress launched a movement of individual satyagraha and civil disobedience. (JLN. Vol. 11, p. 160). Jawaharlal Nehru was arrested on October 31, 1940. Even from the jail he was in correspondence with K.T. Shah, Secretary of the National Planning Committee. Meghnad Saha also wrote to Jawaharlal Nehru in jail that with Jawaharlal Nehru's incarceration "the N.P.C. work has naturally flagged, but I am not keeping my own share in cold storage." However, the work of N.P.C. more or less did come to an end with the refusal of the Government to allow Jawaharlal Nehru to receive in the prison any papers concerning N.P.C. His two years' Chairmanship of the N.P.C. had brought him in contact with some of the most eminent scientists in the country and a number of officials and technical officers of the Central and State Governments.

In December 1941, Japan had come into the war and rapidly occupied a number of the British colonies in South-East Asia, posing a direct threat to India.

Jawaharlal Nehru was released in early December 1941 to resume negotiations with representatives of the British Government and the Government of India. Nehru even while pre-occupied with political tasks in the war-charged atmosphere found time to protest against denial of permission to an Indian industrialist to start automobile, shipbuilding and aeroplane industries while according approval to American interests to establish a plant.

(JLN. Vol. 12, pp. 548-549). He sent a message to the Benaras Hindu University Engineering College Souvenir Volume on January 31, 1942 saying "We have to build the structure of our state and our society anew, and we have to build this on scientific, planned lines if it is to endure. The approach of science is essential as well as specialist and technical knowledge". (JLN. Vol. 12, pp. 556-557). In a series of articles in Indian and foreign newspapers and magazines, Jawaharlal Nehru pointed to the negative and obstructive role of the Government towards India's industrial and economic development. In his article "India, Day of Reckoning" written for *Fortune* (Chicago) in March 1942, he wrote "I have been particularly interested in industrial problems in my capacity as Chairman of the National Planning Committee. This Committee gathered around it some of the ablest talent in India—industrial, financial, technical, economic, scientific – and tackled the whole complex and vast problem of planned and scientific development and coordination of industry, agriculture and social services. The labours of this Committee and its numerous sub-committees would have been particularly valuable in war-time. Not only was this not taken advantage of but its work was hindered and obstructed by the Government". (JLN. Vol. 12, p. 172).

Jawaharlal Nehru's broadening and deepening of Science Consciousness

Negotiations with the Government did not succeed and the Congress Working Committee in August 1942 launched the historic 'Quit-India' struggle. In August 1942 Jawaharlal Nehru was arrested and detained in the Ahmednagar Fort. His ninth incarceration was the last and longest (August 9, 1942 to June 15, 1945) of the series.

In 1942, at the initiative of the Calcutta group of scientists, Jawaharlal Nehru was elected to preside over the 30th Annual Session of the Indian Science Congress to be held at Calcutta in January 1943. It was a proof of solidarity of the scientific community with the national movement in general. It was also in a sense, fraternisation with Jawaharlal Nehru who as Chairman of the N.P.C. had shown keen interest and appreciation of the role of science in national affairs. Jawaharlal Nehru took the occasion to read on science and he says:

"I am trying to get some more books on science in order to qualify myself to some extent at least for the presidentship of the All India Science Congress which holds its next session at Lucknow (it was Calcutta - *ed.*) next January! Not that there is the slightest chance of my presiding over it" (JLN. Vol. 13, p. 22 - Letter to Indira Nehru, October 15, 1942). Recalling this during his address to the 39th Session of the Indian Science Congress at Calcutta in January 1952, he said "I remember on the last occasion, when I should have attended a session of the Science Congress in Calcutta and when I did not do so, though the failure to do so, was not, well, due to any lapse on my particular part..... this city of Calcutta has played (a part*ed.*) in so many things in India, in the development of so much in India; science you have heard about, the pioneering effort, in so far as India is concerned, took place in Calcutta. But so much else, whether it is music or art or cultural life generally, and more especially our movement for freedom, all seem to have had their inception largely in this city". (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, p. 27).

The long and dreary years in jail were spent by Jawaharlal Nehru in serious study and writing work. At various stages but mostly during 1942 and 1943 and early 1944, he read through more than 400 books on a variety of subjects including more than 20 on science subjects—important among these *Frontiers of Science*, C.T. Chase; *Heredity and Politics*, J.B.S. Haldane; *Mathematical Recreations*, M. Kraitchik; *Mathematics for the Million* and *Science for the Citizen*, Lancelot Hogben; *Nature of the Physical World*, Sir A. Eddington; *Outline of History*, H.G. Wells, *Religion with Revelation* and *Reshaping Man's Heritage*, Julian Huxley; *Renaissance in Physics*, Karl Kelchner Darrow; *Universe in Space and time*, George Van den Bergh and *Social Function of Science* by J.D. Bernal; *Science in Progress* ed. George Alfred Baitsell.

His scientific background helped his understanding of the science subjects. About Hogben's books he says "I have just finished reading Hogben's *'Science for the Citizen'* — a huge tome of nearly 1100 pages, with Horraban's illustrations. It is an amazing performance, this book, and though sometimes it is heavy reading and the mathematical formulae are none too easy, on the whole it is an astonishingly good book. I am surprised that I should have kept away from it for these five years or so since it has been out. Though perhaps I would not have had the time to read it outside. I am anxious now to read Hogben's other book — *Mathematics for the Million* — but I cannot get it." (JLN. Vol. 13, p. 22).

He tapped various sources to get science books. He wanted his sister Krishna Hutheesing to write to Dr. Homi J. Bhabha, then Professor of Physics at the Institute of Science at Bangalore for names of some recent books on modern developments in physics especially the Theory of Relativity and the Quantum Theory (JLN. Vol. 13, p. 536). Dr. K.S. Krishnan, then Professor of Physics at Allahabad University was approached and he sent a number of books on physics, general science and social aspects of science. (JLN. Vol. 13, p. 605). The copious extracts which he made from the books he read in prison and the note-books containing these notes and some 120 letters to Indira Gandhi are available in the Nehru papers. The Chapters in 'Discovery of India' entitled 'Mathematics in Ancient India', 'Religion, Philosophy and Science' and 'The Modern Approach to an old Problem' are directly derived from his study of scientific literature while in Ahmednagar Fort. The book *(Discovery of India)* itself of 999 handwritten pages was completed in a record time of 6 months and 25 days (April 13, 1944 to September 7, 1944) and revised twice by December 1944. Jawaharlal Nehru was anxious that the work gets completed before the impending release and says "I do not want release or transfer or any other development to come with any such work unfinished and hanging over. Outside — when I go out — the past should not pull me". (JLN. Vol. 13, p. 521). By 1945, Jawaharlal Nehru had published his major works and he was conscious of his gift of the pen. As early as 1939 he wrote "The Calcutta *Statesman* offered me Rs. 500/- a month for a column a week — 4 columns a month of comments on international affairs. I rejected it of course. It is easy enough for me to earn a decent livelihood by writing. But other matters engross my attention and even when I write, it is not for payment". (JLN. Vol. 10, p. 639).

End of the War and Jawaharlal Nehru's Reaction to Nuclear Holocaust

By the time Jawaharlal Nehru was released in mid 1945, the war in Europe had been won by the Allies and the activity had shifted to the Eastern theatre. India was required to play a crucial role as the principal base for allied operations in the Eastern theatre, which was expected to last two years or more. There was plenty to occupy the political leadership with urgent national tasks. Millions had perished in the famine in 1943 in Bengal, Orissa and the other provinces. The Government of India had proved callous and indifferent besides being incapable of handling the situation. It was obvious that some concessions were necessary to win cooperation of the people. The Viceroy Lord Wavell returned after consultations from London with proposals to reconstitute the Viceroy's Executive Council, as an interim government with representatives of Congress and the Muslim League. The intransigent attitude of Mr. Jinnah claiming total Muslim representation from the League led to failure of the negotiations. There was a change of government in U.K. and the British Labour Party took office on July 26, 1945.

The month of August 1945 was unique in many ways. On August 6, the first atom bomb was dropped on Hiroshima in Japan to be followed by the second one on August 9, on Nagasaki. This brought an unexpected end to the war and the Japanese surrendered on August 11, 1945. Subhas Bose died in an air crash. With this came the collapse of the I.N.A., problem of prisoners and the trial of the Indian National Army; and later followed mutiny

and agitation in air force and the naval mutiny in Bombay in February 1946. It was obvious that India could not be held in bondage for long. The Labour Government launched new proposals ensuring restoration of provincial autonomy after elections, setting up of a constituent assembly and reconstitution of the Viceroy's Executive Council with principal Indian parties. The subsequent developments in terms of provincial elections, negotiations with the Cabinet mission, Jinnah's insistence on Pakistan and the formation of the interim government on September 2, 1946 are a part of recent history.

Notwithstanding the intense political activity during the period, the situation was steadily even if unevenly moving towards an end of the colonial rule of Great Britain. Jawaharlal Nehru instinctively felt that "Great tasks lie ahead. The main task is the achievement of freedom. Economic and social reconstruction should be undertaken". (JLN, Vol. 14, p. 196). He started picking up threads and reviving work of the National Planning Committee. He held a meeting of the N.P.C. on September 17, 1945 at Bombay (JLN, Vol. 14, p. 553) and again on November 6, 1945 (JLN, Vol. 14, p. 449), hoping to finish its labours in the coming summer. He was clear that the "N.P.C. has been set up to keep in readiness plans to ameliorate suffering and improve the conditions of the famished millions of India who have been groaning under the British yoke". (JLN, Vol. 14, p. 221 - October 13, 1945).

In India, the first reaction to the atom bomb was from Sir J.C. Ghosh, Director, Indian Institute of Science, Bangalore, who had recently returned from a visit to the United States and the United Kingdom as a member of the scientists' delegation arranged by the Government of India. The newspapers in U.S.A. carried headlines and were full of details of the destruction caused by the atom bombs in Japan, the effects of radiation and the moral dilemma of the use of atomic weapons in warfare. Dr. Ghosh had summed up the position in his statement that "The post-war application of this source of energy to peaceful development of power for the benefit of mankind would be immense. It is hoped mankind will forget this terrible bomb and will only remember the far-reaching innovations in producing power for industry and transport that this new phenomenon will bring under controlled condition". (Bangalore, August 11, UPI, *The Bombay Chronicle*, August 13, 1945).

June to August 1945 was a period of intense political activity. Jawaharlal Nehru was busy with the Simla meetings and negotiations and on August 21, 1945, it was announced that the elections would be held for the Centre and in the provinces.

Nehru's first reaction to the explosion of atomic bomb came during an election speech at Lahore on August 25, 1945 (JLN, Vol. 14, p. 162), when he referred to destruction of five lakh people in the two cities of Japan. He felt that "the talk of Pakistan sounds empty and meaningless in the age of atom bombs". He also felt that knowledge of atomic bombs would soon spread and render earlier weapon systems obsolete. He argued that the havoc that an atomic bomb can cause had eliminated the scope for survival of small countries, an argument which militated against the workability of Pakistan. The modern trend is towards the establishment of a world federation or at least an Asian federation and thinking in terms of Pakistan was like a return to primitivism. (JLN, Vol. 14, p. 187 - August 29, 1945). He felt that "It is the age of the atom bomb. A terrible force had been found that will either create a new world or destroy the old." (JLN, Vol. 14, p. 227 - November 24, 1945). He warned that "The use of the atom bomb, if properly made, will lead to world peace, otherwise the world will be ruined". (JLN, Vol. 14, p. 228 - November 27, 1945), and he hoped that "If the atomic energy behind the atomic bomb is utilised for constructive power, it will very much develop the entire structure of the world. The world is bound to change within the coming few years and I hope that atomic energy will be used in constructive power to uplift mankind". (JLN, Vol. 14, p. 231 - January 20, 1946).

Projecting his thinking into future developments, Jawaharlal Nehru felt that so long as fundamental causes which created friction and war between nations existed, the menace of atom bomb or even worse weapons could not be removed. Striking an optimistic note he thought that "Probably in another 10 or 15 years, practical applications of atomic energy

will be made. This would mean a great revolution upsetting economic theories and structures. This revolution caused by atomic energy can either destroy human civilization or take it up to higher levels". (JLN. Vol. 14, p. 318).

However, a comprehensive elucidation of his views on the atomic bomb was given at his press conference at Delhi on August 25, 1945 as follows:

"I have a scientist's outlook. Long ago I took a degree in science and studied physics before the present invention of the atom. I am fascinated by the theory that almost anything can be made radio-active. In the spare moments of a politician's life, I have tried to study science and am greatly interested in the atomic bomb. The invention has released tremendous forces in the world, which can be used for good or evil. For the time being, it has been used only to destroy cities and kill people.

There is now a race in the world between the forces of construction and destruction. Since the last generation this race has become more and more frantic and with the coming of the atomic bomb, it looks as though one of them must win. Which would win, I cannot say. I am not interested in the destruction of men in the world, but there is no good making a fuss about it. The atomic bomb cannot be kept a secret for long and, in fact, most of the advanced countries are on the verge of making it. Undoubtedly, they will have it and use it if the war comes again. That means tremendous destruction.

From a humanitarian's point of view I would enquire into the basic cause. It is a very grave responsibility for any country that uses atom bombs. A very great responsibility rests with the United States. It justifies the use of the atomic bomb on the ground that it stopped war, but by unleashing such a weapon it has created a dangerous situation.

The atomic bomb brings a measure of hope also. Faced with such a destructive weapon people might wake up."

In response to a question of whether the future Government of India would have atomic bombs in its armoury, Jawaharlal Nehru responded that "So long as the world is constituted as it is, every country will have to devise and use the latest scientific methods for its protection. I have no doubt India will develop its scientific researches and hope Indian scientists will use the atomic force for constructive purposes. But if India is threatened, it will inevitably try to defend itself by all means at its disposal. I hope India, in common with other countries, will prevent atomic bombs being used. (JLN. Vol. 14, p. 192).

He advised students to "reflect on the tremendous implications of the atomic age and shape your life and work in the light of these reflections." (JLN. Vol. 14, p. 488 - November 13, 1945).

Jawaharlal Nehru in Command and Beginning of a New Phase

Towards the end of 1945, the main political parties and the Government of India were inching their way towards some political adjustment to enable elected representatives to participate in the process of Government. Jawaharlal Nehru's instincts turned again towards the tasks of construction. Government of India was also showing greater cooperation in the work of the National Planning Committee "to the extent that it is sending some material and it has also deputed its representatives to attend the meetings of the Committee". (JLN. Vol. 14, p. 326 - January 9, 1946). Both through his work in the National Planning Committee, his studies and personal contacts with scientists, Jawaharlal Nehru entered a period of direct contact with science and scientists. His appreciation of the role of science in development is shown in the message he sent to the Royal Institute of Science on the occasion of its Silver Jubilee. (JLN. Vol. 14, p. 558). In this message, he says "of all the big problems that face India today nothing is more important than the development of scientific research, both pure and applied and scientific method" and "we have to fill this lack rapidly and on an extensive scale, and at the same time efficiently". This was Nehru's promise to the future of science.

In July 1946, Jawaharlal Nehru took over as President of the Indian National Congress and was looked upon as the incoming Premier of India. He was also elected to preside over the 34th Session of the Indian Science Congress to be held in Delhi in January 1947. His contacts with scientists grew and a number of scientists corresponded with him about the affairs of the science and science organisations. He was invited to send nomination for appointment of an Indian on the staff of UNESCO. Offers of honorary degree also started coming in.

In September 1946 Jawaharlal Nehru was sworn in as Vice-President in the interim Government of India — and with this 'a new phase in Nehru's life began'. A new phase also began in the progress of science in India and of Nehru's active association with and impact upon development and growth of science.

JAWAHARLAL NEHRU
ON
SCIENCE AND SOCIETY

PRIOR TO INDIA'S INDEPENDENCE

1. DARWIN AND THE TRIUMPH OF SCIENCE*

(Letter to his daughter from his cell in the district gaol, Dehra Dun)

February 3, 1933

From the poets let us go to the scientists. The poets, I am afraid, are still considered rather ineffectual beings; but the scientists are the miracle-workers of today, and they have influence and honour. This was not so before the nineteenth century. In the earlier centuries a scientist's life was a risky affair in Europe and sometimes ended at the stake. I have told you of how Giordano Bruno was burnt in Rome by the Church. A few years later, in the seventeenth century, Galileo came very near the stake because he had stated that the earth went round the sun. He escaped being burnt for heresy because he apologized and withdrew his previous statements. In this way the Church in Europe was always coming into conflict with science and trying to suppress new ideas. Organized religion, in Europe or elsewhere, has various dogmas attached to it which its followers are supposed to accept without doubt or questioning. Science has a very different way of looking at things. It takes nothing for granted and has, or ought to have, no dogmas. It seeks to encourage an open mind and tries to reach truth by repeated experiment. This outlook is obviously very different from the religious outlook, and it is not surprising that there was frequent conflict between the two.

Experiments of various kinds have, I suppose, been carried on by different peoples in all ages. In ancient India, it is said that chemistry and surgery were fairly advanced, and this could only have been so after a great deal of experimenting. The old Greeks also experimented to some extent. As for the Chinese, recently I read a most astonishing account, which gave extracts from Chinese writers of 1500 years ago, showing that they knew of the theory of evolution, and of the circulation of the blood through the body, and that Chinese surgeons gave anaesthetics. But we do not know enough about these times to justify any conclusions. If the ancient civilizations had discovered these methods, why did they forget them later? And why did they not make greater progress? Or was it that they did not attach enough importance to this kind of progress? Many interesting questions arise, but we have no materials to answer them.

The Arabs were very fond of experimenting, and Europe in the Middle Ages followed them. But all their experimentation was not truly scientific. They were always looking for what was called the "Philosophers' Stone", which was supposed to have the virtue of turning common metals into gold. People spent their lives in complicated chemical experiments to find the secret of such transmutation of metals; alchemy this was called. They also searched diligently for an "elixir of life" or *amrit*, which would give immortality. There is no record, outside fairy tales, of any one having ever succeeded in finding this *amrit* or the famous stone. This was really dabbling in some kind of magic in the hope of gaining wealth and power and long life. It had nothing to do with the spirit of science. Science has no concern with magic and sorcery and the like.

The real scientific method, however, developed gradually in Europe, and among the greatest names in the history of science is that of the Englishman, Isaac Newton, who

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* *Glimpses of World History*, Jawaharlal Nehru, Asia Publishing House, Bombay (1965), pp. 539-544.

lived from 1642 to 1727. Newton explained the law of gravitation — that is, of how things fall; and with the help of this, and other laws which had been discovered, he explained the movements of the sun and the planets. Everything, both big and small, seemed to be explained by his theories, and he received great honour.

The spirit of science was gaining on the dogmatic spirit of the Church. It could no longer be put down or its votaries sent to the stake. Many scientists patiently worked and experimented and collected facts and knowledge, especially in England and France, and later in Germany and America. The body of scientific knowledge thus grew. The eighteenth century in Europe, you will remember, was the century when rationalism spread among the educated classes. It was the century of Voltaire and Rousseau and many other able Frenchmen who wrote on all manner of subjects and created a ferment in the minds of the people. The great French Revolution was being hatched in the womb of the century. This rationalistic outlook fitted in with the scientific outlook, and both opposed the dogmatic outlook of the Church.

The nineteenth century, I have told you, was, among other things, the century of science. The Industrial Revolution, the Mechanical Revolution, and the amazing changes in the methods of transport, were all due to science. The numerous factories had changed the methods of production; railways and steamships had suddenly narrowed the world; the electric telegraph was an even greater wonder. Wealth poured into England from her far-flung empire. Old ideas were naturally much shaken by this, and the hold of religion grew less. Factory life, as compared to an agricultural life on the land, made people think more of economic relations than of religious dogmas.

In the middle of the century, in 1859, a book was published in England which brought the conflict between the dogmatic and the scientific outlook to a head. This book was the *Origin of Species*, by Charles Darwin. Darwin is not among the very great scientists; there was nothing very new in what he said. Other geologists and naturalists had been at work before Darwin, and had gathered much material. None the less Darwin's book was epoch-making; it produced a vast impression and helped in changing the social outlook more than any other scientific work. It resulted in a mental earthquake and made Darwin famous.

Darwin had wandered about in South America and the Pacific as a naturalist and had collected an enormous amount of material and data. He used this to show how each species of animals had changed and developed by natural selection. Many people had thought till then that every species or kind of animal, including man, had been separately created by God, and had remained apart and unchangeable since then — that is to say that one species could not become another. Darwin showed, by a mass of actual examples, that species did change from one to another, and that this was the normal method of development. These changes took place by natural selection. A slight variation in a species, if it happened to be profitable to it in any way or helped it to survive others, would gradually lead to a permanent change, as obviously more of this varied species would survive. After a while this varied species would be in the majority and would swamp the others. In this way changes and variations would creep in, one after the other, and after some time there would be an almost new species produced. So in course of time many new species would arise by this process of survival of the fittest by natural selection. This would apply to plants and animals, and even man. It is possible, according to this theory, that there might be a common ancestor of all the various plant and animal species we see today.

A few years later Darwin published another book — *The Descent of Man* — in which he applied his theory to man. This idea of evolution and of natural selection is accepted by most people now, though not exactly in the way Darwin and his followers put it forward. Indeed, it is quite a common thing for people to apply this principle of selection artificially to the breeding of animals and the cultivation of plants and fruits and flowers.

Many of the prize animals and plants today are new species, artificially created. If man can produce such changes and new species in a relatively short time, what could not Nature do in this line in the course of hundreds of thousands or millions of years? A visit to a natural history museum, say the South Kensington Museum in London, shows us how plants and animals are continually adapting themselves to nature.

All this seems obvious enough to us now. But it was not so obvious seventy years ago. Most people in Europe still believed at the time in the Biblical account of the creation of the world just 4004 years before Christ, and of each plant and animal being created separately, and finally man. They believed in the Flood and in Noah's Ark with its pairs of animals, so that no species might become extinct. All this did not fit in with the Darwinian theory. Darwin and the geologists talked of millions of years as the age of the earth, and not a paltry 6000 years. So there was a tremendous tussle in the minds of men and women, and many good people did not know what to do. Their old faith told them to believe in one thing, and their reason said another. When people believe blindly in dogmas and the dogmas receive a shock, they feel helpless and miserable and without any solid ground to stand upon. But a shock which wakes us to reality is good.

So there was a great argument and great conflict in England and elsewhere in Europe between science and religion. There could be no doubt of the result. The new world of industry and mechanical transport depended on science, and science thus could not be discarded. Science won all along the line, and "natural selection" and "survival of the fittest" became part of the ordinary jargon of the people, who used the phrases without fully understanding what they meant. Darwin had suggested in his *Descent of Man* that there might have been a common ancestor of man and certain apes. This could not be proved by examples showing various stages in the process of development. From this there grew the popular joke about the "missing link". And, curiously enough, the ruling classes twisted Darwin's theory to suit their own convenience, and were firmly convinced that it supplied yet another proof of their superiority. They were the fittest to survive in the battle of life, and so by "natural selection" they had come out on top and were the ruling class. This became the justification for one class dominating over another, or one race ruling over another. It became the final argument for imperialism and the supremacy of the white race. And many people in the West thought that the more domineering they were, the more ruthless and strong, the higher up in the scale of human values they were likely to be. It is not a pleasant philosophy, but it explains to some extent the conduct of western imperialist Powers in Asia and Africa.

Darwin's theories have been criticized subsequently by other scientists, but his general ideas still hold. One of the results of a general acceptance of his theories was to make people believe in the idea of progress, which meant that man and society, and the world as a whole, were marching towards perfection and becoming better and better. This idea of progress was not the result of Darwin's theory alone. The whole trend of scientific discoveries and the changes brought about by the Industrial Revolution and afterwards had prepared people's minds for it. Darwin's theory confirmed it, and people began to imagine themselves as marching proudly from victory to victory to the goal of human perfection, whatever that might be. It is interesting to note that this idea of progress was quite a new one. There seems to have been no such idea in the past in Europe or Asia, or in any of the old civilizations. In Europe, right up to the Industrial Revolution, people looked upon the past as the ideal period. The old Greek and Roman classical period was supposed to be finer and more advanced and cultured than subsequent periods. There was progressive deterioration or worsening of the race, so people thought, or at any rate there was no marked change.

In India there is much the same idea of deterioration, of a golden age that is past. Indian mythology measures time in enormous periods, like the geological periods, but always it begins with the great age, *Satya Yuga*, and comes down to the present age of evil, the *Kali Yuga*.

So we see that the idea of human progress is quite a modern notion. Our knowledge of past history, such as it is, makes us believe in this idea. But, then, our knowledge is still very limited, and it may be that with fuller knowledge our outlook might change. Even today there is not quite the same enthusiasm about "progress" as there was in the second half of the nineteenth century. If progress leads us to destroy each other on a vast scale, as was done in the World War, there is something wrong with such progress. Another thing worth remembering is that Darwin's "survival of the fittest" does not necessarily mean the survival of the best. All these are speculations for the learned. What we have to note is that the old and widespread idea of a static or unchanging, or even deteriorating, society was pushed aside by modern science in the nineteenth century, and in its place came the idea of a dynamic and changing society. Also there came the idea of progress. And indeed society did change out of all recognition during this period.

As I have been telling you of Darwin's theory of the origin of species, it might interest you to know what a Chinese philosopher wrote on the subject 2500 years ago. Tson Tse was his name, and he wrote in the sixth century before Christ, about the time of the Buddha:

> "All organizations are originated from a single species. This single species had undergone many gradual and continuous changes, and then gave rise to all organisms of different forms. Such organisms were not differentiated immediately, but, on the contrary, they acquired their differences through gradual change, generation after generation."

This is near enough to Darwin's theory, and it is amazing that the old Chinese biologist should have arrived at a conclusion which it took the world two and a half millennia to rediscover.

As the nineteenth century progressed the rate of change became ever faster. Science produced wonder after wonder, and an endless pageant of discovery and invention dazzled people's eyes. Many of these discoveries changed the life of the people greatly, like the telegraph, the telephone, the automobile and later the aeroplane. Science dared to measure the farthest heavens and also the invisible atom and its still smaller components. It lessened the drudgery of man, and life became easier for millions. Because of science there was a tremendous increase in the population of the world, and especially of the industrial countries. At the same time science evolved the most thorough-going methods of destruction. But this was not the fault of science. It increased man's command over Nature, but man with all this power did not know how to command himself. And so he misbehaved often and wasted the gifts of science. But the triumphant march of science went on, and within 150 years this changed the world more than all the previous many thousand years had done. Indeed, in every direction and in every department of life science has revolutionized the world.

This march of science is continuing even now, and it seems to rush on faster than ever. There is no rest for it. A railway is built. By the time it is ready to function it is already out of date. A machine is bought and fixed up; within a year or two better and more efficient machines of that very kind are being made. And so the mad race goes on.

and now in our time electricity is replacing steam, and thus bringing about as great a revolution as the Industrial Revolution of a century and a half ago.

Vast numbers of scientists and experts are continually at work in the numerous highways and byways of science. The greatest name in their ranks today is that of Albert Einstein, who has succeeded in modifying to some extent the famous theory of Newton.

So vast has been the recent progress in science and so great the additions and changes in scientific theory, that scientists themselves have been taken aback. They have lost all their old complacency and pride of certainty. They are hesitant now about their conclusions and their prophecies for the future.

But this is a development of the twentieth century and our own day. In the nineteenth century there was full assurance, and science, priding itself on its innumerable successes, imposed itself on the people, and they bowed down to it as to a god.

2. SCIENCE GOES AHEAD*

(Letter to his daughter from his cell in the district gaol, Dehra Dun)

July 13, 1933

I have written to you at great length about political happenings, and a little about economic changes all over the world during the post-war years. In this letter I want to write about other matters, and especially about science and its effects.

But before I go on to science, I would remind you again of the very great change in woman's position since the World War. This so-called "emancipation" of women from legal, social and customary bonds began in the 19th century with the coming of big industries which employed women workers. It made slow progress, and then war conditions hurried up the process, and the after-war years almost completed it. Today even Tadjikistan about which I wrote to you in my last letter, has its women doctors and teachers and engineers, who only a few years back were in seclusion. You and your generation will probably take all this for granted. And yet it is quite a novel thing not only in Asia but in Europe also. Less than a 100 years ago, in 1840, the first "World's Anti-Slavery Convention" was held in London. Women came as delegates to it from America, where the existence of negro slavery was agitating many people. The Convention, however, refused to admit these "female delegates" on the ground that for any woman to take part in a public meeting was improper and degrading to the sex!

And now let us go to science. In dealing with the Five Year Plan in Soviet Russia, I told you that it was the application of the spirit of science to social affairs. To some extent, though only partly, this spirit has been at the back of Western civilization for the past 150 years or so. As its influence has grown, the ideas based on unreason and magic and superstition have been pushed aside, and methods and processes alien to those of science have been opposed. This does not mean that the spirit of science has triumphed completely over unreason and magic and superstition. Far from it. But it has undoubtedly advanced a long way, and the nineteenth century saw many of its resounding victories.

I have written to you already of the stupendous changes brought about in the nineteenth century by the application of science to industry and life. The world, and espe-

* *Glimpses of World History*, Jawaharlal Nehru, Asia Publishing House, Bombay (1965), pp. 896-902.

cially Western Europe and North America, were changed out of all recognition, far more than they had changed for thousands of years previously. A surprising enough fact is the enormous increase in the population of Europe during the nineteenth century. In 1800 the population was 180 millions for the whole of Europe. Slowly in the course of ages it had risen to that figure. And then it shoots ahead, and in 1914 it was 460 millions. During this period also millions of Europeans emigrated to other continents particularly to America, and we may put their number at about 40 millions. Thus Europe's population went up to about 500 millions from 180 millions, in the course of a little over 100 years. This increase was especially marked in the industrial countries of Europe. England at the beginning of the eighteenth century, had a population of 5 millions only, and was the poorest country in Western Europe. It became the richest country in the world with a population of 40 millions.

This growth and wealth resulted from greater control over , or rather understanding of, the processes of Nature which scientific knowledge made possible. There was great increase in knowledge, but do not imagine that this necessarily means an increase in wisdom. Men began to control and exploit the forces of Nature without having any clear idea of what their aim in life was or should be. A powerful automobile is a useful and desirable thing, but one must know where to go in it. Unless properly guided, it may jump over a precipice. The President of the British Association of Science said recently: "The command of Nature has been put into man's hands before he knows how to command himself."

Most of us use the products of science — railways, aeroplanes, electricity, wireless and thousands of others — without thinking of how they came into existence. We take them for granted, as if we were entitled to them as of right. And we are very proud of the fact that we live in an advanced age and are ourselves so very "advanced". Now, there is no doubt that our age is a very different one from previous ages, and I think it is perfectly correct to say that it is far more advanced. But that is a different thing from saying that we as individuals or groups are more advanced. It would be the height of absurdity to say that because an engine-driver can run an engine and Plato or Socrates could not, therefore the engine-driver is more advanced than, or is superior to, Plato or Socrates. But it would be perfectly correct to say that the engine itself is more advanced method of locomotion than Plato's chariot was.

We read so many books now-a-days, most of them, I am afraid, rather silly books. In the old days people read few books, but they were good books, and they knew them well. One of the greatest of European philosophers, a man full of learning and wisdom, was Spinoza. He lived in the seventeenth century in Amsterdam. It is said that his library consisted of less than sixty volumes.

It is well, therefore, for us to realize that the great increase in knowledge in the world does not necessarily make us better or wiser. We must know how to use that knowledge properly before we can fully profit by it. We must know whither to go before we rush ahead in our powerful car. We must, that is, have some idea of what the aim and object of life should be. Vast numbers of people today have no such notion and never worry themselves about it. They live in an age of science, but the ideas that govern them and their actions belong to ages long past. It is natural that difficulties and conflicts arise. A clever monkey may learn to drive a car, but he is hardly a safe chauffeur.

Modern knowledge is amazingly intricate and widespread. Tens of thousands of investigators work away continuously, each experimenting in his particular department each burrowing away in his own patch, and adding tiny bit by bit to the mountain of knowledge. The field of knowledge is so vast that each worker has to be a specialist in his own line. Often he is unaware of other departments of knowledge, and thus, though he is very learned in some branches of knowledge, he is unlearned about many others. It

becomes difficult for him to take a wise view of the whole field of human activity. He is not cultured in the old sense of the world.

There are, of course, individuals who have risen above this narrow specialization and while being specialists themselves, can take a wider view. Undeterred by war and human troubles, these people have been carrying on scientific researches, and during the last fifteen years or so have made remarkable contributions to knowledge. The greatest scientist of the day is supposed to be Albert Einstein, a German Jew, who has been turned out of Germany by the Hitler government because they do not approve of Jews!

Einstein discovered some new fundamental laws of physics, affecting the whole universe, through intricate calculations in mathematics, and thereby he varied some of Newton's laws which had been accepted without question for 200 years. Einstein's theory was confirmed in a most interesting way. According to this theory, light behaves in a particular way, and this could be tested during an eclipse of the sun. When such an eclipse occurred, it was found that light-rays did behave in that way, and so a conclusion reached by mathematical reasoning was confirmed by actual experiment.

I am not going to try to explain this theory to you, because it is very abstruse. It is called the Theory of Relativity. In dealing with the universe, Einstein found that the idea of time and the idea of space were, separately, not applicable. So he discarded both and put forward a new idea in which both were wedded together. This was the idea of space-time.

Einstein dealt with the universe. At the other end of the scale, scientists investigated the infinitely small. Take a pin's point—about as small a thing as you can see with the unaided eye. This pin's point, it was proved by scientific methods, is, in a way, like a universe in itself! It had molecules buzzing round each other; and each molecule consists of atoms which also go round and round without touching each other; and each atom consists of large numbers of electric particles or charges, or whatever they are, protons and electrons, which were also in constant and tremendously fast motion. Smaller still are positrons and neutrons and dentons; and the average life of a positron has been estimated to be about a thousand-millionth part of a second! All this is, on an infinitely small scale, like the planets and the stars going round and round in space. Remember that the molecule is far too small to be seen even by the most powerful microscope. As for the atoms and the protons and electrons, it is difficult even to imagine them. And yet, so advanced is scientific technique that quite a lot of information has been collected about these protons and electrons, and recently the atom was split.

In considering the latest theories of science one's head reels, and it is very difficult to appreciate them. I shall now tell you something even more amazing. We know that our earth, which seems so big to us, is but a minor planet of the Sun, which is itself a very insignificant little star. The whole solar system is but a drop in the ocean of space. Distances are so great in the universe that it takes thousands and millions of years for light to reach us from some parts of it. Thus when we see a star at night, what we see is not what it is now, but what it was when the ray of light, which now reaches us left it on its long journey, which may have taken hundreds or thousands of years. This is all very confusing to one's ideas of time and space, and that is why Einstein's space-time is far more helpful in considering such matters. If we leave out space and consider only time, the past and present get mixed up. For the star we see is present for us, and yet it is the past that we see. For ought we know it may have ceased to exist long ago, after the light-ray started on its journey.

I have said that our Sun is an unimportant little star. There are about 100,000 other stars, and all these together form what is called a galaxy. Most of the stars that we see at night form this galaxy. But we only see very few of the stars with our unaided eyes. Power-

ful telescopes help us to see far more. It is calculated by the experts in this science that there are as many as 100,000 different galaxies of stars in the universe!

Another astonishing fact. We are told that this universe is an expanding one. A mathematician, Sir James Jeans, compares it to a soap-bubble which is getting bigger and bigger, the universe being the surface of the bubble. And this bubble-like universe is so big that it takes millions and millions of years for light to travel across it.

If your capacity for astonishment is not exhausted, I have something more to tell you about this truly amazing universe. A famous Cambridge astronomer, Sir Arthur Eddington, tells us that the universe is gradually going to pieces, like a clock that is run down, and unless wound up again somehow, will disintegrate. Of course, all this happens in millions of years, so we need not worry!.

Physics and chemistry were the leading sciences of the nineteenth century. They helped man to gain command over Nature or the outside world. Then scientific man began to look inside and to study himself. Biology became important; this was the study of life in man and animals and plants. Already it has made extraordinary progress, and biologists say that it will be possible soon to produce changes in the character or temperament of a persons by injections, or other means. Thus it may perhaps be possible for a coward to be converted into a man of courage, or, what is more likely, for a government to deal with its critics and opponents by reducing their powers of resistance in this way.

From biology the next step has been psychology, the science which deals with the mind, with the thoughts and motives and fears and desires of human beings. Science is thus invading new fields and telling us more about ourselves, and so perhaps helping us to command ourselves.

Eugenics is also a step from biology. It is the science of race improvement.

It is interesting to notice how the study of certain animals has helped in the development of science. The poor frog was cut up to find out how nerves and muscles functioned. The tiny and insignificant little fly which often sits on over-ripe bananas, hence called the banana fly, has led to more knowledge about heredity than anything else. From careful observations of this fly it has been found how the characteristics of one generation pass on by inheritance to the next generation. To some extent this helps in understanding the working of heredity in human beings.

An even more absurd animal to teach us much is the common grasshopper. Long and careful study of grasshoppers by American observers has shown how sex is determined in animals as well as human beings. We know a great deal now as to how the little embryo, right at the beginning of its career, becomes male or female, developing gradually into a tiny male or female animal, a little boy or girl.

The fourth instance is that of the ordinary household dog. A famous Russian scientist of our time, Pavlov, began observing dogs carefully, especially noting when their mouths watered at the sight of food. He actually measured this saliva in the dog's mouth. This watering of the dog's mouth at the sight of food was an automatic occurrence, an "unconditioned reflex" as it is called. Just as when an infant sneezes or yawns or stretches without previous experience.

Then Pavlov tried to produce "conditioned reflexes"– that is, he taught the dog to expect food at a certain signal. The result was that this signal became associated in the dog's mind with food, and produced the same result as food, although no food was present.

These experiments on dogs and their saliva have been made the basis of human psychology, and it has been shown how a human being in infancy has a number of "unconditioned reflexes" and as he grows he develops more and more "conditioned reflexes". In fact, all we learn is based on this. We form habits in this way, and we learn languages, etc.

Our actions are governed by our reflexes, which of course are both pleasant and unpleasant. There is the common reflex of fear. No knowledge of Pavlov's experiments is necessary for a man to jump away with great rapidity, and without thinking, when he sees a snake near him, or even a bit of a string looking like a snake.

Pavlov's experiments have revolutionized the whole science of psychology. Some of them are very interesting, but I cannot go into this question any further here. I must add, though, that there are several other important methods of psychological enquiry.

I have mentioned these few instances to you to give you some idea of the methods of scientific work. The old metaphysical way was to talk vaguely about big things which it was not easy, or even possible, to analyse or understand fully. People argued and argued about them and got very heated, but as there was no final test of the truth or otherwise of their arguments, the matter always remained in the air. They were so busy in arguing about the other world that they did not deign to observe the common things of this world. The method of science is the exact opposite. Careful observations are made of what appear to be trivial and insignificant facts, and these lead to important results. Theories are then framed on these results, and these theories are again checked by further observations and experiments.

This does not mean that science does not go wrong. It often goes wrong, and has to retrace its steps. But, the scientific method seems to be the only correct way of approaching a question. Science today has lost all the arrogance and self-sufficiency which it had during the nineteenth century. It is proud of its achievements, and yet it is humble before the vast and ever-widening ocean of knowledge that still lies unexplored. The wise man realizes how little he knows; it is the foolish person who imagines that he knows everything. And so with science. The more it advances, the less dogmatic does it get, and the more hesitating is its answer to the questions that may be put to it. "The progress of science," says Eddington, "is to be measured not by the number of questions we can answer, but by the number of questions we can ask." That is perhaps so, but still science does answer more and more questions, and helps us to understand life, and thus enables us, if we will but take advantage of it, to live a better life, directed to a purpose worth having. It illumines the dark corners of life and makes us face reality, instead of the vague confusion of unreason.

3. THE GOOD AND BAD APPLICATIONS OF SCIENCE*

(Letter to his daughter from his cell in the district gaol, Dehra Dun)

July 14, 1933

In my last letter I gave you a peep into the wonderland of the latest developments of science. I do not know if this glimpse will interest you and attract you to these realms of thought and achievement. If you have the desire to know more of these subjects, you can easily find your way to many books. But remember that human thought is ever advancing, ever grappling with and trying to understand the problems of Nature and the universe, and what I tell you to-day may be wholly insufficient and out-of-date tomorrow. To me there is a great fascination in this challenge of the human mind, and how it soars up to the ut-

* *Glimpses of World History*, Jawaharlal Nehru, Asia Publishing House, Bombay (1965), pp. 902-907.

termost corners of the universe and tries to fathom its mysteries, and dares to grasp and measure what appear to be the infinitely big as well as the infinitely small.

All this is what is called "pure" science–that is, science which has no direct or immediate effect on life. It is obvious that the Theory of Relativity, or the idea of Space-time, or the size of the universe, have nothing to do with our day-to-day lives. Most of these theories depend on higher mathematics, and these intricate and upper regions of mathematics are, in this sense, pure science. Most people are not much interested in this kind of science; they are naturally far more attracted by the applications of science to every-day life. It is this applied science that has revolutionized life during the last 150 years. Indeed, life today is governed and conditioned entirely by these offshoots of science, and it is very difficult for us to imagine existence without them. People often talk about the good old days of the past, of a golden age that is gone. Some periods of past history are singularly attractive, and in some ways they may even have been superior to our time. But even this attraction is probably due more to distance and to a certain vagueness than to anything else, and we are apt to think of an age as being great because of some great men who adorned it and dominated it. The fate of the common people right through history has been a miserable one. Science brought them some relief from their age-long burdens.

Look around you, and you will find that most of the things that you can see are somehow connected with science. We travel by the methods of applied science, we communicate with each other in the same way, our food is often produced that way and carried from one place to another. The newspaper we read could not be produced, nor our books, nor the paper I write on or the pen I write with, by methods other than those of science. Sanitation and health and the conquest over some diseases depend on science. For the modern world it is quite impossible to do without applied science. Apart from all other reasons, one reason is a final and conclusive one: without science there would not be enough food for the world's population, and half of it, or more, would die off from starvation. I have told you how population has gone up with a bound during the last 100 years. This swollen population can only live if the help of science is taken to produce food and transport it from one place to another.

Ever since science introduced the big machine into human life there has been a continuous process of improving it. Innumerable little changes are being made from year to year, and even month to month, which go to make the machine more efficient and less dependent on human labour. These improvements in technique, these advances in technology, as it is called, have become especially rapid during the last thirty years of the twentieth century. The rate of change in recent years – and it is still going on–has been so tremendous, that it is revolutionizing industry and methods of production as much as the Industrial Revolution of the second half of the eighteenth century. This new revolution is largely due to the increasing use of electricity in production. Thus we have had a great Electrical Revolution in the twentieth century, especially in the United States of America, and this is leading to entirely new conditions of life. Just as the Industrial Revolution of the eighteenth century led to the Machine Age, the Electrical Revolution is now leading to the Power Age. Electric Power, which is used for industries, railways and numerous other purposes, dominates everything. It was because of this that Lenin, looking far ahead, decided to build all over Soviet Russia huge hydro-electric power works.

This application of electric power to industry, together with other improvements, often results in a great change without costing much. Thus a slight re-arrangement of electrically-driven machinery might double the production. This is largely due to the progressive elimination of the human factor which is slow and liable to err. Thus, as machines go on improving, fewer workers are employed in them. Huge machines are now controlled by one man handling some levers and switches. This results in increasing the production of

manufactured goods enormously, and at the same time throwing out many workers from the factory, as they are no longer required. At the same time, advances in technology are so rapid, that, often by the time a new machine is installed in a factory, it is itself partly obsolete because of new improvements.

The process of machines replacing workers had, of course, occurred from the early days of machinery and, as I think I have told you, there were many riots in those days, and angry workmen broke the new machines. It was found, however, that ultimately machinery resulted in more employment. As a worker could produce far more goods with the help of machinery, his wages went up and the prices of goods went down. The workers and common people could thus buy more of these goods. Their standards of living went up and the demands for manufactured goods grew. This resulted in more factories being built and more men being employed. Thus, although machinery displaced workers in each factory, as a whole far more workers were employed because there were many more factories.

The process went on for a long time, helped as it was by the exploitation by industrial countries of distant markets in backward countries. During the past few years this process seems to have stopped. Perhaps no further expansion is possible under the present capitalistic system, and some change in the system is necessary. Modern industry goes in for "mass production" but this can only be carried on if the goods so produced are bought by the masses. If the masses are too poor or are unemployed, then they cannot buy these goods.

In spite of all this, technical improvements go on ceaselessly, and result in machinery displacing men and adding to the unemployed. From 1929 onwards there has been a great depression in trade all over the world, but even this did not prevent technology from advancing. It is said that there have been so many improvements since 1929 in the United States that millions of people who have been thrown out of work can never be employed, even if the production of 1929 were to be kept up.

This is one of the reasons –there are many others also–that has produced the great problem of the unemployed all over the world, and especially in the advanced industrial countries. It is a curious and inverted problem, for greater production by up-to-date machinery means, or ought to mean, greater wealth for the nation and higher standards of living for every one. Instead, it has resulted in poverty and terrible suffering. One would have thought that a scientific solution of the problem would not be difficult. Perhaps it is not. But the real difficulty comes in trying to solve it scientifically and reasonably. For in doing so many vested interests are affected, and they are powerful enough to control their governments. Then, again, the problem is essentially an international one, and today national rivalries prevent an international solution. Soviet Russia is applying the methods of science to similar problems, but because she has to proceed nationally, the rest of the world being capitalist and hostile to her, she has far greater difficulties than she would otherwise have had. The world is essentially international today, although its political structure lags behind and is narrowly national. For socialism to succeed finally, it will have to be international world socialism. The hands of the clock cannot be put back, nor can the international structure of today, incomplete as it is, be suppressed in favour of national isolation. An attempt at the intensification of nationalism, as the fascists are trying to do in various countries, is bound to fail in the end, because it runs counter to the fundamental international character of world economy today. It may be, of course, that in so failing it may carry the world with it, and involve what is called modern civilisation in a common disaster.

The danger of such a disaster is by no means remote and unthinkable. Science, as we have seen, has brought many good things in its train, but science has also added enormously

to the horrors of war. States and governments have often neglected many branches of science, pure and applied. But they have not neglected the warlike aspects of science, and they have taken full advantage of the latest scientific technique to arm and strengthen themselves. Most States rest, in the final analysis, on force, and scientific technique is making these governments so strong that they can tyrannise over people without, as a rule, any fear of consequences. The old days of popular risings against tyrannical governments and the building of barricades and fights in the open streets, such as occurred in the great French Revolution, are long past. It is impossible now for an unarmed or even armed crowd to fight with an organised and well-equipped State force. The State army itself may turn against the Government, as happened in the Russian Revolution, but, unless that happens, it cannot be forcibly defeated. Hence the necessity has arisen for people, struggling for freedom, to seek other and more peaceful methods of mass action.

Science thus leads to groups or oligarchies controlling States, and to the destruction of individual liberty, and the old nineteenth century ideas of democracy. Such oligarchies arise in different States, sometimes outwardly paying homage to the principles of democracy, at other times openly condemning them. These different State oligarchies come into conflict with each other and nations go to war. Such a big war today or in the future may well destroy not only these oligarchies, but civilization itself. Or it may be that out of its ashes an international socialist order might arise, as expected by the Marxist philosophy.

War is not a pleasant subject to contemplate in all its horrid reality, and because of this the reality is hidden behind fine phrases and brave music and bright uniforms. But it is necessary to know something of what war means today. The last war—the World War—brought home to many the horror of war. And yet, it is said, that the last war was nothing compared to what the next one is likely to be. For if industrial technique has advanced tenfold during the last few years, the science of war has advanced a hundred fold. War is no longer an affair of infantry charges and cavalry dashes; the old foot-soldier and cavalry man are almost as useless now in war as the bow and arrow. War today is an affair of mechanised tanks (a kind of moving battleship on caterpillar wheels), aeroplanes and bombs, and especially the latter two. Aeroplanes are increasing in speed and efficiency from day to day.

If war breaks out, it is expected that the warring nations will immediately be attacked by hostile aircraft. These aeroplanes will come immediately after the declaration of war, or they may even come before, to steal an advantage over the enemy, and hurl high explosive bombs at the great cities and factories. Some of the enemy aeroplanes might be destroyed but the remaining ones will be quite enough to bomb the city. Poison gases will come out of the bombs thrown from aeroplanes, and these will spread and envelop whole areas, suffocating and killing every living thing within their reach. It will be a large-scale destruction of the civilian population in the cruellest and most painful way, causing intolerable suffering and mental distress. And this kind of thing might be done simultaneously in the great cities of the rival Powers at war with each other. In a European war, London, Paris, Berlin might be a heap of smouldering ruins within a few days or weeks.

There is worse to come. The bombs thrown from the aeroplanes might contain germs and bacteria of various horrible diseases, so that a whole city might be infected with these diseases. This kind of "bacteriological warfare" can be carried on in other ways also: by infecting food, drinking water and by animal-carriers – for instance, a rat which carries plague.

All this sounds monstrous and incredible, and so it is. Not even a monster would like to do it. But incredible things happen when people are thoroughly afraid and are fighting a life-and-death struggle. The very fear that the enemy country might adopt such unfair and monstrous methods, induces each country to be the first in the field. For the

weapons are so terrible that the country that uses them first has a great advantage. Fear has big eyes!

Indeed, poison gas was used extensively during the last war, and it is well known that all the great Powers have now got large factories to manufacture this gas for war purposes. A curious result of all this is that the real fighting in the next big war will take place not at the front, where some armies might dig themselves in and face each other, but behind the fronts, in the cities and homes of the civilian population. It may even be that the safest place during the war will be the front, for the troops will be fully protected there from air attacks and poison gases and infection! There will be no such protection for the men left behind, or the women or the children.

What will be the result of all this? Universal destruction? The end of the fine structure of culture and civilisation that centuries of effort have built up?

What will happen no one knows. We cannot tear the veil from the future. We see two processes going on today in the world, two rival and contradictory processes. One is the progress of cooperation and reason, and the building up of the structure of civilization; the other a destructive process, a tearing up of everything, an attempt by mankind to commit suicide. And both go faster and faster, and both arm themselves with the weapons and technique of science. Which will win?

4. SCIENCE AND GANDHI*

(Letter to Aldous Huxley refuting his characterisation of Congress views as anti-Science)[1]

Allahabad,
September 1, 1933

Dear Mr. Huxley[2]

A short while ago, I read in prison a little book called *Science in the Changing World*. A passage in your broadcast, included in this book, surprised and distressed me a little.[3] According to this, you said that Tolstoyans and Gandhi-ites advocate a "return to Nature"

* *Selected Works of Jawaharlal Nehru*, Orient Longman Ltd., New Delhi (1973) (First Series), Vol. 5, pp. 510-514.

[1] J.N. Correspondence, N.M.M.L.

[2] (1894-1963); well-known writer of novels, essays, biography and short stories, visited India in the winter of 1925 and published his diary under the title *Jesting Pilate*.

[3] Huxley wrote: "....Tolstoyans and Gandhi-ites tell us that we must "return to Nature" – in other words, abandon sciences altogether and live like primitives or, at best, in the style of our medieval ancestors. The trouble with this advice is that it cannot be followed – or rather that it can only be followed if we are prepared to sacrifice at least eight or nine hundred million human lives. Science, in the form of modern industrial and agricultural technique, has allowed the world's population to

and want people to abandon science altogether and live like primitives or, at least, in the medieval style. If this advice was followed, you pointed out, it would result in the sacrifice of eight or nine hundred million human lives, a slaughter compared to which the massacres of Timur[4] and Jinghiz Khan[5] sink into absolute insignificance.

I am not competent to say anything about the Tolstoyans but I have been closely associated with Mr. Gandhi and the "Gandhi-ites" for the last fourteen years and can thus presume to know something about them. Indeed, in a political sense, I have myself been a "Gandhi-ite" for all these years. I feel that, quite unintentionally, you have done them a grave wrong in the reference you have made. And as Mr. Gandhi is the unquestioned leader of the Indian national movement, it is more than likely that many people who listened to your remarks or read them subsequently, were led to misjudge the nationalist movement by them and to imagine that it stood for a most reactionary and lunatic policy which, if logically carried out, must lead to a frightful catastrophe.

I do not propose to discuss Mr. Gandhi's personality in this letter. He is a complete person and has many aspects which astonish the modern mind. Essentially he is a man of religion and essentially the typical modern is not. Finding, what he considers, too much indulgence about him, he lays stress on the ascetic ideal. In particular, his ideas about sex relations seem extraordinary to most people of our day. All this is, what I might perhaps call, Mr. Gandhi's personal philosophy, and those who look upon him more or less as a religious or moral leader presumably accept it to a greater or lesser extent. Mr. Gandhi no doubt realizes that his strict personal code cannot be followed by more than a handful of people, but he hopes that this handful will set an example which will result in toning up the lives of large numbers of others.

His attitude to science is very far from being hostile. He welcomes it and takes advantage of it in a variety of ways, and often people, wilfully misunderstanding him, accuse him of inconsistency because he does so, as for instance, when he submits to an operation, or rides a motor car, or uses a printing machine, or telegraphs or telephones. None the less, it is perfectly true that, being fundamentally religious, his tendency is to seek for the truth inside himself, rather than externally by the methods of science.

Large-scale machine production he does not like but he has never suggested, to my knowledge, that it should be scrapped. He wants, as far as possible, to decentralise industry, to have small units and not large ones, and for this purpose he wants to take the fullest advantage of the scientific method. He thinks that this ought to suit modern conditions but in case it does not, why then, he is perfectly prepared to have something else. In either event there is no question, so far as he is concerned, of ignoring any advantage that science has to offer.

This, in brief, is Mr. Gandhi's personal attitude to science and industry. It may not be a correct attitude; its logic may be faulty. But it does not mean a negation of science or a destruction of machine industry. Possibly it may result in a lessening of production and in this sense it may be a putting back of the clock. Even so it could hardly be madder than

double itself in about three generations. If we abolish science and "return to Nature", the population will revert to what it was-and never, not in a hundred years, but in as many weeks. Famine and pestilence do their work with exemplary celerity. Tolstoy and Gandhi are professed humanitarians, but they advocate a slaughter, compared with which the massacres of Timur and Jinghiz Khan seem almost imperceptibly trivial.

[4] Tartar chieftain who invaded India in 1398 and sacked Delhi.

[5] Chengiz Khan (c. 1155-1227); a Mongol conqueror who subjugated most of Asia and penetrated into Europe.

the present deliberate restriction of output, both in industry and agriculture and the actual destruction of large quantities of foodstuffs and other useful articles which millions lack.

Even this attitude is not necessarily accepted by the political associates and followers of Mr. Gandhi. Personally, I do not agree with it, and I should like to make it perfectly clear that the Indian Congress and the National movement have not adopted it. Indeed Mr. Gandhi has never asked the Congress, except in one particular, to endorse this attitude. That one particular is, as the world knows, the cottage spinning wheel. The Congress has recommended hand-spinning to the agricultural classes of India not because of any hostility to machinery or science, but because of special reasons applicable to the Indian peasant under present conditions. The spinning wheel is not to be the rival of machinery—it would be absurd to say so; nor is spinning to take the place of any other occupation. Agriculture, as it is carried on here, is not a full time job for the whole year. There is intense activity at harvest time and some other times and then there are several months of unemployment. The peasant and his family were encouraged to spin during this seasonal unemployment as well as during their leisure hours. It was thus to be a kind of secondary occupation, an auxiliary industry for him, so long as he had no other and better way of employing his spare time. Spinning was also to be a partial stand-by for the vast numbers of unemployed who have nothing to do and who are such a burden on the land. It is a remarkable fact that, contrary to the universal tendency, in India the rural population has grown at the expense of the urban during the last hundred years and right up to our day.

The obvious way to absorb these scores of millions of unemployed and partially employed is to provide other occupations for them by industrialising the country. Scientific agriculture may lessen the peasant's waste time and increase the yield but the immediate result would be to add to the unemployment. Hand-spinning cannot solve these problems or put an end to unemployment, whole time or seasonal. If we had the state power in our hands we would certainly adopt a host of other methods, including industrialization. As it is, we are helpless and can only work in a limited sphere. In the limited sphere there is no doubt that hand-spinning and its associate cottage occupations have brought a small measure of well-being to those who have taken it up. The real objection to widespread cottage spinning is that by bettering slightly the conditions of those who adopt it, it helps to prop up a land system and an economic structure which are indefensible and which are in process of breaking down. A radical socialist would rightly object to this attempt at propping up a doomed structure.

In these days of economic nationalism there is one other factor which is worth considering. In the event of a crisis where India has to rely on her own resources, spinning can fill the gap so far as cloth is concerned. A war may stop all imports; the Indian mills may fill the gap but they are not in the position to do so wholly yet. No doubt they will grow. Meanwhile, they have a way of exploiting a crisis to their own great advantage by raising prices, as they did during the Great War, when there is no outside competition. A widespread movement of hand-spinning is some check on this raising of prices and it helps the country to clothe itself when there is a cloth famine.

These are some obvious considerations, and there are others of a political nature such as the boycott of foreign cloth, which induced the Congress to recommend hand-spinning. There is also a human side to the spinning-wheel and the weaving of homespun cloth. They have brought the intelligentsia nearer to the peasant masses and reduced the vast gap which our one-sided education had produced between them. I have mentioned these considerations to you not to defend the spinning wheel but so that you may realise that Indian nationalism is not opposed to big scale machinery and much less to science.

I have no doubt that when it is in a position to do so, it will industrialize the country as rapidly as possible. Meanwhile, helpless as we are, we have to carry on with such makeshifts as are available.

To touch a personal note. My whole outlook on life and its problems is a scientific one and I have never felt attracted towards religion and its methods. (I took the natural sciences tripos at Cambridge). I entirely disagree with Mr. Gandhi's views on sex, birth control, asceticism etc. I believe in the machine and would have it spread in India but I believe also in the social control of it. I would like India to have socialism and a widespread industrialization. Believing all this, would it be possible for me, or the large numbers who are like me, to cooperate closely for years with a person who stands for a policy which is inimical to science and industry and which might lead to a dreadful holocaust? And is it for this that we spend long years of our life in prison?

Forgive me for writing at such length to you. One gets rather tired of misrepresentations and propaganda when most of us are shut up in prison and a rigid censorship prevails outside. Often it happens that the most amazing propositions are advanced by our critics and opponents as representing our views and this imaginary and unreal structure is then demolished with great gusto. I know you could not have meant to misrepresent us and that is why I wanted to make you appreciate to some extent what our position was. I do not want you to take the trouble to contradict anything that you have said or to correct yourself.

We met once–an all too brief meeting. It was during the Congress session at Cawnpore in December 1925. I tried to find you and your wife later but you had gone. You will hardly remember me but I have had many occasions to renew that acquaintance through your delightful books.

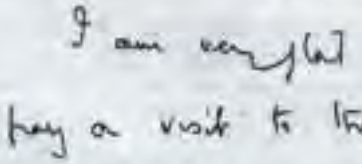
I have only just come out of prison after serving out a two year sentence. I hasten to write to you for soon, within a few days perhaps, I am likely to go back again–to muse on the earthly paradise and the various bars, of iron and of the spirit, which prevent us from reaching it.

Yours sincerely,

Jawaharlal Nehru

5. AN EARNEST OF THE FUTURE*

(Message recorded during visit to the Indian Institute for Medical Research, Calcutta on June 14, 1937)



* *Indian Institute for Biochemistry and Experimental Medicine*, Calcutta (Council of Scientific and Industrial Research, New Delhi) [1961].

Indian Institute for Industrial Research — good and yet sorry. I am sorry that such good work should suffer for lack of funds and should be carried on in a confined space. I think this kind of research work is vital work for any person or nation to take up. It has the greatest and the most far-reaching value in modern life and industry. Therefore every people who seek to advance and be up-to-date must pay attention to it. Personally I am greatly interested in and attracted to scientific research and I hope that when India is free the State will encourage this in every possible way. Meanwhile we have to rely on our

our slender resources. But still I hope that our industrial magnates, social workers and all who are interested in increasing the efficiency of the race will pay heed to this important work and support it in every way.

I have been especially interested in the research being undertaken here in the various articles of diet. A proper diet is one of the most important questions our people have to face, and it is partly because of our ill-balanced diets that our physique has deteriorated and so many deficiency diseases abound. I trust that the results of these investigations in food values will be given out

to the public before long and propaganda undertaken to make the people generally take to a balanced diet.

I have been impressed by the band of earnest and efficient-looking young men who work in the Research Institute. I wish they had better facilities in the way of building and accessories for carrying on this work. For that they have to rely on the public and I hope that the public will help them in generous measure.

June 14. 1937 Jawaharlal Nehru

6. THE PROGRESS OF SCIENCE*

(Address to the National Academy of Sciences at their seventh annual meeting at Allahabad on March 5, 1938)

You are men of learning and many of you have distinguished records in the realm of science. Yet you have honoured me, an outsider, with an invitation to participate in this annual gathering of yours and I have most willingly accepted that invitation. Science and academic halls have not known me for many a long year, and fate and circumstance have led me to the dust and din of the market-place and the field and the factory, where men live and toil and suffer. I have become involved in the great human upheavals that have shaken this land of ours in recent years. Yet in spite of the tumult and movement that have surrounded me, I do not come to you wholly as a stranger. For I too have worshipped at the shrine of science and counted myself as one of its votaries.

Who indeed can afford to ignore science today? At every turn we have to seek its aid and the whole fabric of the world today is of its making. During the ten thousand years of human civilization, science came in with one vast sweep a century and half ago, and during these 150 years it proved more revolutionary and explosive than anything that had gone before. We who live in this age of science live in an environment and under conditions which are totally different from those of the pre-scientific age. But few realize this in its completeness, and they seek to understand the problems of today by a reference to a yesterday that is dead and gone.

Science has brought all these mighty changes and not all of them have been for the good of humanity. But the most vital and hopeful of the changes that it has brought about has been the development of the scientific outlook in man. It is true that even today vast numbers of people still live mentally in the pre-scientific age, and that most of us, even when we talk glibly of science, betray it in our thought and actions. Even scientists, learned in their particular subjects, often forget to apply the scientific method outside that charmed sphere. And yet it is the scientific method alone that offers hope to mankind and an ending of the agony of the world. This world is racked by fierce conflicts and they are analysed and called by many names. But essentially the major conflict is between the method of science and the methods opposed to science.

In the early days of science there was much talk of a conflict between religion and science, and science was called materialistic and religion spiritual. That conflict hardly seems real today when science has spread out its wings and ventured to make the whole universe its field of action, and converted solid matter itself into airy nothing. Yet the conflict was real, for it was a conflict between the intellectual tyranny imposed by what was deemed to be religion and the free spirit of man nurtured by the scientific method. Between the two there can be no compromise. For science cannot accept the closing of the windows of the mind, by whatever pleasant name this might be called; it cannot encourage blind faith in someone else's faith. Science therefore must be prepared not only to look up to the heavens and seek to bring them under its control, but also to look down, unafraid, into the pit of hell. To seek to avoid either is not the way of science. The true scientist is the sage unattached to life and the fruits of action, ever seeking truth wheresoever this

* i) *Selected Works of Jawaharlal Nehru*, Orient Longman Ltd., New Delhi (1976) (First Series), Vol. 8, pp. 808-812. ii) *The Hindu*, March 9, 1938; Reprinted in *The Unity of India* (London 1941), pp.178-183.

quest might lead him. To tie himself to a fixed anchorage, from which there is no moving, is to give up that search and to become static in a dynamic world.

Perhaps there is no real conflict between true religion and science, but, if so, religion must put on the garb of science and approach all its problems in the spirit of science. A purely secular philosophy of life may be considered enough by most of us. Why should we trouble ourselves about matters beyond our ken when the problems of the world insistently demand solution? And yet that secular philosophy itself must have some background, some objective, other than merely material well-being. It must essentially have spiritual values and certain standards of behaviour, and, when we consider these, immediately we enter into the realm of what has been called religion.

But science has invaded this realm from many fronts. It has removed the line that was supposed to separate the world of things from the world of thought, matter from mind; it has peeped into the mind and even the unconscious self of man and sought the inner motives that move him, it has even dared to discuss the nature of ultimate reality. The reality of even a particle of matter, we are told, is not its actuality but its potentiality. Matter becomes just a "group agitation" and nature a theatre for such agitations or "for the inter-relations of activities". Everywhere there is motion, change, and the only unit of things real is the "event", which is, and instantaneously is no more. Nothing is, except a happening. If this is the fate of solid matter, what then are the things of the spirit?

How futile the old arguments seem in view of these astonishing developments in scientific thought. It is time we brought our minds into line with the progress of science and gave up the meaningless controversies of an age gone by. It is true that science changes, and there is nothing dogmatic or final about it. But the method of science does not change, and it is to that we must adhere in our thought and activities, in research, in social life, in political and economic life, in religion. We may be specks of dust on a soap-bubble universe, but that speck of dust contained something that was the mind and spirit of man. Through the ages this has grown and made itself master of this earth and drawn power from its innermost bowels as well as from the thunderbolt in the skies. It has tried to fathom the secrets of the universe and brought the vagaries of nature itself to its use. More wonderful than the earth and the heavens is this mind and spirit of man which grows ever mightier and seeks fresh worlds to conquer.

That is the task of the scientist, but we know that all scientists are not fashioned in the heroic mould, nor are they the philosopher-kings of whom Plato told us in days of old. Kingliness might not be theirs, but even philosophising is often lacking, and the day's task follows a narrow sphere and a dull routine. As they specialise, and specialise they must, they lose sight of the larger picture and become pedants out of touch with reality. In India the political conditions under which we have had the misfortune to live have further stunted their growth and prevented them from playing their rightful part in social progress. Fear has often gripped them, as it has gripped so many others in the past, lest by any activity or even thought of theirs they might anger the Government of the day and thus endanger their security and position. It is not under these conditions that science flourishes or scientists prosper. Science requires a free environment to grow. When applied to social purposes, it requires a social objective in keeping with its method and the spirit of the age.

That fear complex which oppressed India has happily disappeared to a large extent owing to the activities and movements initiated by our great organization, the National Congress, and even the poor, hungry and miserable peasant has a franker look today and a straighter back. It is time that the shadow of that fear and apprehension vanished from our academic halls also.

We have vast problems to face and to solve. They will not be solved by the politicians

alone, for they may not have the vision or the expert knowledge; they will not be solved by scientists alone, for they will not have the power to do so or the larger outlook which takes everything into its ken. They can and will be solved by the cooperation of the two for a well-defined and definite social objective.

The objective is necessary, for without it our efforts are vain and trivial and lack co-ordination. We have seen in Soviet Russia how a consciously held objective, backed by co-ordinated effort, can change a backward country into an advanced industrial state with an ever-rising standard of living. Some such method we shall have to pursue if we are to make rapid progress.

The greatest of our problems is that of the land, but intimately connected with it is that of industry. And side by side with these go the social services. All of these will have to be tackled together and our plans co-ordinated together. That is a vast undertaking, but it will have to be shouldered.

Soon after the formation of the Congress Ministries in August last, the Working Committee of the Congress passed a resolution which should interest scientists and experts. I should like, therefore, to draw your attention to it. It ran thus:

> "The Working Committee recommends to the Congress Ministries the appointment of a committee of experts to consider urgent and vital problems, the solution of which is necessary to any scheme of national reconstruction and social planning. Such solution will require extensive surveys and the collection of data, as well as a clearly defined social objective. Many of these problems cannot be dealt with effectively on a provincial basis and the interests of adjoining provinces are interlinked. Comprehensive river surveys are necessary for the formulation of a policy to prevent disastrous floods, to utilize the water for purposes of irrigation, to consider the problem of soil erosion, to eradicate malaria, and for the development of hydro-electric and other schemes. For this purpose the whole river valleys will have to be surveyed and investigated, and large-scale state planning resorted to. The development and control of industries requires also joint and co-ordinated action on the part of several provinces. The Working Committee advises therefore that, to begin with, an inter-provincial committee of experts be appointed to consider the general nature of the problems to be faced, and to suggest how, and in what order, these should be tackled. The expert committee may suggest the formation of special committees or boards to consider each such problem separately and to advise the provincial governments concerned as to the joint action to be undertaken."

Something has been done in this latter respect, a power alcohol and other committees have been appointed, but I wish more had been done. I should like an aggressive and widespread tackling of our problems by experts. I should like museums and permanent exhibitions for the education of our masses, especially the peasantry, to grow up in every district. I remember the wonderful peasant museums I saw in the U.S.S.R. and compare them with the pitiful agricultural exhibitions that are organized here from time to time. I also remember vividly that splendid and astonishing museum, the Deutsches Museum at Munich[1], and wonder rather wistfully when some such thing will grow up in India.

It is for this Academy of Sciences to take a lead in all such matters and to advise the government thereon. The government should co-operate with them and help them and take full advantage of their expert knowledge. But the Academy must not just wait for the

1. Pandit Nehru's visit to Germany was before 1933.

government to give it a push every time. We have got too much into the habit of waiting for the government to take the initiative in everything. It is the business of the government to take the initiative, but it is also the business of the scientists to take the initiative themselves. We cannot wait for each other. We must get a move on.

And so, having taken up so much of your time, I commend you to your labours, and hope that you will have the privilege of serving India and of helping in the progress and advancement of her people.

7. THE CULTIVATION OF A SCIENTIFIC OUTLOOK*

(Address at the cultural conference organized by the students of the Scottish Church College, Calcutta on January 3, 1939)

Culture is one of those words which might mean anything, including culture in everything, in history, in society and in every form of human activity.

Certain people in this country, for instance, condemn education in India as a manifestation of British imperialism. I suppose there is nobody in India who is not aware of the fact that the present system of education is bad, and that the basis on which it stands is doubly bad. Attempts are, however, being continually made to change and improve it.

The Wardha scheme of education seems to me a remarkable attempt at improvement of education on modern lines. I am of the opinion that any system of education that might be introduced in this country should integrate the activities of both the mind and the body of the students.

What exactly do you mean by culture? Individual culture, social and national developments and everything akin to them. Development also takes two forms generally. There is the development of individuals which is highly important, and as individuals develop they form social groups. Naturally, the more well-developed the individuals, the higher the social groups which we shall have. On the other hand, when we develop a social group, it helps the development of individuals, because one reacts upon the other. So we have to see that both developments take place simultaneously.

Ordinarily, the religious approach in the past has been the way of individual development. It tries to improve the individual hoping that the improvement of the individual will affect the social group. That has been so in every country whatever religion it may have had or whatever method may have been devised for approaching the problem.

Nevertheless, the modern method lays stress on improving the environment so that a person living in a particular environment may grow to his fullest capacity. Both these methods have not been, however, contemporary. Perhaps the stress laid on the improvement of a particular environment is more important today because if the environment is bad you cannot make much progress. We have to think again in terms of social culture and what kind of environment it develops. What is the good, for instance, of your trying to cultivate unselfishness and noble qualities when the social structure that surrounds you is based on selfishness and produces bad influences on life?

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* i) *Selected Works of Jawaharlal Nehru*, Orient Longman Ltd., New Delhi (1976) (First Series), Vol. 9, pp. 613-617. ii) *The National Herald*, January 7, 1939.

Look at the world today, the international world. It is quite astoundingly immoral and bad. How can you expect influences to be highly moral when continuous pressure of immorality is put on environments, with the result that there has inevitably occurred an all-round deterioration. The deterioration has taken place on the international level, the national level and the individual level.

Today there is a great feeling of paralysis of mind among a large number of thinking individuals in Europe, in America and all over the world. It is so because they feel that the forces of evil are stronger than their combined strength. The forces of evil are indicated by fascism and reaction, and this environment forces them to be far from good.

How to find a way out of this situation? It is not enough for you to imagine that the problem is so simple that by a few slogans you will be able to solve it. Every form of government or state, whether it is fascist, imperialist or communist indulges inevitably in creating an environment which helps its maintenance. It inevitably tries to spread its influence on the minds of its citizens through educational process.

You have, therefore, ultimately to decide what form of state or society you are going to have. Saying that you dislike imperialism is to make a negative statement. We have to be positive as to what type of 'ism' we want. It depends on certain fundamental axioms of thought and freedom of various kinds of activities. Because various complex situations influence the society as well as the individual, we cannot possibly help develop the conditions we desire.

We must, therefore, have freedom of thought. We must have a democratic process working as far as it can. But, at the same time, we must not forget that the freedom of thought leads to some difficulties. Ordinarily, it does not lead to difficulties because people who avail of the freedom of thought and action are sufficiently disciplined. They are advanced in their thinking and are responsible in outlook.

Today in many countries of the world the democratic process seems to work slow. It does not bring in results quickly when quick results are necessary. We, therefore, find that in this century, democracy has not functioned well even in those countries where it has been in existence for many years. When confronted with these difficulties we try to find an answer by resorting to pat phrases which do not really help. They only divert our attention to other channels of thought.

Today mankind is passing through unprecedented changes and a period of transition. We must remember that we are going through the most extraordinary period in history. It has been an astoundingly revolutionary period of changes. From my knowledge of history, I doubt if there has hitherto been any time which was fraught with such revolutionary changes as the period which began in 1914 with the commencement of the Great War and which continues till today.

It is not a question of one year or two. This crisis of change is bound to remain with us for a long time to come.

You hear nowadays a great deal about planning, specially in industrial and economic life, but what is more important is the planning of various activities of life that the nation undertakes so that each activity fits in well with the other. Yet, the approach to the problems must be our own.

In India today there is a conflict going on between two kinds of forces and problems. It is more or less a psychological conflict. There are obviously other conflicts such as political, economic and others. But there is also a psychological conflict, a conflict of minds. Many forces are pulling us in different directions. Many forces of the past have strengthened us. Many others have proved a burden also.

Now look at the various complex forces that have resulted in developing a more or less composite culture in this country. Every culture is equally a composite culture because

no culture is purely a national culture in the sense that it has had no influence from other quarters. Of course, there is such a phenomenon as national culture which has a certain influence on the nation, but, generally speaking, even this culture has had a great deal of influence from other quarters, although India is one of those countries which has had an essentially composite culture for thousands of years. Our country has possessed a great capacity for absorbing foreign cultures that invaded this country.

Ultimately, India had to face what we call a new culture from the West which had as its basis science and modern industry which upset for the time being the whole fabric. During the last one hundred years or so, there has been a conflict in India between various types of cultures. There has been a conflict between the Western culture and our own culture. I do not mean to say that there is essentially a conflict between the two in public; but still there is an inherent conflict. If the culture of the West had not come to us in the guise of political conquerers there would not have been any conflict.

Just as in other cases we would have taken it much more readily, we must distinguish it from this political conquest because science as such has nothing to do with political conquest. It is something which represents the spirit of the age. There cannot be any doubt that we cannot progress nationally or individually unless we profit by the lessons of science.

There is, however, a problem before us when we think of science. We have to think presumably not of science as applied in the fields of industry or politics but science in its wider connotation. What is science? It is a certain way of approaching problems, a certain way of seeking the truth. It is a certain empirical way whereby we get prepared to reject anything if we cannot establish or prove it.

Of course, some of the most established rules of science are often being upset. Newton's theory of gravitation has undergone a change by Einstein's theory.

What I wish to emphasize is that science means an approach to all of life's problems. It is to be applied to the problems relating to our family, religion and everything else. You cannot apply science in your industries keeping other departments of your life free from it. The whole scheme is unscientific. Therefore, if we want to consider various problems that face us as an individual and as a social group, the right way to consider these problems is to adopt the method of science. If we examine our social and economic systems, we will find that these have developed in a most irrational manner. If on one side there is an abundance of production, we find that on the other side there is terrible misery and want.

The League of Nations proclaims peace and cooperation but the very members of the League are preparing for war and indulging in wars of aggression. They are the people destroying foodstuffs so that the prices of those foodstuffs might be kept up for profit[1]. If we want to solve all these problems, we have to approach them in a scientific and rational way, with a proper objective before us. That kind of approach alone can help us to understand and solve the problems.

I am a socialist because I feel that socialism is a scientific approach to the world's problems. It is not necessary that I should agree with every other socialist but generally a socialist approach is scientific and that appeals to me tremendously. It helps me in understanding the problems of history and history itself. If I try to look at history from a socialist point of view, it helps me to understand the present position because the present has its roots in the past.

Therefore, I would like you to consider the various cultural and other problems and apply the scientific approach to your personal life, especially because you are apt to give

1 In mid-thirties, farmers in the United States of America were granted subsidies for producing less. In 1936, nearly thirty per cent of the total produce of coffee was destroyed, and in England, a quarter of the capacities of the Lancashire mills or ten million cotton spindles were destroyed.

up this approach in your personal life. When you adopt the scientific approach, you will find a conflict between the personal ideals and the ideals of our public life. This conflict will not, of course, make you happy in your life. But the real joy in life is to work for a great purpose, to understand it, and put all the strength and energy of the integrated mind and personality into its fulfilment. Such an endeavour will give you a sense of fulfilment and real joy.

8. THE TASK OF ENGINEERS*

(Message for the Souvenir Volume of the Engineering College, Benares Hindu University on January 31, 1942)

The world is in the grip of war and vast revolutionary changes hover in the air. No one can say with assurance what the future will unfold. Yet one thing is certain. We have to build the structure of our state and our society anew, and we have to build this on scientific, planned lines if it is to endure. The approach of science is essential as well as specialist and technical knowledge. Engineers will inevitably have to play a very important part in this building up. We have seen how vast numbers of engineers have helped in the construction of the new state in Soviet Russia. Thus we in India have to look to our future engineers to fulfil a vital part of our national programme. I send my good wishes to the Engineering College of the Benares Hindu University and to those who after completing their course there are going out into the wider field of activity. I trust that they have not considered their studies merely as a preparation for a gainful profession but rather as an avenue of national service. If they keep this ideal of national service before them and the building up of a new India out of the debris that surrounds us today, their education has been worthwhile. We have enormous problems before us and crises and possibly much suffering. If we keep our ideal in view and pursue it unflinchingly, we shall succeed. Let us, therefore, hold fast to our anchor and be ready for all the trials that may come.

9. SCIENCE AND CULTURE**

(Message on the eighth anniversary of "Science and Culture", July 1942)

I send my greetings to *"Science and Culture"* on the eighth anniversary of its birth. The very name of this periodical signifies the two things which, more than anything else, India, like all progressive and civilised nations, must possess. For science and culture in their widest meaning comprise almost everything. Science is the very basis and texture of life

* *Selected Works of Jawaharlal Nehru*, Orient Longman Ltd., New Delhi (1979) (First Series), Vol. 12, pp. 556-557.

** *Science and Culture*, Vol. VIII, No. 1, July 1942.

today and without it we perish, or, what is even worse, slide back to barbarism. Science does not just mean the thousand and one applications of it that we see to-day, but even more so the scientific and rational approach to all problems of life. Science has made great progress in the West and raised the standard of living in some countries to unprecedented heights. And yet that very science has failed to solve the major problems of the age and we see war with all its horrors ravaging the world. Thus science destroys itself if it is not extended to the political, economic and other fields of human life and endeavour. It would appear that science today is in a position to solve all these problems, or most of them, and to create conditions of well-being and progress for all humanity. Yet though we swear by science and accept it advantageously for many purposes, still the habit of unscientific approach remains. Vested interests, superstitions and out-of-date customs prevent the full application of the scientific and the rational method.

Science thus becomes a narrow field unless it is accompanied by a wider and more far-seeing view of human society. This is where a real culture comes in. Not the narrow culture of the upper social groups that we see, but the real culture which enthuses the great majority of human beings and gives to all their undertakings a moral and human basis.

So science and culture are of the essence of life today, in war and in peace, and any periodical which serves the cause of science and culture performs a service to India and humanity. I wish that *"Science and Culture"* will continue its useful career and will widen its sphere of influence, so that its message may reach even the laymen in India and might not be confined to the experts and the scientists. It is comforting to know that in spite of the war and the difficulties that inevitably result from the war, this journal has continued to come out. Indeed it is in these times of war and crisis that the rational message of science is all the more necessary. So more power to *"Science and Culture"*.

Jawaharlal Nehru

10. THE DEVELOPMENT OF SCIENTIFIC RESEARCH*

(Message to the Royal Institute of Science, Bombay on the occasion of its Silver Jubilee, November 21, 1945)

I am convinced that of all the big problems that face India today nothing is more important than the development of scientific research, both pure and applied, and scientific method. This is indeed the basis and foundation of all other work.

In the world of today, though many pay lip homage to science and use it for purposes both good and evil, there are few who adopt the scientific method in dealing with life's many problems. The extensive use of that method can only come through a properly directed education and a large number of research institutions which deal with pure science as well as innumerable applications of it.

* i) *Selected Works of Jawaharlal Nehru*, Orient Longman Ltd., New Delhi (1981) (First Series), Vol. 14, p. 558 ii) *The Bombay Chronicle*, November 22, 1945.

Probably there are few countries, claiming to be civilised, which are so lacking in the scientific method as well as research as India. We have to fill this lack rapidly and on an extensive scale, and at the same time efficiently. Any research institute which has done pioneering work in this direction is, therefore, deserving of support.

11. MATHEMATICS IN ANCIENT INDIA*

Highly intellectual and given to abstract thinking as they were, one would expect the ancient Indians to excel in mathematics. Europe got its early arithmetic and algebra from the Arabs — hence the 'Arabic numerals' — but the Arabs themselves had previously taken them from India. The astonishing progress that the Indians had made in mathematics is now well known and it is recognized that the foundations of modern arithmetic and algebra were laid long ago in India. The clumsy method of using a counting frame, and the use of Roman and such-like numerals, had long retarded progress when the ten Indian numerals, including the zero sign, liberated the human mind from these restrictions and threw a flood of light on the behaviour of numbers. These number symbols were unique and entirely different from all other symbols that had been in use in other countries. They are common enough today and we take them for granted, yet they contained the germs of revolutionary progress in them. It took many centuries for them to travel from India, via Baghdad, to the Western world.

A hundred and fifty years ago, during Napoleon's time, La Place wrote: "It is India that gave us the ingenious method of expressing all numbers by means of ten symbols, each symbol receiving a value of position, as well as an absolute value; a profound and important idea which appears so simple to us now that we ignore its true merit, but its very simplicity, the great ease which it has lent to all computations, puts our arithmetic in the first rank of useful inventions; and we shall appreciate the grandeur of this achievement when we remember that it escaped the genius of Archimedes and Apollonius, two of the greatest men produced by antiquity"[1].

The origins of geometry, arithmetic and algebra in India go back to remote periods. Probably to begin with there was some kind of geometrical algebra used for making figures for *Vedic* altars. Mention is made in the most ancient books of the geometrical methods for the transformation of a square into a rectangle having a given side: $ax = c$. Geometrical figures are even now commonly used in Hindu ceremonies. Geometry made progress in India but in this respect Greece and Alexandria went ahead. It was in arithmetic and algebra that India kept the lead. The inventor or inventors of the decimal place-value system and the zero mark are not known. The earliest use of the zero symbol, so far discovered, is in one of the scriptural books dated about 200 B.C. It is considered probable that the place-value system was invented about the beginning of the Christian era. The zero, called *shunya* or nothing, was originally a dot and later it became a small circle. It was considered a number like any other. Professor Halsted thus emphasizes the vital significance of this invention: "The importance of the creation of the zero mark can never be exaggerated. This giving to airy nothing, not merely a local habitation and a name, a picture, a symbol, but helpful power, is the characteristic of the Hindu race from whence it sprang. It is

* *The Discovery of India*, Jawaharlal Nehru, The Signet Press, Calcutta (1946), pp. 248-254.

1. Quoted in Hogben's 'Mathematics for the Million' (London, 1942).

like coining the Nirvana into dynamos. No single mathematical creation has been more potent for the general on-go of intelligence and power"[2].

Yet another modern mathematician has grown eloquent over this historic event. Dantzig in his 'Number' writes: "This long period of nearly five thousand years saw the rise and fall of many a civilization, each leaving behind it a heritage of literature, art, philosophy, and religion. But what was the net achievement in the field of reckoning, the earliest art practised by man? An inflexible numeration so crude as to make progress well-nigh impossible, and a calculating device so limited in scope that even elementary calculations called for the services of an expert....Man used these devices for thousands of years without making a single worthwhile improvement in the instrument, without contributing a single important idea to the system....Even when compared with the slow growth of ideas during the dark ages, the history of reckoning presents a peculiar picture of desolate stagnation. When viewed in this light, the achievements of the unknown Hindu, who some time in the first centuries of our era discovered the principle of position, assumes the importance of a world event"[3].

Dantzig is puzzled at the fact that the great mathematicians of Greece did not stumble on this discovery. "Is it that the Greeks had such a marked contempt for applied science, leaving even the instruction of their children to slaves? But if so, how is it that the nation that gave us geometry, and carried this science so far, did not create even a rudimentary algebra? Is it not equally strange that algebra, that cornerstone of modern mathematics, also originated in India, and at about the same time that positional numeration did?"

The answer to this question is suggested by Professor Hogben: "The difficulty of understanding why it should have been the Hindus who took this step, why it was not taken by the mathematicians of antiquity, why it should first have been taken by practical man, is only insuperable if we seek for the explanation of intellectual progress in the genius of a few gifted individuals, instead of in the whole social framework of custom thought which circumscribes the greatest individual genius. What happened in India about A.D. 100 had happened before. May be it is happening now in Soviet Russia....To accept it (this truth) is to recognize that every culture contains within itself its own doom, unless it pays as much attention to the education of the mass of mankind as to the education of the exceptionally gifted people"[4].

We must assume then that these momentous inventions were not just due to the momentary illumination of an erratic genius, much in advance of his time, but that they were essentially the product of the social milieu and that they answered some insistent demand of the times. Genius of a high order was certainly necessary to find this out and fulfill this demand, but if that demand had not been there, the urge to find some way out would have been absent, and even if the invention had been made, it would have been forgotten or put aside till circumstances more propitious for its use arose. It seems clear from the early Sanskrit works on mathematics that the demand was there, for these books are full of problems of trade and social relationship involving complicated calculations. There are problems dealing with taxation, debt and interest, problems of partnership, barter and exchange, and the calculation of the fineness of gold. Society had grown complex and large numbers of people were engaged in governmental operations and in an extensive trade. It was impossible to carry on without simple methods of calculation.

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2 G.B. Halsted: *'On the Foundation and Technique of Arithmetic'*, p. 20 (Chicago, 1912), quoted in *'History of Hindu Mathematics'* by B. Datta and A.N. Singh (1935).

3 Quoted in L. Hogben's *'Mathematics for the Million'* (London, 1942).

4 Hogben: *'Mathematics for the Million'* (London, 1942), p. 285.

The adoption of zero and the decimal place-value system in India unbarred the gates of the mind to rapid progress in arithmetic and algebra. Fractions came in, and the multiplication and division of fractions; the Rule of three is discovered and perfected; squares and square-roots (together with the sign for the square-root $\surd$); cubes and cube-roots; the minus sign; tables fo sines; π is evaluated as 3.1416; letters of the alphabet are used in algebra to denote unknowns; simple and quadratic equations are considered; the mathematics of zero are investigated. Zero is defined as $a - a = 0$; $a + 0 = a$; $a - 0 = a$; $a \times 0 = 0$; a divided by 0 becomes infinity. The conception of negative quantities also comes in; thus $\surd 4 = \pm 2$.

These and other advances in mathematics are contained in books written by a succession of eminent mathematicians from the fifth to the twelfth century A.C. There are earlier books also (*Baudhayana* c. eighth century B.C.; *Apastamba* and *Katyayana*, both c. fifth century B.C.) which deal with geometrical problems, especially with triangles, rectangles and squares. But the earliest extant book on algebra is by the famous astronomer Aryabhata who was born in A.C. 476. He wrote this book on astronomy and mathematics when he was only 23 years old. Aryabhata, who is sometimes called the inventor of algebra, must have relied, partly at least, on the work of his predecessors. The next great name in Indian mathematics is that of Bhaskara I (A.C. 522) and he was followed by Brahmagupta (A.C. 628), who was also a famous astronomer and who stated the laws applying to *shunya* or zero and made other notable advances. There follow a succession of mathematicians who have written on arithmetic or algebra. The last great name is that of Bhaskara II who was born in A.C. 1114. He wrote three books, on astronomy, algebra and arithmetic. His book on arithmetic is known as *'Lilavati'*, which is an odd name for a treatise on mathematics, as it is the name of a woman. There are frequent references in the book to a young girl who is addressed as *'O Lilavati'* and is then instructed on the problems stated. It is believed, without any definite proof, that *Lilavati* was Bhaskara's daughter. The style of the book is clear and simple and suitable for young persons to understand. The book is still used, partly for its style, in Sanskrit schools.

Books on mathematics continued to appear (*Narayana* 1150, *Ganesha* 1545) but these are mere repetitions of what had been done. Very little original work in mathematics was done in India after the twelfth century till we reach the modern age.

In the eighth century, during the reign of the Khalif Al-Mansur (753-774), a number of Indian scholars went to Baghdad and among the books they took with them were works on mathematics and astronomy. Probably even earlier than this, Indian numerals had reached Baghdad but this was the first systematic approach and Aryabhata's and other books were translated into Arabic. They influenced the development of mathematics and astronomy in the Arab world and Indian numerals were introduced. Baghdad was then a great centre of learning and Greek and Jewish scholars had gathered there bringing with them Greek philosophy, geometry and science. The cultural influence of Baghdad was felt throughout the Moslem world from Central Asia to Spain, and a knowledge of Indian mathematics in their Arabic translations spread all over this vast area. The numerals were called by the Arabs 'figures of Hind' (or India), and the Arabic word for a number is 'Hindsah', meaning 'from Hind.'

From this Arab world the new mathematics travelled to European countries, probably through the Moorish universities of Spain, and became the foundation for European mathematics. There was opposition in Europe to the use of the new numbers as they were considered infidel symbols, and it took several hundred years before they were in common use. The earliest known use is in a Sicilian coin of 1134; in Britain the first use is in 1490.

It seems clear that some knowledge of Indian mathematics, and especially of the place-value system of numbers, had penetrated into western Asia even before the formal

embassy carried books to Baghdad. There is an interesting passage in a complaint made by a Syrian scholar-monk who was hurt at the arrogance of some Greek scholars who looked down on Syrians. Severus Sebokht was his name and he lived in a convent situated on the Euphrates. He writes in A.C. 662 and tries to show that the Syrians were in no way inferior to the Greeks. By way of illustration he refers to the Indians: "I will omit all discussion of the science of the Hindus, a people not the same as the Syrians, their subtle discoveries in the science of astronomy, discoveries that are more ingenious than those of the Greeks and the Babylonians; their computing that surpasses description. I wish only to say that this computation is done by means of nine signs. If those who believe, because they speak Greek, that they have reached the limits of science, should know of these things, they would be convinced that there are also others who know something"[5].

Mathematics in India inevitably makes one think of one extraordinary figure of recent times. This was Srinivasa Ramanujam. Born in a poor Brahmin family in South India, having no opportunities for a proper education, he became a clerk in the Madras Port Trust. But he was bubbling over with some irrepressible quality of instinctive genius and played about with numbers and equations in his spare time. By a lucky chance he attracted the attention of a mathematician who sent some of his amateur work to Cambridge in England. People there were impressed and a scholarship was arranged for him. So he left his clerk's job and went to Cambridge and during a very brief period there did work of profound value and amazing originality. The Royal Society of England went rather out of their way and made him a Fellow, but he died two years later, probably of tuberculosis, at the age of 33. Professor Julian Huxley has, I believe, referred to him somewhere as the greatest mathematician of the century.

Ramanujam's brief life and death are symbolic of conditions in India. Of our millions how few get any education at all, how many live on the verge of starvation; of even those who get some education and have nothing to look forward to but a clerkship in some office on a pay that is usually far less than the unemployment dole in England. If life opened its gates to them and offered them food and healthy conditions of living and education and opportunities of growth, how many among these millions would be eminent scientists, educationists, technicians, industrialists, writers and artists, helping to build a new India and a new world?

12. RELIGION, PHILOSOPHY AND SCIENCE*

India must break with much of her past and not allow it to dominate the present. Our lives are encumbered with the dead wood of this past; all that is dead and has served its purpose has to go. But that does not mean a break with, or a forgetting of, the vital and life-giving in that past. We can never forget the ideals that have moved our race, the dreams of the Indian people through the ages, the wisdom of the ancients, the buoyant energy and love of life and nature of our forefathers, their spirit of curiosity and mental adventure, the daring of their thought, their splendid achievements in literature, art and culture, their love of truth

5 Quoted in *'History of Hindu Mathematics'* by B. Datta and A.N. Singh (1935). I am indebted to this book for much information on this subject.

* *The Discovery of India*, Jawaharlal Nehru, The Signet Press, Calcutta (1946), pp. 620-627.

and beauty and freedom, the basic values that they set up, their understanding of life's mysterious ways, their toleration of other ways than theirs, their capacity to absorb other peoples and their cultural accomplishments, synthesize them and develop a varied and mixed culture; nor can we forget the myriad experiences which have built up our ancient race and lie embedded in our sub-conscious minds. We will never forget them or cease to take pride in that noble heritage of ours. If India forgets them she will no longer remain India and much that has made her our joy and pride will cease to be.

It is not this that we have to break with, but all the dust and dirt of ages that have covered her up and hidden her inner beauty and significance, the excrescences and abortions that have twisted and petrified her spirit, set it in rigid frames, and stunted her growth. We have to cut away these excrescences and remember afresh the core of that ancient wisdom and adapt it to our present circumstances. We have to get out of traditional ways of thought and living which, for all the good they may have done in the past age, and there was much good in them, have ceased to have significance today. We have to make our own all the achievements of the human race and join up with others in the exciting adventure of Man, more exciting today perhaps than in earlier ages, realizing that this has ceased to be governed by national boundaries or old divisions and is common to the race of man everywhere. We have to revive the passion for truth and beauty and freedom which gives meaning to life, and develop afresh that dynamic outlook and spirit of adventure which distinguished those of our race who, in ages past, built our house on these strong and enduring foundations. Old as we are, with memories stretching back to the early dawns of human history and endeavour, we have to grow young again, in tune with our present time, with the irrepressible spirit and joy of youth in the present and its faith in the future.

Truth as ultimate reality, if such there is, must be eternal, imperishable, unchanging. But that infinite, eternal and unchanging truth cannot be apprehended in its fullness by the finite mind of man which can only grasp, at most, some small aspect of it limited by time and space, and by the state of development of that mind and the prevailing ideology of the period. As the mind develops and enlarges its scope, as ideologies change and new symbols are used to express that truth, new aspects of it come to light, though the core of it may yet be the same. And so, truth has ever to be sought and renewed, reshaped and developed, so that, as understood by man, it might keep in line with the growth of his thought and the development of human life. Only then does it become a living truth for humanity, supplying the essential need for which it craves, and offering guidance in the present and for the future.

But if some one aspect of the truth has been petrified by dogma in a past age, it ceases to grow and develop and adapt itself to the changing needs of humanity; other aspects of it remain hidden and it fails to answer the urgent questions of a succeeding age. It is no longer dynamic but static, no longer a life-giving impulse but dead thought and ceremonial and a hindrance to the growth of the mind and of humanity. Indeed, it is probably not even understood to the extent it was understood in that past age when it grew up and was clothed in the language and symbols of that age. For its context is different in a later age, the mental climate has changed, new social habits and customs have grown up, and it is often difficult to understand the sense, much less the spirit, of that ancient writing. Moreover, as Aurobindo Ghose has pointed out, every truth, however true in itself, yet, taken apart from others which at once limit and complete it, becomes a snare to bind the intellect and a misleading dogma; for in reality each is one thread of a complex weft and no thread must be taken apart from the weft.

Religions have helped greatly in the development of humanity. They have laid down values and standards and have pointed out principles for the guidance of human life. But with all the good they have done, they have also tried to imprison truth in set forms and

dogmas, and encouraged ceremonials and practices which soon lose all their original meaning and become mere routine. While impressing upon man the awe and mystery of the unknown that surrounds him on all sides, they have discouraged him from trying to understand not only the unknown but what might come in the way of social effort. Instead of encouraging curiosity and thought, they have preached a philosophy of submission to nature, to the established church, to the prevailing social order, and to everything that is. The belief in a supernatural agency which ordains everything has led to a certain irresponsibility on the social plane, and emotion and sentimentality have taken the place of reasoned thought and inquiry. Religion, though it has undoubtedly brought comfort to innumerable human beings and stabilized society by its values, has checked the tendency to change and progress inherent in human society.

Philosophy has avoided many of these pitfalls and encouraged thought and inquiry. But it has usually lived in its ivory tower cut off from life and its day-to-day problems, concentrating on ultimate purposes and failing to link them with the life of man. Logic and reason were its guides and they took it far in many directions, but that logic was too much the product of the mind and unconcerned with fact.

Science ignored the ultimate purposes and looked at facts alone. It made the world jump forward with a leap, built up a glittering civilization, opened up innumerable avenues for the growth of knowledge, and added to the power of man to such an extent that for the first time it was possible to conceive that man could triumph over and shape his physical environment. Man became almost a geological force, changing the face of the planet earth chemically, physically, and in many other ways. Yet when this sorry scheme of things entirely seemed to be in his grasp, to mould it nearer to his heart's desire, there was some essential lack and some vital element was missing. There was no knowledge of ultimate purposes and not even an understanding of the immediate purpose, for science had told us nothing about any purpose in life. Nor did man, so powerful in his control of nature, have the power to control himself, and the monster he had created ran amuck. Perhaps new developments in biology, psychology and similar sciences, and the interpretation of biology and physics, may help man to understand and control himself more than he has done in the past. Or, before any such advances influence human life sufficiently, man may destroy the civilization he has built and have to start anew.

There is no visible limit to the advance of science, if it is given the chance to advance. Yet it may be that the scientific method of observation is not always applicable to all the varieties of human experience and cannot cross the uncharted ocean that surrounds us. With the help of philosophy it may go a little further and venture even on these high seas. And when both science and philosophy fail us, we shall have to rely on such other powers of apprehension as we may possess. For there appears to be a definite stopping place beyond which reason, as the mind is at present constituted, cannot go. 'La dernière demarche de la raison,' says Pascal, 'c'est de connaître qu'il y a une infinite de choses qui la surpassent. Elle est bien faible si elle ne va jusque-là.'

Realizing these limitations of reason and scientific method, we have still to hold on to them with all our strength, for without that firm basis and background we can have no grip on any kind of truth or reality. It is better to understand a part of truth and apply it to our life, than to understand nothing at all and flounder helplessly in a vain attempt to pierce the mystery of existence. The applications of science are inevitable and unavoidable for all countries and people today. But something more than its application is necessary. It is the scientific approach, the adventurous and yet critical temper of science, the search for truth and new knowledge, the refusal to accept anything without testing and trial, the capacity to change previous conclusions in the face of new evidence, the reliance on observed fact and not on pre-conceived theory, the hard discipline of the mind — all this is

necessary, not merely for the application of science but for life itself and the solution of its many problems. Too many scientists today, who swear by science, forget all about it outside their particular spheres. The scientific approach and temper are, or should be, a way of life, a process of thinking, a method of acting and associating with our fellowmen. That is a large order and undoubtedly very few of us, if any at all, can function in this way with even partial success. But this criticism applies in equal or even greater measure to all the injunctions which philosophy and religion have laid upon us. The scientific temper points out the way along which man should travel. It is the temper of a free man. We live in a scientific age, so we are told, but there is little evidence of this temper in the people anywhere or even in their leaders.

Science deals with the domain of positive knowledge but the temper which it should produce goes beyond that domain. The ultimate purposes of man may be said to be to gain knowledge, to realize truth, to appreciate goodness and beauty. The scientific method of objective inquiry is not applicable to all these, and much that is vital in life seems to lie beyond its scope — the sensitiveness to art and poetry, the emotion that beauty produces, the inner recognition of goodness. The botanist and zoologist may never experience the charm and beauty of nature; the sociologist may be wholly lacking in love for humanity. But even when we go to the regions beyond the reach of the scientific method and visit the mountain tops where philosophy dwells and high emotions fill us, or gaze at the immensity beyond, that approach and temper are still necessary.

Very different is the method of religion. Concerned as it is principally with the regions beyond the reach of objective inquiry, it relies on emotion and intuition. And then it applies this method to everything in life, even to those things which are capable of intellectual inquiry and observation. Organized religion, allying itself to theology and often more concerned with its vested interests than with things of the spirit, encourages a temper which is the very opposite to that of science. It produces narrowness and intolerance, credulity and superstition, emotionalism and irrationalism. It tends to close and limit the mind of man, and to produce a temper of a dependent, unfree person.

Even if God did not exist, it would be necessary to invent Him, so Voltaire said — 'si dieu n'existait pas, il faudrait l'inventer'. Perhaps that is true, and indeed the mind of man has always been trying to fashion some such mental image or conception which grew with the mind's growth. But there is something also in the reverse proposition: even if God exists, it may be desirable not to look up to Him or to rely upon Him. Too much dependence on supernatural factors may lead, and has often led, to a loss of self-reliance in man and to a blunting of his capacity and creative ability. And yet some faith seems necessary in things of the spirit which are beyond the scope of our physical world, some reliance on moral, spiritual, and idealistic conceptions, or else we have no anchorage, no objectives or purpose in life. Whether we believe in God or not, it is impossible not to believe in something, whether we call it a creative life-giving force, or vital energy inherent in matter which gives it its capacity for self-movement and change and growth, or by some other name, something that is as real, though elusive, as life is real when contrasted with death. Whether we are conscious of it or not, most of us worship at the invisible altar of some unknown god and offer sacrifices to it — some ideal, personal, national or international, some distant objective that draws us on, though reason itself may find little substance in it; some vague conception of a perfect man and a better world. Perfection may be impossible of attainment, but the demon in us, some vital force, urges us on and we tread that path from generation to generation.

As knowledge advances, the domain of religion, in the narrow sense of the word, shrinks. The more we understand life and nature, the less we look for supernatural causes. Whatever we can understand and control ceases to be a mystery. The processes of agri-

culture, the food we eat, the clothes we wear, our social relations, were all at one time under the domain of religion and its high priests. Gradually they have passed out of its control and become subjects for scientific study. Yet much of this is still powerfully affected by religious beliefs and the superstitions that accompany them. The final mysteries still remain far beyond the reach of the human mind and are likely to continue to remain so. But so many of life's mysteries are capable of and await solution, that an obsession with the final mystery seems hardly necessary or justified. Life still offers not only the loveliness of the world but also the exciting adventure of fresh and never-ceasing discoveries, of new panoramas opening out and new ways of living, adding to its fullness and ever making it richer and more complete.

It is therefore with the temper and approach of science, allied to philosophy, and with reverence for all that lies beyond, that we must face life. Thus we may develop an integral vision of life which embraces in its wide scope the past and the present, with all their heights and depths, and look with serenity towards the future. The depths are there and cannot be ignored, and always by the side of the loveliness that surrounds us is the misery of the world. Man's journey through life is an odd mixture of joy and sorrow; thus only can he learn and advance. The travail of the soul is a tragic and lonely business. External events and their consequences affect us powerfully, and yet the greatest shocks come to our minds through inner fears and conflicts. While we advance on the external plane, as we must if we are to survive, we have also to win peace with ourselves and between ourselves and our environment, a peace which brings satisfaction not only to our physical and material needs but also to those inner imaginative urges and adventurous spirit that have distinguished the man ever since he started on his troubled journey in the realms of thought and action. Whether that journey has any ultimate purpose or not we do not know, but it has its compensations, and it points to many a nearer objective which appears attainable and which may again become the starting point for a fresh advance.

Science has dominated the western world and everyone there pays tribute to it, and yet the West is still far from having developed the real temper of science. It has still to bring the spirit and the flesh into creative harmony. In India in many obvious ways we have a greater distance to travel. And yet there may be fewer major obstructions on our way, for the essential basis of Indian thought for ages past, though not its later manifestations, fits in with the scientific temper and approach, as well as with internationalism. It is based on a fearless search for truth, on the solidarity of man, even on the divinity of everything living, and on the free and cooperative development of the individual and the species, ever to greater freedom and higher stages of human growth.

13. THE MODERN APPROACH TO AN OLD PROBLEM*

The modern mind, that is to say, the better type of the modern mind, is practical and pragmatic, ethical and social, altruistic and humanitarian. It is governed by a practical idealism for social betterment. The ideals which move it represent the spirit of the age, the *Zeitgeist*, the *Yugadharma*. It has discarded to a large extent the philosophic approach of the ancients, their search for ultimate reality, as well as the devotionalism and mysticism of the medieval period. Humanity is its god and social service its religion. This conception may be incomplete as the mind of every age has been limited by its environment, and every

* *The Discovery of India*, Jawaharlal Nehru, The Signet Press, Calcutta (1946), pp. 680-686.

age has considered some partial truth as the key to all truth. Every generation and every people suffer from the illusion that their way of looking at things is the only right way, or is, at any rate, the nearest approach to it. Every culture has certain values attached to it, limited and conditioned by that culture. The people governed by that culture take these values for granted and attribute a permanent validity to them. So the values of our present-day culture may not be permanent and final; nevertheless they have an essential importance for us for they represent the thought and spirit of the age we live in. A few seers and geniuses, looking into the future, may have a completer vision of humanity and the universe; they are of the vital stuff out of which all real advance comes. The vast majority of people do not even catch up to the present-day values, though they may talk about them in the jargon of the day, and they live imprisoned in the past.

We have therefore to function in line with the highest ideals of the age we live in, though we may add to them or seek to mould them in accordance with out national genius. Those ideals may be classed under two heads: humanism and the scientific spirit. Between these two there has been an apparent conflict but the great upheaval of thought today, with its questioning of all values, is removing the old boundaries between these two approaches, as well as between the external world of science and the internal world of introspection. There is a growing synthesis between humanism and the scientific spirit, resulting in a kind of scientific humanism. Science also, while holding on to fact, is on the verge of other domains, or at any rate, has ceased to deny them contemptuously. Our five senses and what they can perceive, obviously, do not exhaust the universe. During the past twenty-five years there has been a profound change in the scientist's picture of the physical world. Science used to look at nature as something almost apart from man. But now, Sir James Jeans tell us that the essence of science is that 'man no longer sees nature as something distinct from himself.' And then the old question arises which troubled the thinkers of the *Upanishads*: how can the knower be known? How can the eyes that can see external objects see themselves? And if the external is part and parcel of the internal, what we perceive or conceive is but a projection of our minds, and the universe and nature and the soul and mind and body, the transcendent and the immanent are all essentially one, how then are we, within the limited framework of our minds, to understand this mighty scheme of things objectively? Science has begun to touch these problems and though they may elude it, still the earnest scientist of today is the prototype of the philosopher and the man of religion of earlier ages. 'In this materialistic age of ours', says Professor Albert Einstein, 'the serious scientific workers are the only profoundly religious people'.[1]

In all this there appears to be a firm belief in science and yet an apprehension that purely factual and purposeless science is not enough. Was science, in providing so much of life's furniture, ignoring life's significance? There is an attempt to find a harmony between the world of fact and the world of spirit, for it was becoming increasingly obvious that the over-emphasis on the former was crushing the spirit of man. The question that troubled the philosophers of old has come up again in a different form and context: How to reconcile the phenomenal life of the world with the inner spiritual life of the individual. The physicians have discovered that it is not enough to treat the body of the individual or of society as a whole. In recent years, medical men, familiar with the finding of modern psycho-pathology, have abandoned the antithesis between 'organic' and 'functional' diseases, and lay greater stress on the psychological factor. "This is the greatest error in the treatment of sickness," wrote Plato, 'that there are physicians for the body and physicians for the soul, and yet the two are one and indivisible'.

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[1] Fifty years ago, Vivekananda regarded modern science as a manifestation of the real religious spirit, for it sought to understand truth by *sincere effort*.

Einstein, most eminent among scientists, tells us that 'the fate of the human race was more than ever dependent on its moral strength today. The way to a joyful and happy state is through renunciation and self-limitation everywhere.' He takes us back suddenly from this proud age of science to the old philosophers, from the lust for power and the profit motive to the spirit of renunciation with which India has been so familiar. Probably most other scientists of today will not agree with him in this or when he says: 'I am absolutely convinced that no wealth in the world can help humanity forward, even in the hands of the most devoted workers in the cause. The example of great and pure characters is the only thing that can produce fine ideas or noble deeds. Money only appeals to selfishness and always tempts its owners irresistibly to abuse it.'

In facing this question, that is as old as civilization itself, modern science has many advantages denied to the old philosophers. It possesses stores of accumulated knowledge and a method which has abundantly justified itself. It has mapped and charted many regions which were unknown to the ancients. As it has enlarged man's understanding and control over many things, they have ceased to be mysteries to be exploited by the priests of religion. But it has some disadvantages also. The very abundance of its accumulated knowledge has made it difficult for man to take a synthetic view of the whole, and he loses himself in some part of it, analyses it, studies it, partly understands it, and fails to see its connection with the whole. The vast forces science has released overwhelm him and carry him forward relentlessly, and often an unwilling victim, to unknown shores. The pace of modern life, the succession of crisis after crisis, comes in the way of a dispassionate search for truth. Wisdom itself is hustled and pushed about and cannot easily discover that calm and detached outlook which is so necessary for true understanding. 'For still are the ways of wisdom and her temper trembleth not.'

Perhaps we are living in one of the great ages of mankind and have to pay the price for that privilege. For the great ages have been full of conflict and instability, of an attempt to change over from the old to something new. There is no permanent stability and security and changelessness for then life itself would cease. At the most we can seek a relative stability and a moving equilibrium. Life is a continuous struggle of man against man, of man against his surroundings, a struggle on the physical, intellectual and moral plane out of which new things take shape and fresh ideas are born. Destruction and construction go side by side and both aspects of man and nature are ever evident. Life is a principle of growth, not of standing still, a continuous becoming which does not permit of static conditions.

Today in the world of politics and economics there is a search for power and yet when power is attained much else of value has gone. Political trickery and intrigue take the place of idealism, and cowardice and selfishness the place of disinterested courage. Form prevails over substance, and power, so eagerly sought after, somehow fails to achieve what it aimed at. For power has its limitations, and force recoils on itself. Neither can control the spirit, though they may harden and coarsen it. 'You can rob an army of its general,' says Confucius, 'but not the least of men of his will.'

John Stuart Mill wrote in his Autobiography: 'I am now convinced that no great improvements in the lot of mankind are possible, until a great change takes place in the fundamental constitution of their modes of thought.' And yet that fundamental change in the modes of thought itself comes from a changing environment and the pain and suffering that accompany life's unceasing struggles. And so though we may try to change those modes of thought directly, it is even more necessary to change the environment in which they grew and found sustenance. Each depends on the other and influences it. There is an endless variety of men's minds and each sees the truth in its own way and is often unable to appreciate the other's viewpoint. Out of that comes conflict. Out of that interaction also a fuller and more integrated truth emerges. For we have to realize that truth is many-sided and is

not the monopoly of any group or nation. So also the way of doing things. There may be different ways for different people in different situations. India and China, as well as other nations, evolved their own ways of life and gave them an enduring foundation. They imagined, and many among them vainly imagine still, that their way was the only way. Today Europe and America have evolved their own way of life, which is dominant in the world, and which, their people imagine, is the only way. But probably none of these ways is the one and only desirable way and each may learn something from the other. Certainly India and China must learn a great deal, for they had become static and the West not only represents the spirit of the age but is dynamic and changing and has the capacity for growth in it, even though this functions through self-destruction and periodical human sacrifice.

In India, and perhaps in other countries also, there are alternating tendencies for self-glorification and self-pity. Both are undesirable and ignoble. It is not through sentimentality and emotional approaches that we can understand life but by a frank and courageous facing of realities. We cannot lose ourselves in aimless and romantic quests unconnected with life's problems, for destiny marches on and does not wait for our leisure. Nor can we concern ourselves with externals only, forgetting the significance of the inner life of man. There has to be a balance, an attempt at harmony between them. 'The greatest good,' wrote Spinoza in the seventeenth century, 'is the knowledge of the union which the mind has with the whole of nature...The more the mind knows the better it understands its forces and the order of nature; the more it understands its forces or strength, the better it will be able to direct itself and lay down rules for itself; and the more it understands the order of nature, the more easily it will be able to liberate itself from useless things; this is the whole method.'

In our individual lives also we have to discover a balance between the body and the spirit, and between man as part of nature and man as part of society. "For our perfection" says Tagore, "we have to be vitally savage and mentally civilized; we should have the gift to be natural with nature and human with human society." Perfection is beyond us for it means the end, and we are always journeying, trying to approach something that is ever receding. And in each one of us are many different human beings with their inconsistencies and contradictions, each pulling in a different direction. There is the love of life and the disgust with life, the acceptance of all that life involves and the rejection of much of it. It is difficult to harmonize these contrary tendencies, and sometimes one of them is dominant and sometimes another. 'Oftentimes,' says Lao-tzu:

'Oftentimes, one strips oneself of passion
In order to see the Secret of Life;
Oftentimes, one regards life with passion,
In order to see its manifold results.'

For all our powers of reason and understaning and all our accumulated knowledge and experience, we know little enough about life's secrets, and can only guess at its mysterious processes. But we can always admire its beauty and, through art, exercise the god-like function of creation. Though we may be weak and erring mortals, living a brief and uncertain span of life, yet there is something of the stuff of the immortal gods in us. 'We must not,' therefore, says Aristotle, 'obey those who urge us, because we are human and mortal, to think human and mortal thoughts; in so far as we may, we should practise immortality and omit no effort to live in accordance with the best that is in us.'

14. SCIENCE IN WAR AND IN PEACE*

(Address to army officers, Wana on October 19, 1946)

The old approach to the tribal area has been unsuccessful. We have spent vast sums of money in the past but to no purpose. The basic factor is the economic life of this country. You cannot win over a people by punitive expeditions. You can only win them over by treating them exactly as if they were your own people. Of course crime must be prevented. But in modern theory of crime, even in case of an individual criminal, jurists try to penetrate through the act of crime to the entire environment which is responsible for the crime. Just as there are individuals with undeveloped minds, similarly there may be a whole people who are immature. Such a people require education to develop their minds including the scope for modern vocation. To this end we must lend our efforts.

As for the role of the national army in free India I would like to say that the army of free India must have the best weapons possible and the scientists and industrialists of India must place such weapons in their hands to safeguard India's newly won freedom. If we must have a force we must have the best.

I can give examples in history where superior weapons had made all the difference between victory and defeat — destruction of Rome by Attilla, the gun that gave Babar an empire in India. Scientific research and weapons go hand in hand. Those who have made the greatest advance in science and have the industry to back such research have the best weapons. See the atomic bomb which threatened to make other weapons obsolete. Before the war, leading nations were engaged in a race to capture nuclear energy. The Germans lost the race by two or three months, otherwise the course of history would have been changed.

India today is inspired by a dynamic urge. On the one hand there is this urge and on the other is the economic crisis. There is a race between this urge and the economic crisis — one symptom of which was the Bengal famine. Who will win in this race?

Although yet faltering like a patient getting up from the sickbed or a prisoner released from jail, India is today among the four great powers of the world, other three being America, Russia and China. But in point of resources India has a greater potential than China.

It is difficult for anyone now to stop the rise of India.

Indians have shown that they can use weapons placed in their hands. If further opportunity arises, they will show it again. I am glad that the barrier between the army and the people is now gone. India's future army would be a nationalised army and not, as has been misnamed, an Indianised army.

The key to removal of poverty and to raising of the standard of life by the provisions of better houses, education and food is the development of heavy industries. A dozen nation-building schemes of huge dimensions are already in hand and, if there is no war for the next ten years, these should by then be complete, giving India a unique position in certain directions of economic effort especially irrigation. Progress will be hastened by hard work and scientific research.

Therefore I want that our own scientists should be the foremost in the world.

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* i) *Selected Works of Jawaharlal Nehru*, Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1984) (Second Series), Vol. 1, pp. 310-311. ii) *The Hindu* and *The Hindustan Times*, October 21, 1946.

15. THE NECESSITY OF ATOMIC RESEARCH IN INDIA*

(Speech after laying the foundation-stone of the National Physical Laboratory at New Delhi on January 4, 1947)

Presently, we may have to follow other countries in having a great atomic energy research institute also, not to make bombs, I hope, but nevertheless I do not see how we can lag behind in this very important matter, because atomic energy is going to play a vast and dominating part, I suppose, in the future shape of things. Already it is known that radio-active elements that are produced can be used for therapeutic purposes but in regard to other matters too it will make power mobile and this mobility of power can make industry develop anywhere. We will not be tied up so much by the accidents of geography. Atomic energy will help cottage industry. Obviously if you have atomic energy at your disposal or some form of it, you can work in small units much more easily, effectively and efficiently, so that all these very practical aspects of it make it incumbent on us to think in terms of atomic energy research on a big scale — apparently it cannot be done on a small scale.

I hope that the National Physical Laboratory which will soon begin functioning here, will be followed by numerous other research institutes and laboratories, and a stream of earnest young men and women will go through it and come out to serve the country and the world. During the last few months I have been watching and reading about these schemes of various types of laboratories being set up in different parts of India and I have also to some extent scrutinised other vast schemes — river valley schemes, projects, barrages, dams, etc., some of them bigger in scope than the Tennessee Valley Scheme — and my mind has been fired by the picture that I saw emerging out of these great schemes. In the turmoil of the present what seemed to me far more important and essential was laying the foundations of this great development of India.

I fully agree with the statement that what comes in the way of rapid development in India is not so much lack of money as lack of trained personnel. We talk too much of money or lack of money and yet, as everybody knows, when people are bent on doing something certainly, when they are bent on carrying on a war, there is never lack of money. It is only in regard to constructive schemes that people talk of lack of money. I am quite convinced in my mind that lack of money must not be allowed to come in the way of any scheme which develops India.

We must train our boys and yet I have had cases before me often enough of very competent young men who have done well in the universities, later, for lack of opportunity, drifting to some very secondary job. They go into some executive services, probably thinking that they will get a little more security there. The country loses talent which really could be used to better advantage than sitting in office and doing some utterly unnecessary work.

There is a great deal to be done to train people but we have at the same time to offer opportunities to those who are being trained to do work. In India we possess very little in the way of data or statistics and we require a tremendous development of the branches collecting data in regard to the 400 million people of India. At the same time, we cannot just stop waiting for data to be collected before we can do something. We have to start doing something and the essential thing to do, therefore, is to start having these research institutes and at the same time lay the foundations for the development of large-scale

* i) *Selected Works of Jawaharlal Nehru*, Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1984) (Second Series), Vol. 1, pp. 377 - 379. ii) *The Hindu*, January 5, 1947; also printed in *New India Speaks* (Calcutta 1947) pp. 114-117.

power. Whatever we do, we shall require huge power resources in India. At present this huge country has very little power resources at her disposal. There is tremendous power potential, no doubt. It can be said with confidence that India is one of the richest countries in the world in regard to her mineral resources, her manpower and even in regard to her potential power resources, so that we have everything at hand. The question is how we can yoke all these things together. All this would rapidly change the whole face of India. Science had in the past changed the face of society considerably, probably very largely unconsciously and to some extent consciously; but today it is changing the society deliberately and consciously. We in India have many difficulties to face. Nevertheless, I do not think we cannot get over them rapidly. I believe it is easy to go ahead in India very fast and when I say so I am not thinking merely of the technical difficulties of the problem which are obvious but the far greater difficulty about which possibly scientists do not think much but I have to think a lot and that is the reaction of everything that we do on the large masses of people in the country. Unless we have their goodwill and their partial understanding at least in what we are doing we shall not go very far. They will stop us and become a brake. That is why it becomes necessary to make a deliberate approach to make the masses of the country understand what we are doing.

Many of us are still rather restricted and hide-bound in our outlook in regard to many things, notably social customs and the like. Science in the past had helped to some extent at least to rid mankind of the terror of the Gods. Much remains still to be done in that matter but certainly I shall like science to help in this respect in India. And then at the same time there is perhaps a greater terror even than the terror of the Gods and that is the terror of man himself. In that science and scientific approach may also help a great deal.

Sometimes I feel a little sorry that I am not much younger than I am when I think of this picture of the new India growing up, these vast changes impending, of young boys and girls growing up in this atmosphere with this new training and outlook and building this great structure about which so many of us have dreamt so long. I feel a little sorry that I may not be there to see it in its full glory. Nevertheless it is glory enough to take part in the building and to many of us that satisfaction has come in full measure. And I rejoice today at helping in this very small way at the beginning of this great undertaking.

The primary purpose of the Institution that will rise on this site will be removal of the poverty of India's millions and therefore your cooperation and sympathy are necessary for the work of the Institution.

16. THE NEED FOR A SPIRIT OF SERVICE*

(Speech at the inaugural meeting of the All-India Scientific Workers' Association at New Delhi on January 7, 1947)

Whether this Association is or is not going to be a trade union I do not know. Of course, it will be its function to protect your interests. I hope that in protecting your interests it will not do so at the expense of the community. I suppose scientists have been rather individualistically inclined. Some of them have had power and glory, but for some reason

* i) *Selected Works of Jawaharlal Nehru*, Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1984) (Second Series), Vol. 1, p. 380. ii) *The Hindustan Times*, January 9, 1947.

they have not been properly organized. As a group they have not been able to do as much as most groups who are really not so favourably situated, but a time may come when organized scientists may well have the power to hold a pistol at the rest of the community, if they want to. That may happen if science also proceeds purely on the lines of advocating and encouraging the profit motive in the individual.

Power plus profit motive is a very dangerous thing and I should like scientists to develop more of what in India we consider the Brahminic spirit of service. It so happens that I was born a Brahmin, but that has nothing to do with it because we know that the Brahminic spirit is something entirely apart from the Brahmins.

I do not want that the man who receives honours should go without any money, but I hope that in the new set-up that we are likely to have, money at any rate will not have too much power or honour or glory attached to it, and that honour will go to service and learning.

17. CALL TO THE INDIAN SCIENTIFIC WORKERS*

(Message to the Association of Scientific Workers of India given at New Delhi on January 14, 1947)

I consider it a great privilege to be associated with the Indian Association of Scientific Workers. Such an Association was urgently needed in India and the Indian Science Congress has given shape to it at the right moment. It is meant to protect these workers and to help them. It is meant also for the advancement of science and the service of the community. I hope that scientific workers all over the country will join this Association and make it an active and vital organization.

18. DEFENCE POLICY AND NATIONAL DEVELOPMENT**

It is not an easy matter for a layman to consider the intricacies of the problem of defence in the modern world. Probably even an expert will find it difficult to balance all the factors, many of which are uncertain. Defence cannot be considered in a vacuum. It bears an intimate relation to international affairs, foreign policy, industrial development, scientific research and the resources of the country. The expert soldier knows much more about the technique of defence and the building up of defence forces than a layman does. But the

* *Selected Works of Jawaharlal Nehru*, Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1984) (Second Series), Vol. 1, p. 381.

** i) J.N. Collection, Note: February 3, 1947, Extracts. ii) *Selected Works of Jawaharlal Nehru*, Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1984) (Second Series), Vol. 2, pp. 363-368.

expert soldier necessarily looks at the problem from his own narrow viewpoint and he is apt to ignore many other considerations.

2. Our difficulties are increased by the fact that great changes are taking place in the science of war and it is quite possible and indeed probable that new methods of warfare might change the whole conception of war.

3. We have two able memoranda before us — one containing the proposals of the Commander-in-Chief with the Defence Member's comments, and the other a note by the Finance Department. These are helpful in considering the problem. I am inclined to agree with much that the Finance Member says in his note, though I do not wholly appreciate his approach or his conclusions.

4. It is impossible for me to enter into any discussion of the technical aspects of the problem or the details of the cost of maintaining defence forces. Obviously such cost must bear some relation to the revenue and the resources. It cannot swallow up the greater part of the revenue leaving little for other services and development. At the same time, defence is obviously a primary need and inadequate defence is waste of money.

5. In considering this problem we must proceed on certain assumptions:

(1) That we are going to provide for defence by armed forces.
(2) That India will soon be independent and will have to rely on her own resources.
(3) That India will follow a peaceful policy which means that it will not prepare for or think in terms of any aggression or dominion over any other country.

Defence thus become purely defence against external aggression or internal disorder.

6. It is an axiom today that there can be no defence without a sufficient industrial backing. A country which has not got that industrial background cannot fight a modern war or defend itself for any length of time, however big its army might be. The defence forces indeed are merely an extension of the industry of the country. When one thinks of defence, therefore, one has to think first of all of industrialisation on a vast scale.

7. Modern defence as well as modern industry require scientific research, both on a broad basis and in highly specialized ways. Even more than before, war is controlled by the latest scientific inventions and devices. If India has not got highly qualified scientists and up-to-date scientific institutions in large numbers, it must remain a weak country incapable of playing a primary part in a war.

8. Though it must be an essential duty for the defence forces to support civil authority in the maintenance of order, we need not consider this aspect of the problem in any detail. It is enough to think of the requirements of defence against external aggression or invasion.

9. In the world today it would appear that there are only two countries which can be considered first-rate military Powers capable of resisting aggression or of indulging in aggression themselves. These are the U.S.A. and the Soviet Union. No other country can effectively defend itself without aid. Indeed, potentially speaking, the only two other countries that come into the picture from the point of view of resources are China and India. But

even these two countries cannot be considered as major Powers in the military sense for at least a decade.

10. The probable use of atomic energy in warfare is likely to revolutionise all our concepts of war and defence. For the moment we may leave that out of consideration except that it makes it absolutely essential for us to develop the methods of using atomic energy for both civil and military purposes. This means scientific research on a big scale.

11. If unfortunately war breaks out in the future in spite of every effort to keep the peace, it is likely to spread and become a world war. Nevertheless the two chief countries involved would be the U.S.A. and the Soviet Union.

Paragraphs 12 to 16 omitted.

17. India's strongest factor, apart from morale and industrial development, would be her vast spaces and the determination of her people not to submit whatever the consequences.

18. In order to build up this morale and determination, it is essential that the defence forces should consist of Indians only with no foreign element. Only this will give these forces the character of a national army and enthuse the people. This is important from the point of view of defence apart from other factors. It is clear also that an independent India cannot have foreign forces or even foreign officers in her defence forces. That would be a negation of independence and would actually come in the way of proper defence. That would also lead to her entanglements in international conflicts and increase the danger of invasion.

19. It is perfectly true that we cannot start preparing for a danger when the danger is actually upon us. Previous preparation is necessary in order to give us some kind of insurance. But what exactly do we prepare for? If we are in the midst of war we have to do the best we can without thinking in long-distance terms; but organising in peace time for possible war gives us some leisure to lay down foundations of defence more effectively.

20. Normally speaking there is no danger of external invasion for some years to come. But even if there was some danger, it is safer to have a sound foreign policy to make India secure and strong enough to defend herself in the future which may mean ten years hence than to waste our energy and resources on something which may help a little now but which comes in the way of developing in the future effective defence forces drawing their strength from science and industry.

21. The most important thing therefore, looked at narrowly from the point of view of defence alone, is the rapid industrialisation of the country. The next important thing is the morale of the country and the armed forces and this can be brought about chiefly by independence and the complete nationalisation of the Indian Army. Our policy being one of defence, we shall have to build up our defence forces accordingly. Thus the Air Forces would have first priority. The army, whatever its numbers, must be thoroughly efficient and up-todate in the mechanical sense. The Navy would occupy a third place. Indeed the development of the Navy at present is hardly indicated if it comes in the way of Air Forces development. Whether we have a cruiser or two in the Navy or not does not make the slightest difference in terms of defence.

22. The numbers of the land forces also do not make very much difference, provided of course that the number is sufficient not only to meet internal troubles but also to serve as a nucleus for development during a crisis. Such development can be facilitated by widespread training of a militia which would serve as the reservoir for the army. There is an advantage in this which I consider important. A measure of military training, such as the militia might have, will not only make them efficient but it would also raise the standard of efficiency all over the country.

23. In the context of the present situation it does not make very much difference whether we have a land army of 200,000 or 300,000. Even the latter figure is not big enough and is totally inadequate to face a major Power. What is necessary is a big enough army which can expand fairly rapidly if needed. The disadvantage of having a relatively large army is not only the additional cost which inevitably would have to come out of the money for development, but that it would compel us to engage foreign officers and this would result in the spirit of the army and of the country not changing to a great extent.

24. The line of approach should, therefore, be:-

(1) Completely nationalised defence forces from the outset of independence.

(2) No foreign forces in the country.

(3) Rapid industrialisation and provision for scientific research.

(4) The employment of British officers, where they are considered absolutely essential, as advisers.

(5) The development of the Air Force. The British squadrons of the Air Force should not remain in India. I understand that it would be easily possible to have a completely Indianised Air Force of 10 squadrons immediately if we take back some Indian maintenance units in the British air forces in India. The withdrawal of the British squadrons would leave us these ten Indian squadrons only. We must carry on with them and at the same time try to add to them as rapidly as possible. I believe that it is easily possible to add ten or twenty squadrons in the course of the next few years.

It is important also that we develop an aeroplane-making factory in India — something much bigger and more self-contained than the Bangalore factory.

(6) The Navy for the present should not be increased, and cruisers and the like, which cost a lot of money without giving adequate protection in any sense, should not be kept.

(7) The land army should be kept more or less on the pre-war level in regard to numbers, but should be highly mechanised and efficient. It should be officered entirely by the Indians with a few superior British officers attached, where necessary, as advisers.

(8) A militia should be gradually built up to serve as a reservoir for the armed forces and at the same time to help in raising the physique, discipline and the well-being of the nation.

(9) A machine-making industry should be started to provide for the production of the latest mechanical devices for warfare as well as to help in the industrialisation of the country. This should be state-owned and controlled.

(10) A scientific man-power committee should be appointed to prevent waste of such man-power as can be used for the development of science and technique and to make the best provision for trying out latent talents.

(11) An Atomic Energy Commission should be appointed for research work in the proper utilization of atomic energy for civil and other uses.

(12) Planned development of industry, especially heavy industry, should be organized. This will include the rapid increase of the power resources of the country which are essential for any industrial growth.

25. It is not possible for me to make an estimate of the cost of all this. The principal idea is that even in the interest of defence as large a sum as possible should be diverted to the building up of heavy industry and power. The Air Force should be increased. This Air Force should consist not of long-range bombers but of fighter planes. The Navy should be kept at a standstill. The Army should have relatively small numbers, more or less on the prewar level and should be highly mechanised. All this would probably result in an actual saving on the army, navy and air force, and a much larger expenditure on the development of science and industry. This would mean that after a few years, say from five to ten, we will be in a position, if we thought it necessary and if the conditions warranted it, to increase our defence forces very greatly on that industrial and scientific foundation which would have added to the wealth of the country also. Possibly we take a risk during this period of not being strong enough to defend ourselves. That risk has anyhow to be taken because even a somewhat larger army does not do away with that risk. That risk is not great as probabilities go, for there is no obvious danger of invasion. Even if such an invasion occurs during this interim period, the best way to check it is by means of the air force. Having survived the interim period, we can readjust our defence policy in accordance with the situation then.

26. What is suggested not only keeps defence in view in the immediate future but also provides for a more effective defence later on. At the same time it helps in building up the nation, adding to its wealth and raising the standards of the people. It produces the psychological atmosphere in the country of growth and progressive well-being and a determination to protect at all costs the country which is rapidly going ahead. Too much purely military expenditure impedes growth and thus defeats even the objectives of defence.

19. THE NEED FOR A SCIENTIFIC MANPOWER COMMITTEE*

In a recent note on the post-war defence forces of India I stated that a Scientific Manpower Committee should be appointed. (See Note on 'Defence Policy and National Development',

* i) Cabinet Secretariat Papers, Nos. February 11, 1947. ii) *Selected Works of Jawaharlal Nehru*, Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1984) (Second Series), Vol. 2, pp. 597-601.

para 24(10), *Ed.*). This matter seems to me of considerable importance and urgency not merely from the defence point of view but also for many other reasons. Indeed all our projects and plans for development, in whatever sphere they might lie, are likely to be affected by the number and quality of scientists available. This is a basic matter and the earlier it is tackled the better.

2. Even the U.K., where scientific training is much more developed and organised, felt the need of such a committee and a Scientific Manpower Committee was appointed in December 1945 under the chairmanship of Sir Alan Barlow. The Committee reported in May 1946. The terms of this committee were "to consider the policies which should govern the use and development of our scientific manpower and resources during the next ten years and to submit a report on very broad lines at an early date so as to facilitate forward planning in those fields which are dependent upon the use of scientific manpower."

3. In India today there is a demand for development all along the line and a large number of projects have been prepared or are under preparation. There are schemes for scientific research institutes, technical institutes and a host of other institutions. Yet all these as well as the future of industry and defence depend upon the proper and most effective organisation and utilisation of the scientific manpower and resources available in India. There can be no doubt whatever that there is a great deal of potential scientific talent in India. Whenever a chance is given it is taken advantage of. We have some first-rate scientists. It is true, however, that their number is limited considering the size and the demands of the country. There is not only a lack of opportunity for training but also "wastage" and "leakage". Many young men who show great scientific talent in the universities drift to the civil or other services where this talent and experience are not employed.

4. It is roughly estimated that about 1% or less of our scientific manpower is being utilised at present, though even that is not properly organised. If we can raise it to 5%, we would have as large and as fine a body of scientists in India as there exists in the U.K. at present. In the U.K. it is said that 50% of the available scientific talent is being used. This figure is sought to be increased.

5. Unless this problem of the expansion and organisation of scientific manpower is tackled immediately, we shall have bottle-necks in all our plans for development as well as defence. It should be remembered that there is close relationship between pure science and various branches of engineering and technology. Defence depends on the growth of technology and the expansion of scientific research. We shall require in the future not only trained scientists but also technical assistants. A balanced scheme of scientific and technical education requires expansion not only in the number of students but an even larger proportionate expansion in the number of teachers and also an expansion in research schools.

6. At present we are thinking in terms of starting several technical institutes on a big scale. This is of course desirable but it is not enough. These institutes cannot stand by themselves. They can only function properly with the growth of scientific education all over the country.

7. A large number of Indian students have been sent abroad in recent years chiefly for technical training. There have been many criticisms of the way this has been done and a reconsideration of the whole scheme is called for. It is obvious that it is desirable for every

person who can be trained in India to receive his training here. Only a limited number of specially qualified persons should be sent abroad for specialised training, usually for particular kinds of work to be undertaken. It is easier, cheaper and far better from the national point of view to increase rapidly opportunities for training students here, than to send any of them abroad for more or less elementary training.

8. As a matter of fact the opportunities of training abroad are very limited today. The universities in the U.K. and the U.S.A. as well as probably in other countries abroad are overfull and find it difficult to accept foreign students. In a British report it is stated that "in present circumstances every student enrolled from overseas excludes a student from the U.K." In the U.S.A. many of our students have been compelled, after periods of waiting, to join second-rate universities or institutes which are not much better than some Indian universities.

9. We must, therefore, think in terms of a rapid expansion of teaching and training facilities in India, remembering always that quality must not be sacrificed for quantity.

10. It is clear that we must rely principally on existing universities for the training of scientists. Technical institutes will not take the place of universities; they will supplement them. Therefore we have to look at the science departments of existing universities and try to improve and expand them. These science departments are often good and some of the professors in India are very capable men. But the science faculties are poorly manned, laboratory equipment is very limited and the professor, who ought to be doing research work for a great part of his time, is busy with teaching or administrative duties. Hardly anywhere in India is there a real nucleus of first-rate scientists working together for a specialised purpose, and this is the only way to have continuity of first-class research work. We have good men spread out doing outstanding work and when such a man leaves the university, that work ends.

11. Most of our universities are connected with provincial governments. The only three universities dealing directly with the Central Government are Delhi, Benares and Aligarh. All universities at present suffer from lack of funds and equipment. Large numbers of students wishing to take up scientific courses can find no admittance and if they were admitted the staff is not sufficient to teach them. Some of them, who go through their course and do well in it, cannot be fitted into any useful work and drift to other activities, thus wasting their scientific training and experience.

12. For all these reasons and many others which might be mentioned, it has become urgently necessary to plan the training of scientists and the utilization of scientific talents. This indeed is a first priority in all our schemes of development. It is also a first priority from the point of view of defence. The British Scientific Manpower Committee assessed priorities so as to make the best use of the limited supply of scientists as follows:

First — Teaching and fundamental research.
Second — Civil science, both Governmental and industrial.
Third — Defence science.

Some such system will have to be followed by us also. But as a matter of fact we should try to increase the supply of scientists so as to cover all these fields.

13. I suggest, therefore, that a Scientific Manpower Committee be appointed to survey this problem and to recommend policies which should govern the use and development of our scientific manpower and resources during the next five years. This is a matter which might perhaps lie within the purview of the Education Department. But it is so important that it is desirable for the Cabinet to consider it as a whole and to give it the weight of its authority. If the principle is accepted, the personnel will have to be named. There should be no difficulty about this as there are a number of very eminent and qualified scientists in India. Apart from the scientists I would suggest the inclusion of some eminent educationist, other than a scientist, also. It can be asked to report within a stated period which should not exceed six months at the most.

14. I suggest that this note may be put up at an early date before the Cabinet for their consideration.

20. SCIENTIFIC RESEARCH AND DEFENCE PLANS*

(Remarks at a Cabinet meeting, February 12, 1947)

The Hon'ble Member for External Affairs said that though it was not strictly necessary for the present purpose, he would in fact like it to be recorded that industrial development and scientific research were of vital importance to the country's future and that due attention should be paid to them in making our defence plans. He added further that he had drafted a separate note on the subject of Scientific Manpower Committee (See Note on The Need for a Scientific Manpower Committee') which was a problem of first-rate importance and he was anxious that it should be considered early by the Cabinet.

21. DOCTORS AND PUBLIC SERVICE**

(Inaugural speech at the annual conference of the Association of Physicians of India at New Delhi on February 14, 1947).

The medical profession is very important from the point of view of looking after the health of the community and from the point of view of making the community think in terms of scientific method of approach to life's problems.

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* i) Cabinet Secretariat Paper; ii) *Selected Works of Jawaharlal Nehru*, Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1984) (Second Series), Vol. 2, p. 601.

**1) *Selected Works of Jawaharlal Nehru*, Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1984) (Second Series), Vol. 2, pp. 619-620. ii) *The Hindustan Times*, February 15, 1947.

The work that engages you in this conference is of the most vital character. The organization of the health of the country in a sense precedes almost everything except food, which presumably is the basis of health. Subject to that first priority, health and sanitation come highest in the list.

In India we have a medical profession organized more or less on what may be called modern scientific lines. We also have indigenous and ancient systems of medicine which are still used in large parts of the country. Sometimes there is argument as to what should be done about all this apparent overlapping. Speaking for myself and not on behalf of the Government, I should like to put before you my own views. I have no doubt at all that medical science in India has greatly advanced. In fact, it may be said that India once led the world in the field of medical research. Afterwards the Arabs became leaders in that science, and from them medical knowledge spread to other parts of the world.

Even now if one were to study what was done in India and by the Arabs one would be able to learn a great deal. Unfortunately, it is true that all these ancient systems of medicine, excellent though they were, later became static and unscientific. They satisfied themselves with following precedents and failed to improve the science by experimentation and investigation. The indigenous systems may have excellent remedies for certain ailments, but they lack scientific basis.

People talk of allopathy, homoeopathy and various other pathies and methods. But what is important is — are you going to follow a scientific method or not? Those trained in medical colleges adopt scientific methods of treatment, whereas, comparatively speaking, *vaids* and hakims do not. But I am not prepared to say that even the trained people are very scientific. In fact my own experience is that, while in a narrow field they may show some element of scientific approach, their approach to larger problems of life is unscientific. Scientific method, in my opinion, is an approach to life and all life's problems.

Any group of human beings in a trade are liable to create certain vested interests which they always seek to protect. This interferes with the growth of the community. Charges of this kind have been made against the medical profession too. One of the most eminent men, Bernard Shaw, has made these charges on many occasions and there is no doubt that there is a great deal of truth in what he has said.

In olden times there was a feeling that a physician was a public servant functioning for the good of the community. In theory the State is still supposed to look after the health of the people. The question has, however, arisen as to how far the State should intervene and control the practice of medicine. It is a very important question and in almost all progressive countries there is a great deal of debate about it. There is a general tendency for greater intervention and State supervision, so that everyone may have the benefit of full medical advice. India will have to consider this question as soon as she is free. Meanwhile, doctors should try to maintain certain standards and infuse scientific methods not only in their profession but outside. They should organize themselves for public service.

Surgeons, physicians and specialists are not only a very important element in the community but a very dangerous element also. In one of the books I have read, the author visualized a time when the medical profession organized as a trade union might gain control over the State by threatening to poison the whole people.

There is no doubt that scientists and experts can hope to wield such power at a future date. It is already exemplified in the atom bomb. Though atom bombs have not been used by scientists so far, there is a distinct danger of their resorting to such an instrument to gain their ends.

22. STATE CONTRO_ OF MONAZITE AND THORIUM NITRATE*

I am deeply interested in this matter not only on behalf of E.A.D. (Department of External Affairs *Ed.*), but also as President of the Indian Science Congress[1]. Indeed, during the session of this Congress last January in Delhi, there were rumours to the effect that the Travancore Durbar has entered into an agreement for the disposal of monazite and thorium nitrate. This produced some consternation among many of the Indian scientists present and a special resolution was passed, as far as I remember, that the State should own and control all these minerals and specially any foreign exploitation of them should be prohibited. This resolution referred to all minerals and more especially and specifically to those minerals which are necessary for the production of atomic energy.

Dr. Homi Bhabha, the Chairman of the Atomic Energy Committee, also spoke to me about this matter and said that it was exceedingly important that our mineral resources for atomic energy be preserved. If they are to be disposed off this should be done only on behalf of the Government of India and after full consideration of all concerned issues. This is not merely a financial matter. It has international implications. One important aspect of it is that if we agreed to give any of these very valuable minerals to any foreign country we should get in exchange a measure of cooperation from them in the production of atomic energy. We have in India some very distinguished scientists working on atomic energy and cosmic rays. They lack facilities. If they work in cooperation with their opposite numbers in the U.K., U.S.A. or France (the chief countries carrying on this research, apart from the U.S.S.R.), India and the world would both profit by their work.

It is not quite clear, even now, what the exact terms of the agreement between the Travancore Durbar and the British Government are[2]. The Travancore Durbar's communique does not give the text of this agreement. It would appear that after the communique was issued some new agreement was arrived at in regard to monazite and thorium. Some reference to this is made in Mr. Trevelyan's note of 24 February, wherein it is said that Mr. Griffin[3] gave some account of the agreement. I would have thought that the exact terms of the agreement should have been communicated to us formally and placed on the file.

The Atomic Energy Commission of the United Nations has already, as pointed out by Mr. Trevelyan, recommended that there should be effective control of the production and

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* i) Note dated February 27, 1947, File No. 17(4) 47-PMS; ii) *Selected Works of Jawaharlal Nehru*, Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1984) (Second Series), Vol. 2, pp. 604-607.

1 The general committee of the Indian Science Congress, presided over by Nehru, passed a resolution on 6 January 1947 which strongly recommended State ownership of the mineral resources of India, including the States, and demanded immediate action to conserve these resources, particularly uranium and thorium bearing minerals in the interests of India.

2 In January 1947 the Government of Travancore announced that in collaboration with a British firm — which would supply the technical knowledge — they were setting up a factory for the production of thorium from the State's deposits of monazite sand. The arrangement involved "the export to the United Kingdom for a limited period of a limited quantity of surplus monazite and of the factory's output of thorium nitrate, save for what may be required in India."

3 L.C.L. Griffin (1900-1964); entered Indian Civil Service 1923; Secretary to the Crown Representative Department, 1944-47.

use of uranium, thorium and their fissionable derivatives. This report will be considered by the Security Council next autumn. Meanwhile, I think we should proceed on the basis of this report.

I agree with Dr. Bhatnagar's[4] suggestion that the Central Government should not allow surplus monazite or thorium nitrate to be exported from Travancore except through the Government of India, who should purchase the whole of the produce. If the United Kingdom want any of this surplus they should deal with the Government of India. It is desirable, therefore, that an enquiry be made, as suggested by Dr. Bhatnagar, in regard to the quantities of monazite sands involved in the transaction between Travancore State and the British Government or firm and the amount of money involved in the purchase of the whole produce of monazite and thorium nitrate from Travancore State.

How we should proceed about this matter is for Commerce and other Departments to consider, but meanwhile the suggested enquiry would be useful.

The market value of thorium nitrate, though an important factor, is not the deciding factor. Apparently, the amount of money involved in the purchase of the whole production of monazite and thorium nitrate in Travancore is round about Rs.20 lakhs. The important consideration is first how much of it we must keep for India's requirements and, secondly, on what terms we should give it to any other country, the terms including co-operation in atomic research. Again, if we are to give it to any other country, we should have direct transactions with it. This means that we should not give it to any country for it to pass it on to a third country. In direct dealings we can gain direct advantages.

There need be no question of the Government of India storing up vast quantities of these precious articles. What we may consider necessary for our use now and later must anyhow be protected and stored, whatever the cost. What is not necessary will be disposed of to our best advantage.

Similar considerations apply to beryl.

In regard to the questions put by the Works, Mines and Power Department, I would suggest the following answers:-

(i) It is desirable for the Government of India to prohibit the export of monazite and thorium nitrate from India. What is the best method of doing this is for the Departments concerned to consider. This would mean that any export would be in accordance with the explicit permission of the Government of India and subject to the conditions laid down;

(ii) This rule should apply to beryl also;

(iii) I am unable to say what is the best method of prohibiting or controlling exports of these essential minerals;

(iv) I think the Government of India should agree to purchase all quantities of such minerals which may be offered for sale. The question of financing should not offer any difficulty, because of the very great value of these minerals. Primarily they should be employed in research work or industrial purposes in India. Secondly, they may be exported in the manner indicated above;

(v) The export of these minerals would necessarily be limited to particular countries. On no account can this matter be left to the discretion of exporters;

4 Shanti Swarup Bhatnagar (1895-1955); F.R.S.; Professor of Chemistry, University of Punjab, Lahore, 1924-40; Director of Scientific and Industrial Research, Government of India, 1940-51; Secretary to the Ministry of Natural Resources and Scientific Research, 1951-55.

(vi) As I have mentioned above, Dr. Bhatnagar's suggestions should be accepted. They appear to be supported by Mr. Wadia[5], the Mineral Adviser.

On the whole, my views coincide largely with the decisions of the Inter-Departmental Committee, except that I think the Government of India should be prepared to purchase all quantities of these materials and other enquiries should be proceeded with to give effect to this recommendation.

In considering this matter expert scientific advice is obvious indeed. Fortunately, we have got Dr. Bhatnagar and Mr. Wadia to advise us. I would suggest, however, that Dr. Homi Bhabha, the Chairman of the Atomic Energy Committee, might also be consulted as probably he knows more about the value and use of monazite, thorium nitrate and beryl in connection with the production of atomic energy than other people in India.

23. REORGANISATION OF SCIENTIFIC RESEARCH*

(Preliminary remarks at a meeting attended by several ministers, secretaries, the Director, C.S.I.R., and the Deputy Chief of the General Staff to consider the future organisation of scientific research, New Delhi, August 23, 1947)

This meeting has been called with a view to discuss the future set-up of scientific research. The Ministries of Health and Agriculture, for instance, deal with important aspects of scientific research, but the greater part of it comes under the Ministry of Industries and Supplies, which is in administrative charge of the Council of Scientific and Industrial Research. It is, however, necessary to ensure for scientific research as much coordination and encouragement as possible. Without proper coordination, there is bound to be considerable overlapping and waste.

I have placed scientific research under my personal charge[1]. However, I have no desire to interfere in the work now being carried on; but I am interested in scientific research and wish to be closely associated with it and help in its promotion. I realise I cannot undertake anything of a detailed or routine nature. I feel it is highly desirable to have a committee of the Cabinet, specially charged with the task of promoting scientific research[2]. The Ministers in charge of the various departments concerned with scientific research, including the Minister for Transport, should be members of this committee. The committee could meet at least once a month, and as and when necessary.

The Council of Scientific and Industrial Research is an autonomous body with the Minister for Industries and Supplies as its Chairman. I understand that while the Council

5. D.N. Wadia.

* i) File No. 17(12)/47-PMS. ii) *Selected Works of Jawaharlal Nehru*, Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1986) (Second Series), Vol. 4, pp. 546-547.

1 The new Cabinet announced in August 1947 included a portfolio of scientific research.

2 The meeting agreed on a Cabinet committee for scientific research presided over by the Prime Minister and consisting of the Ministers for Industries and Supplies, Food and Agriculture, Education, Transport, Defence, Health, and Works, Mines and Power.

has internal autonomy in certain matters, it functions through a department of the Government[3]. It is conceivable that the Prime Minister could function as the Chairman of the Council, while there could be a Vice-Chairman who may be concerned with its administrative functioning[4].

In conclusion, I might say that there is no intention of finalising arrangements for scientific research at this stage[5]. However, we must think of scientific research in relation to planning and consider at a later stage proposals for a suitable planning machinery within the Government of India, perhaps a Planning Commission.

24. CO-ORDINATION OF SCIENTIFIC AND INDUSTRIAL RESEARCH WITH PLANNING*

(Speech at the meeting of the Governing Body of the Council of Scientific and Industrial Research, New Delhi, August 25, 1947)

I thank the members for their kind sentiments. Many urgent problems have been engaging my attention in the midst of which, however, I made it a point to attend the meeting of the governing body. I wished to associate myself with the Council in my individual capacity since I am interested in its work, and also in my official capacity in order to show what importance the new Government attaches to scientific development in India. After a big change we have to face very large number of problems and the work should therefore go at a fairly faster speed. The problem of refugees and communal troubles in the Punjab and elsewhere have been assuming large and painful proportions and have to be tackled not in an emotional but in a scientific manner. The members of the governing body will appreciate that it is difficult for me to devote much time to many aspects of the work of the Council. In so far as the matter of policy and important matters are concerned, I would like to be associated with the Council's work. I expected the Council of Scientific and Industrial Research and the new activities in the planning to be coordinated. For the present, Dr. Syama Prasad Mookerjee[1] will, however, look after the day-to-day routine work of the Council.

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3 The Council started to function under the Ministry of Industries and Supplies.

4. It was decided that the C.S.I.R. would continue as an autonomous body with the Prime Minister as Chairman and the Minister for Industries and Supplies as Vice-Chairman.

5. It was agreed to continue research in the fields of medical science and agriculture under the aegis of the concerned ministries. A suggestion to place all government organisations concerned with scientific research under the Member for Planning and Development was not accepted. As a compromise, a scientific consultative committee was formed.

* i) File No. 17(12)/47-PMS. ii) *Selected Works of Jawaharlal Nehru*, Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1986) (Second Series), Vol. 4, pp. 548-549.

1 Syama Prasad Mookerjee, as Minister for Industries and Supplies, was elected Vice-President of the Council.

JAWAHARLAL NEHRU
ON
SCIENCE AND SOCIETY

PRIOR TO SCIENTIFIC POLICY RESOLUTION

25. ROSTER OF SCIENTIFIC TALENT*

(Statement to the Press on January 6, 1948)

The Government of India have at present under consideration the report of the Scientific Manpower Committee appointed in April, 1947,[1] to advise on the best method of utilising and augmenting the scientific manpower resources of the country. A basic recommendation of the Committee, which the Government have accepted, is that immediate steps should be taken to prepare a roster of scientific talent that is now available. The necessity of such a roster is obvious.

The National Institute of Sciences had previously made an attempt to prepare such a roster but they were not able to make much headway. The Government of India have entrusted the work to the same agency working under the auspices of the Council of Scientific and Industrial Research.[2]

I appeal to all persons in India possessing degrees or diplomas in science to send complete information about themselves such as age, permanent and present addresses, their scientific qualifications, research and industrial experience, their present occupation, the nature of the research work, if any, they are engaged upon, etc. This information should be sent to the Secretary to the National Institute of Sciences, India, University Building, Delhi. I hope this information will be supplied soon and a complete roster prepared urgently.

26. AGE-LIMIT FOR RETIREMENT OF SCIENTISTS**

The age-limit for retirement from our service is not suitable for scientists who function differently from ordinary civil servants and the like. In fact, many scientists do their best work in later years. We have a great lack of eminent scientists and we can ill spare them. Normally, therefore, it is desirable to keep them on for as long as they are capable of good

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* i) *Selected Works of Jawaharlal Nehru*, Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1987) (Second Series), Vol. 5, p. 419. ii) *The Hindustan Times*, January 7, 1948.

1 The Government of India appointed a Scientific Manpower Committee in April 1947, with Shafaat Ahmed Khan as Chairman.

2 The C.S.I.R. published, in three volumes, *National Register of Scientific and Technical Personnel.*

** i) Note dated January 28, 1948, File No. 35(9)/56-66-PMS; ii) *Selected Works of Jawaharlal Nehru*, Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1987) (Second Series), Vol. 5, pp.419-420.

work. Dr. Bhatnagar[1] and some other prominent scientists in India are doing important work and are capable of continuing to do so for a number of years. Therefore, the application of the old-age limits would be harmful to our interest. The extension by a year does not appear to me to be quite sufficient. This leaves a sense of insecurity in the minds of those affected as well as the Government, and big schemes, with which they are concerned, may suffer somewhat.

27. ATOMIC ENERGY BILL*

(Speeches on the Atomic Energy Bill in the Constituent Assembly of India (Legislative) on April 6, 1948)

Speech moving the Bill

Sir, I move :

> "That the Bill to provide for the development and control of atomic energy and for purposes connected therewith, be taken into consideration".

Unfortunately, the first use that atomic energy has been put to has somewhat clouded the other manifold uses that it is likely to be put to in the future. Most people probably think of atomic energy in the sense of something producing atomic bombs for the destruction of human beings. But probably, even the great destruction of that atomic bomb will be forgotten, while the use of atomic energy may in future powerfully influence the whole structure of the world. No one can say when that use will be perfected or brought into the common life of man. But the tempo of change and progress is so great nowadays, that it is quite possible that within our life-time we may see the whole world change because of the use of this enormous power being released for human purposes. Therefore, it is not from the point of view of war that I am placing this Bill before this House but rather from the point of view of the future progress of India and the Indian people and the world at large. If we do not set about it now, taking advantage of the processes that go towards the making of atomic energy, and join in the band of scholars and researchers who are trying to develop it, we will be left behind and we shall possibly only just have the chance to follow in the trail of others. That is not good enough for any country, least of all for a country with the vast potential and strength that India possesses. Fortunately for India we have most of the material that is needed — the minerals that are essential and the human material, which is perhaps even more essential. All that is necessary is that we should put them together and the State should give every facility for this development.

Now because of this association of atomic energy with war, inevitably the matter has become a highly secret matter and most of the countries advanced in research are jealous that the results of their research should not be known to others, unless of course there is some kind of mutual exchange. We have, therefore, ourselves proceeded somewhat cau-

1. Shanti Swarup Bhatnagar.

* *Constituent Assembly of India (Legislative) Debates, Official Report*, Vol. V, No. 1 (Tuesday, April 6, 1948), pp. 3315-17; 3326-28; 3333-34.

tiously, that is to say, in the sense that our research work cannot be as public as normal scientific research or scientific work ought to be. Firstly, because if we did that may be the advantage of our research would go to others before even we reaped it, and secondly it would become impossible for us to cooperate with any other country which is prepared to cooperate with us in this matter, because it will not be prepared for the results of their research to become public. Therefore, this Bill lays down that this work should be done in privacy and in secrecy. There is no other way of doing it. It is not that we desire secrecy and privacy. We would rather wish that all scientific work and scientific research were public and that the world could take advantage of it. I am entirely opposed to any secrecy in science, just as I am entirely opposed to the pernicious system of patent medicines that has spread, whether they are the Western type of patent medicines or Unani or Ayurvedic or any other. I think secrecy in science or in the art of cure is a dangerous thing. So it is not our desire to keep these processes secret but we are compelled by circumstances to proceed along these lines: otherwise there can be no progress at all.

So this Bill gives certain powers to the Atomic Energy Board that we have already got, subject, of course, always to the supervisory and superintending power of the Government, to carry on these researches in a non-public and secret way and to concentrate more or less all the researches in it and bring them more or less together into its own domain.

There is a tendency, and that tendency might perhaps increase, for individual researchers to do work separately. They are welcome to do so. Nobody wants to come in the way of any individual doing any research work. But atomic energy research, if it is to be effective and successful, must be on a big scale. Individuals can do research work in a petty way on the theoretical aspect of it; nobody comes in the way. Fortunately we have some very eminent scientists who are acknowledged to be very eminent in regard to theoretical physics and even in the study of cosmic rays and atomic energy. But when you come to the practical side of it, it is just impossible for any individual to do it without pooling all the resources that we have and without the aid of the State. This Bill provides for that being done, the pooling of their resources and the aid of the State for which we shall have to provide later on.

A number of amendments have been moved. I should like the movers of those amendments to bear two or three facts in mind. One is that this work must be of a secret character. It cannot be done publicly. Therefore, to have advisory committees and the like will defeat the purpose of this work. There is an Atomic Board — I forget what the exact name of it is — a Board for the study of this problem and the execution of any projects that we may have. It consists of very eminent scientists. That is the advisory board for Government and the Board will presumably carry out the schemes. That the Board may be added to is a different matter. But if we have other boards and advisory committees it would be impossible for that Atomic Energy Board to function with any privacy or secrecy.

Secondly, there is a certain amount of urgency about this matter, not that we are going to produce any great results immediately but we have to preserve our mineral deposits, those that might be used for this purpose and already there is a hungering for them and there might be misuse so that we cannot delay this matter. And if we are to enter into any cooperative terms with other countries engaged in the production of atomic energy we have to guarantee them secrecy on this thing. We cannot talk to them till we have some such Act on our statute-book and some Board appointed under the Act. There is a proposal that there should be an advisory committee and, secondly that this Bill should be circulated for public opinion and be brought again at the next session. I submit that this delay would not be good and we might lose valuable time.

As for the other amendments and there are many, some are rather verbal and some of them I propose to accept but those which infringe these fundamental provisions I would

work. Dr. Bhatnagar[1] and some other prominent scientists in India are doing important work and are capable of continuing to do so for a number of years. Therefore, the application of the old-age limits would be harmful to our interest. The extension by a year does not appear to me to be quite sufficient. This leaves a sense of insecurity in the minds of those affected as well as the Government, and big schemes, with which they are concerned, may suffer somewhat.

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Sir, I move :

"That the Bill to provide for the development and control of atomic energy and for purposes connected therewith, be taken into consideration".

Unfortunately, the first use that atomic energy has been put to has somewhat clouded the other manifold uses that it is likely to be put to in the future. Most people probably think of atomic energy in the sense of something producing atomic bombs for the destruction of human beings. But probably, even the great destruction of that atomic bomb will be forgotten, while the use of atomic energy may in future powerfully influence the whole structure of the world. No one can say when that use will be perfected or brought into the common life of man. But the tempo of change and progress is so great nowadays, that it is quite possible that within our life-time we may see the whole world change because of the use of this enormous power being released for human purposes. Therefore, it is not from the point of view of war that I am placing this Bill before this House but rather from the point of view of the future progress of India and the Indian people and the world at large. If we do not set about it now, taking advantage of the processes that go towards the making of atomic energy, and join in the band of scholars and researchers who are trying to develop it, we will be left behind and we shall possibly only just have the chance to follow in the trail of others. That is not good enough for any country, least of all for a country with the vast potential and strength that India possesses. Fortunately for India we have most of the material that is needed — the minerals that are essential and the human material, which is perhaps even more essential. All that is necessary is that we should put them together and the State should give every facility for this development.

Now because of this association of atomic energy with war, inevitably the matter has become a highly secret matter and most of the countries advanced in research are jealous that the results of their research should not be known to others, unless of course there is some kind of mutual exchange. We have, therefore, ourselves proceeded somewhat cau-

1. Shanti Swarup Bhatnagar.

* *Constituent Assembly of India (Legislative) Debates, Official Report*, Vol. V, No. 1 (Tuesday, April 6, 1948), pp. 3315-17; 3326-28; 3333-34.

tiously, that is to say, in the sense that our research work cannot be as public as normal scientific research or scientific work ought to be. Firstly, because if we did that may be the advantage of our research would go to others before even we reaped it, and secondly it would become impossible for us to cooperate with any other country which is prepared to cooperate with us in this matter, because it will not be prepared for the results of their research to become public. Therefore, this Bill lays down that this work should be done in privacy and in secrecy. There is no other way of doing it. It is not that we desire secrecy and privacy. We would rather wish that all scientific work and scientific research were public and that the world could take advantage of it. I am entirely opposed to any secrecy in science, just as I am entirely opposed to the pernicious system of patent medicines that has spread, whether they are the Western type of patent medicines or Unani or Ayurvedic or any other. I think secrecy in science or in the art of cure is a dangerous thing. So it is not our desire to keep these processes secret but we are compelled by circumstances to proceed along these lines: otherwise there can be no progress at all.

So this Bill gives certain powers to the Atomic Energy Board that we have already got, subject, of course, always to the supervisory and superintending power of the Government, to carry on these researches in a non-public and secret way and to concentrate more or less all the researches in it and bring them more or less together into its own domain.

There is a tendency, and that tendency might perhaps increase, for individual researchers to do work separately. They are welcome to do so. Nobody wants to come in the way of any individual doing any research work. But atomic energy research, if it is to be effective and successful, must be on a big scale. Individuals can do research work in a petty way on the theoretical aspect of it; nobody comes in the way. Fortunately we have some very eminent scientists who are acknowledged to be very eminent in regard to theoretical physics and even in the study of cosmic rays and atomic energy. But when you come to the practical side of it, it is just impossible for any individual to do it without pooling all the resources that we have and without the aid of the State. This Bill provides for that being done, the pooling of their resources and the aid of the State for which we shall have to provide later on.

A number of amendments have been moved. I should like the movers of those amendments to bear two or three facts in mind. One is that this work must be of a secret character. It cannot be done publicly. Therefore, to have advisory committees and the like will defeat the purpose of this work. There is an Atomic Board — I forget what the exact name of it is — a Board for the study of this problem and the execution of any projects that we may have. It consists of very eminent scientists. That is the advisory board for Government and the Board will presumably carry out the schemes. That the Board may be added to is a different matter. But if we have other boards and advisory committees it would be impossible for that Atomic Energy Board to function with any privacy or secrecy.

Secondly, there is a certain amount of urgency about this matter, not that we are going to produce any great results immediately but we have to preserve our mineral deposits, those that might be used for this purpose and already there is a hungering for them and there might be misuse so that we cannot delay this matter. And if we are to enter into any cooperative terms with other countries engaged in the production of atomic energy we have to guarantee them secrecy on this thing. We cannot talk to them till we have some such Act on our statute-book and some Board appointed under the Act. There is a proposal that there should be an advisory committee and, secondly that this Bill should be circulated for public opinion and be brought again at the next session. I submit that this delay would not be good and we might lose valuable time.

As for the other amendments and there are many, some are rather verbal and some of them I propose to accept but those which infringe these fundamental provisions I would

rather not accept, because I do not want to weaken this measure. It is not a measure, of course, applying to the people in general; it applies to a very limited number of persons who might be interested in or who might be working for the production of atomic energy and if in this particular case, for the safety of the State we apply rather stringent rules to them, I do not think any person has a right to complain. Ultimately of course, it will be for the Government and beyond that for Parliament here to determine what we should do or what we should not do. The ultimate authority will inevitably remain with this House. Apart from that we should give them sufficient authority to carry on their work in secrecy and effectively without what might be called governmental or other interference, Sir, I beg to move.

Speech during discussion

Sir, every member who has spoken has welcomed this Bill in a more or less degree, many of them have grown rather poetic envisaging the future that might develop through the use and exploitation of atomic energy to the human race. But the last speaker who spoke, Mr. Krishnamurthy Rao, while finally welcoming it, practically criticised every feature of the Bill and in fact thoroughly disapproved of it lock, stock and barrel. I was amazed to hear that he was really supporting the Bill or was welcoming it. He attacked the provisions regarding secrecy. He said there was nothing constructive about it. He asked me to tell him what equipment we have proposed to have, how many cyclotrons and how many other things we have got in India, that there were advisory committees elsewhere and so on and so forth. I am sorry I cannot provide a list here of various technical equipment that we have or might get. I have not got it. But the fundamental fact is that in regard to time, for instance, I should like this House to appreciate that time is an important element; I will go further and say that it is a vital element. And any one who raised the question of time, specially today, is singularly ignorant of what is happening all around us. It may be that a short while later it may become impossible for us even to deal in such matters with other countries. It may be that in view of each country trying to get the best bargain in regard to materials and other things, if we do not take advantage of an opportunity when it comes our way, we may not have that opportunity for some time. It is not enough for us merely to say that our materials should not go out of India; we may want to send them out in exchange for something valuable. It is not quite enough to hold on to them as misers without profiting by them ourselves and not knowing how to profit by them, but just to hold them on merely for the pleasure of having some kind of wealth. These minerals have been here under the Indian earth for a few million years; the time and opportunity for exploiting them has come only now. We did not profit by them during all these years as the rest of the world did not profit by them. Now when the time comes, to sit back and think ourselves fortunate in possessing them seems to me an extraordinarily limited and narrow view of looking at things, especially in this vast changing world of today.

As for the secrecy part, I should have thought that what has been said in the Statement of Objects and Reasons and further from what has been said by other Honourable Members after me, it is obvious that it is difficult to go ahead in this matter internally or externally without these provisions for secrecy. I believe there are these provisions of secrecy, may be in varying measures but more or less on these lines, in every country. Now it is possible and conceivable that these provisions might come in the way of some scientific research. On the other hand in scientific research of this kind what is more likely to come in the way is frittering away our energies and not concentrating them. As I mentioned earlier, it is impossible to do any experimental research of any major scale — theoretical research of course is open to everybody — except on a large scale, *i.e.* except on a scale which is helped by the State. I can conceive of no private scientists or individuals being in a position to do

so; even if the State helps them separately they cannot do so unless they coordinate their efforts. When the question of coordination comes, you arrive immediately at some central organisation or body where these scientists who are associated with it will do it with the help of the State. So I do not understand many of the criticisms that Mr. Krishnamurthy Rao has put forward. He asked us what equipment we have got — cyclotrons and other things. I do not quite follow this line of argument — that if we have not got the equipment we should not set about it and if we have got it we have got it. The fact of the matter is that we have very little equipment but we have some. My own interest in this business is not a very new interest. I think the first time the question came up before me was before the last war, and I was instrumental in helping one of the universities in India[1] to get the first cyclotron machine into India. Unfortunately the war came and it was not easy to set it up fully because some parts had not come, but anyhow it had come. Since then I have been following this matter up. We have not got much in the way of equipment, we have some little things for theoretical work and for petty experiments. But the point is this: are we going to carry on in that petty, local, limited way or are we going to set up what is called a pile? A pile need not be a big pile; it may be a small pile. Nevertheless a pile is a big thing involving much expenditure, much preparation, concentration and effort and so on, and a great deal of secrecy. I do not know of a single instance anywhere in any country where this has been done without this eriction of a pile and without all the concomitants of secrecy, concentration of work, etc. I may also point out that it is not true to say that there are only three countries indulging in this atomic research today. Mr. Krishnamurthy Rao mentioned the U.K., the U.S.A. and Canada. Undoubtedly these three countries are going ahead with this; but there are several other countries and several of them are pretty far advanced — perhaps more advanced — who are also doing it. I am not for the moment referring to the U.S.S.R. about which we do not know much, except that I have no doubt that they are doing something to develop atomic energy. But many countries of Europe and even many small countries like Belgium and Norway and of course France are technically highly advanced. I do not wish to discuss individual countries, but in spite of their small resources they are quite advanced and sometimes more advanced than countries with higher resources, scientifically advanced and otherwise. They are setting up piles in small countries in spite of their relatively limited resources. So that at the present moment there is everything ripe for us and we can go ahead. What I mean is this that the main things that are necessary are the men or human beings trained to do it and materials. We have got them but we naturally want equipment, we want other facilities, we want many of them, but unless the pile comes we cannot set about doing it. The more you delay the Bill the more we simply cannot begin functioning in this new way; we cannot start doing it. Of course the passing of the Bill will not work wonders and nothing much will happen. You cannot produce atomic energy merely by setting up the machinery and men; but in course of time — not too long I hope — we shall be able to set up all the kind of plant that is required for this purpose. Therefore I will beg the House not to delay this matter but to give these powers to the Atomic Energy Commission.

Mr. Krishnamurthy Rao also spoke about the advisory committee and he mentioned some names. I am sorry I cannot say much about England, but when he was reading out the names I was rather surprised to notice that the names were of the very eminent scientists who formed the Atomic Energy Commission there, which he called the Advisory Committee, so far as I can make out. There are half a dozen or ten or more eminent scientists chosen for atomic energy research in England. We are just forming that atomic energy commission here too. The point is whether you are going to have an advisory committee to sit

1. Calcutta University.

over the heads of these scientists, to advise them, to cross-examine them or to find out what they are going. That I think would be undesirable. Therefore I think that in regard to this measure the changes suggested — either postponement or removal of secrecy or advisory committees etc. — would be highly undesirable.

One criticism is that there is nothing constructive about it, presumably referring to the giving of grants etc. All that hardly comes within the scope of this Bill. Of course Government, if it is interested, as it is bound to be, must develop scientific research in every way, in the universities etc. The giving of grants to the Atomic Energy Commission will, of course, be one concentrated effort to work out this business and for universities to carry on theoretical research work. That is an important function of the Government or the Education Ministry, and I have no doubt that they will look after it.

Speech in reply to debate

There is just one aspect to which I should like again to draw the attention of the House. Somehow we cannot help associating atomic energy with war. That is the present context of our lives. Nevertheless, the important thing today is that atomic energy is a vast source of power that is coming to the world and it is something even more important than the coming in of wars and the like. The wars may be forgotten. Even great world wars may come and go and bring enormous destruction in their wake. But we are on the verge, I think, of a tremendous development in some direction of the human race. Consider the past few hundred years of history; the world developed a new source of power, that is steam — the steam engine and the like — and the industrial age came in. India, with all her many virtues, did not develop that source of power. It became a backward country in that sense; it became a slave country because of that. The steam age and the industrial age were followed by the electrical age which gradually crept in, and most of us were hardly aware of the change. But enormous new power came in. Now we are facing the atomic age; we are on the verge of it. And this is obviously something infinitely more powerful than either steam or electricity. While we are on the verge of the atomic age people talk of another source of power which is even bigger and vaster, that is, cosmic rays. It may be that this atomic age may merge into the cosmic age or the cosmic ray age, whatever it may be called. The point I should like the House to consider is this that if we are to remain abreast in the world as a nation which keeps ahead of things, we must develop this atomic energy quite apart from war - indeed, I think we must develop it for the purpose of using it for peaceful purposes. It is in that hope that we should develop this. Of course, if we are compelled as a nation to use it for other purposes, possibly no pious sentiments of any of us will stop the nation from using it that way. But I do hope that our outlook in regard to this atomic energy is going to be a peaceful one for the development of human life and happiness and not one of war and hatred.

28. THE SCIENTIFIC APPROACH*

(Speech after laying the foundation-stone of the building of the National Institute of Sciences at New Delhi on April 19, 1948)

"The scientific method is the only right method of approach to life's problems; and in India today it is even more important than elsewhere because we are backward in sci-

* *The Hindustan Times*, New Delhi, April 20, 1948.

ence", declared Pandit Nehru, Prime Minister, laying the foundation-stone of the building of the National Institute of Sciences in New Delhi, last evening (April 19, 1948).

Pandit Nehru added: "Scientists, like human beings, are good and bad, but science ought to be good if properly pursued. In India today, we should pursue science in the right way and try our utmost to foster it. There is no other way except the way of science ultimately for the development of human life and institutions. This is the scientific approach to life's problems. I myself doubt very much if even scientists have the scientific approach to life's problems. They are often unscientific outside their laboratory or in considering other human problems.

The fundamental thing is a scientific approach. You cannot change man legally. You can create an atmosphere where his actions are governed by a scientific approach. The science remains the only right method of approach. It is certainly one of the most important methods and in India today it is even more important than elsewhere because we are backward in science. There is no reason why we should be backward because, I think, we have extra-ordinarily good material. We have men. We have only to put them together to produce results.

"I am glad that the scope of the Institute of Sciences is comprehensive. I hope, at the same time, it will not presume too much and become too exclusive and disdain anybody who does not belong to it. During the last two months or more, I have been laying many foundation-stones. Now I should like something more too and rapidly too. After the foundation-stone is laid, there is a tendency for subsequent progress to be slow. I hope in this case the foundation-stone will soon disappear and people will sit here and do some honest work."

Earlier, Pandit Nehru referred to the decision to house the Institute in Delhi and said that "in his opinion any real institution of research should not be at the seat of the government. The atmosphere in Delhi was not suited to scientific thinking. It was a pity that scientists, too, were drawn towards the government's departmental work and were not uninterested in emoluments which it carried."

29. APPLICATION OF SCIENCE*

(Speech at the foundation-stone laying ceremony of the Central Electro-Chemical Research Institute, Karaikudi on July 25, 1948)

I have come here to associate myself with the beginning of this undertaking because I believe that by such undertakings and by yoking science to public good we can advance enormously the lot of the people of India. We get thereby many opportunities to solve the problems of the people. I am therefore glad to see such large numbers of the common people associating themselves here in such ceremonies.

I am told that people living round about here do not even have sufficient water to drink. They also lack most of the other good things of life. Now, it is up to us, who are responsible for the running of the government — whether it be the Government of Madras

* Director, Central Electro-Chemical Research Institute, Karaikudi (Tamil Nadu)

or the Central Government — to see that our immediate objective should be to provide them with the basic essentials of life. Once that is done, then we can think in terms of providing other things that are necessary.

Now, there are many ways of approaching the problem. But the best way is to attack it at the root and lay the foundation for increasing the means of producing the goods that people want. Ultimately, our Government, whether it is the Provincial or the Central, will be judged by this one standard. How far have they advanced the good of the people, how far have they made their lot better, and how far have they improved the lot of the common man, not by way of constructing fine buildings and fine structures in a few cities, but by improving the villages and providing them with the normal amenities of life. That will be the real test.

We have to see how we can apply science to this end. What is science? Science is the method of using various kinds of power to better the lot of human beings but at the same time science has also been used towards their destruction and greater misery. However, we shall take the good from science and from the Institute that will come up here and all that the Institute can do and all that the power of science can do for bettering the lot of humanity. People talk of pure science and applied science. To me they are about the same. I think that no science or other activity for that matter, can be worth anything unless they are carried out and worked in terms of the larger humanity. Therefore, whether it is pure science or applied science, it must serve humanity, human good, raise human standards and help our fellowmen. That will be the objective and the activity which will be desirable.

The combination of pure science and application of science to public good is something which now has an integral connection with the life of the people round about here in South India. I congratulate Dr. Alagappa Chettiar on this scheme and for his generosity. But, now, the scheme is something more than that of Dr. Alagappa Chettiar. It has been taken up by the Nation and it has become a National Institution. Therefore, it will belong to the Nation and not to any particular individual. It is up to you to consider it as yours and help it in every way.

Round about this Institute, I understand, other institutions will grow. The building construction, I am told, will take place very soon and the work will start thereafter as rapidly as possible. This centre may thus be converted into one of the most productive areas of the country and do good to the people. Electro-chemistry is an important discipline. You will be carrying out research in this connection and the usefulness of the work will spread itself out, so that not only the Institute but all the other things that flow from it can go to better the conditions of the people in villages and towns, and to establish industries and provide employment.

What is the objective we seek? It is to put an end to poverty, to put an end to all the waste of human power and talent, so that everyone may be able to work and produce and have the amenities of life and advance to the best of his capacity; so that every person whatever caste, community or religion he may belong to, may have equal opportunity and scope to be the architect of his own progress.

We are children of a great and mighty country. Our country has attained freedom. We have now to concentrate on making her great in other ways also. True greatness lies not in the power of arms but in having prosperous, contented and productive people. We, therefore, have to build up the greatness of the people for the greatness of India, so that she may become the soul and symbol of a great and productive human activity.

30. CULTIVATION OF SCIENCE*

(Message sent on the occasion of laying of the foundation-stone of the building of the Indian Association for the Cultivation of Science, Calcutta on September 26, 1948)

"On the occasion of Foundation Stone of new buildings for the Indian Association for the Cultivation of Science being laid, I send you and your Association my good wishes. The Association has a fine record of past work in the field of Scientific Research. May it excel this in future."

31. CHANGING PERSPECTIVE IN THE AIR AGE**

(Inaugural address to the Aeronautical Society of India, Bangalore on December 27, 1948)

It is not quite clear to me, on such an occasion, what an inaugural address should consist of. I can indulge in various generalities and after the fashion of politicians talk vaguely round a subject. For me or for anyone, to commend the formation of this Aeronautical Society of India seems to me rather unnecessary. When I was asked to come here, as has been pointed out, the main object of my visit to Bangalore and Mysore — this State — was really to inaugurate this function; although a large number of other engagements have also been added on to this function. In fact, almost it appears, this has become the smallest of the functions.*(Laughter)*.

But I was a little surprised, when I was asked to come here, surprised by the fact that there was no such Aeronautical Society in India thus far. I would have thought some such steps would have been taken years ago. Then, I gladly agreed; also because this meeting was taking place in Bangalore. I wanted to come to Bangalore and I am glad I came.

Yesterday, I was addressing some of our Air Service Cadets — a large number, say, about two thousand or so — and as I was addressing them, odd ideas came to my mind. I put it across to them. It is an odd thing that while we talk more and more about these air developments, air technology, form such societies and the rest, yet our life somehow has not been sufficiently influenced by the Air Age into which we have stepped. That is to say, one of the things that Air Age does, obviously, is to eliminate and obliterate frontiers. It is impossible to have a frontier somewhere in the air. Just imagine it if you like.

Nevertheless, there is more talk of frontiers now than ever before. In fact, apart from national frontiers which give rise to a lot of trouble even in India, people talk a great deal about provincial frontiers, and changes and new provinces and the rest of it. It takes such a long time, it seems to me, for the human mind to adapt itself to changing conditions. And the odd thing is that while these changing conditions themselves come out of the human mind, yet that very mind somehow does not understand the implications of what it itself has produced.

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* Director, Indian Association for the Cultivation of Science, Calcutta.

** i) Nehru Memorial Museum and Library, Teen Murti House, New Delhi; ii) *Journal of the Aeronautical Society of India*, Vol. 1, No. 1 (1949), pp. 1-3.

And so we find that even among eminent scientists who, in their own domain are very eminent and very advanced, in other domains of life some believe in superstitions which are completely out of place with the work that they are doing. And so we come across this difficulty that while modern age requires a great deal of specialization and unless we are specialists in our job we cannot do much in it — the more we specialize the more ignorant we become of the essential purpose of life. We may be very good at our job and even attain specialization in regard to other departments, but then we may be rather ignorant, and more especially of what after all should be a basic conception in each mind, i.e. some purpose in human life that we are aiming at.

Science, of course, apparently is not supposed to enquire into that matter. It leaves it, may be to philosophy, may be to somebody else, something else. But, when we are confronted with the tremendous problems as we are confronted today, when sometimes, frequently enough, war comes and obliterates large sections of the human race or destroys a good bit of the earth's surface, it is not good enough for any one of us to think or say that it is none of our business. When this happens do we stick to our own lands, to our own job, to our own beat?

It becomes everybody's business to consider these problems and to help in devising some kind of solution which will prevent these recurring catastrophies and disasters. You know, there are some people who blame scientists for helping war machines, and say that they are really working for and that they are helping the forces of evil in the world by placing their talent and genuius at the disposal of these forces. I do not know if it is right to blame scientists in that way, or if scientists can very well help it. But nevertheless, even a scientist, I take it, ought to possess a soul and spirit and not be merely a piece of mind, functioning in vacuum and producing things and inventions and discoveries and the like.

Therefore, this odd question comes up, that while the mind of man has, historically speaking, in the past and the present, made the most tremendous advances in every way, somehow some part of man lags behind, does not keep up with it; even in fact, some part of that mind of man itself lags behind itself. It is a contradiction, I do not understand, how else can I say it? The fact remains that of the progress that we make, we do not make the best use of. Or, in fact, we misuse our advances and the progress that we achieve. How can we get out of this tangle, out of this vicious circle, I do not know.

Then, to put another idea into your head which I repeated to the young men yesterday — through thousands of years of history, we have got used to living in terms of what might roughly be called as two dimensions of existence. We just cannot get used to this Air Age, which has three dimensions. We creep and crawl along thinking in terms of frontiers, this frontier and that, and grouse and quarrel with each other, and have intense nationalist passions and the like. But, all these things just do not fit in with this Air Age.

Now, how long will it take for us to catch up with these developments in the Air Age? I do not know. But, obviously, we have to catch up with it. It is a conflict between the second dimension and the third dimension, and we have to choose which to exist in. I take it that this Aeronautical Society has also a third dimension, and therefore, will have to inculcate this in people's minds in India and will incidentally also help to produce people, technical people, experts, etc. for all the various manifold needs that a progressive country has. Defence of course, but other than defence also.

Therefore, I welcome the formation of this Aeronautical Society and I am very gratified that I have been chosen its Patron. Though I have always an uneasy feeling about this business of choosing people as Patrons — whether it is due to any individual merit or is it to the office one happens to occupy for the moment. It is very irritating to have the feeling that it is not because you are good enough for it, but because you happen to be occupying an office, or a livery of that office, therefore you are to be in a particular chair. But, I hope

that it is not entirely due to that, and that I might possess some individual merit of this too — which merit does not consist in any knowledge of the subject, but an exceeding interest in the subject, an abiding interest which arose long ago. Therefore, I gladly inaugurate this Society and I wish it progress and success.

32. QUALITY IN SCIENTIFIC WORK*

(Speech on the occasion of laying the foundation-stone of the new premises for the Electrical Communication Engineering Department of the Indian Institute of Science, Bangalore, on December 27, 1948. He also declared open the Scientific Exhibition organised by the Institute)

Pandit Nehru said that he had thought of Bangalore always in connection with the Institute because of the immense value of such institutes to India and because it was a symbol of many things that they desired to have. So far as he was concerned, he would like to help this Institute to grow and other institutes to grow too. There was a wide-spread desire for more scientific research and for the social application of science. Science, in its application, had tremendous possibilities both for good and for evil.

Scientific work in India was progressing and undoubtedly they had extraordinarily eminent scientists here. He was also equally convinced that there was first rate material amongst their students for research or other work. But just at the present moment there seemed to be a certain lack of coordination of the various activities. For instance, students were sent abroad at government expense to learn some job, though sometimes those who went abroad were not fit to learn the job. More than that, when they came back, there was nothing for them to do here. This was an extraordinary state of affairs. It was a matter to be attended to because it was important. So, soon after he came on the official scene, he appointed a Scientific Manpower Committee because he felt very much that first of all they should encourage people to take more and more to scientific pursuits and secondly they should prevent and avoid wastage. The Committee produced a report and the Government accepted most of its provisions. But last month they came up against the Finance Ministry which said that though the thing was good they could not give any money now because they must fight inflation.

Undoubtedly, fighting inflation was a most important thing and they must not waste money. So it was unfortunate that when they were full of ideas and enthusiasm, inflation had come in to cool all their ardour. They would fight inflation, but inflation could not be allowed to cause all their creative endeavour to be suspended or stopped. They had to proceed cautiously and with as great economy as possible.

Why he mentioned all this was because the output of real research did not appear to him to be commensurate with India's position and India's talent. It was true that some of their scientists had done great things. But he did not just see the output of original research work as he expected to see. While he did want quantity, he would like to impress on them that it would be a fatal thing if in thinking in terms of quantity they sacrificed quality in their work. Recently, a delegation of eminent scientists had come to advise them. He was sure that with their great experience, they would be able to suggest ways and means

* *The Hindu*, Madras, December 28, 1948.

to develop scientific and other work particularly in this Institute.

The Prime Minister hoped that with the help of these scientists' recommendations and their own ideas on the subject, they could minimise such failings as they might have and put their work on a sound basis, always placing quality above everything. It was really because of his conviction that this should be done that he took charge himself of the Department of Scientific Research, though normally such a thing should be done by a scientist. But scientists seldom reached ministerial office in any country and so somebody had to do the job. He was not sorry that scientists did not reach ministerial offices because ministerial office has a mentally corrupting influence. It slightly coarsened the mind. It prevented a person from doing any kind of creative work. In the democratic structure of society, one had to spread oneself out so much and please so many kinds of people that one could not do any solid thinking or any kind of work. This was a problem democracy had to resolve.

"I am entirely opposed to any serious-minded person coming and working in Delhi", said Jawaharlal Nehru. "There is no reason whatever why new institutes should be started at Delhi. I would be very happy if some of the existing institutions moved away. I would welcome various centres of intellectual activity growing up in India like Bangalore. India is a big country and I do not know why we should think in terms of one or two big centres for everything. I believe less in concentration whether it be concentration of wealth, which is bad, or power or industry. In so far as it is possible, I should like to decentralise most things. I should like this Institute and other institutes to think more on the lines of decentralising production and activity."

Dealing with production, Jawaharlal Nehru observed that it was one of the main headaches of the Government. In the grow-more-food campaign, the stuff grown was not very obvious. If they thought less in terms of huge undertakings and more in terms of small undertakings, they could succeed in increasing their production quickly. Big undertakings were also necessary but they required a lot of capital, time and resources for producing results. When they had to deal with immediate and difficult problems, quicker results had a certain importance. They had been thinking in terms of huge river valley schemes, and had some schemes bigger even than the Tennessee Valley in conception. They were pushing ahead with some of them but they would take a lot of time. So it was, they had to think in terms of small hydro-electric schemes in order to obtain quicker results and in order that big social problems might not suddenly confront them.

33. IMPORTANCE OF FOOD TECHNOLOGY*

(Speech on the occasion of taking over of Cheluvamba Mansion at Mysore from the Government of Mysore for the Central Food Technological Research Institute on December 29, 1948)

The Prime Minister on behalf of the Government of India thanked the Government of Mysore for placing the beautiful building (Cheluvamba Mansion) at their disposal. He expressed the hope that the fine and spacious building would serve not only a very useful purpose but would help them in spreading out their Central Institutes all over India.

* *The Hindu*, Madras, December 30, 1948.

"I am all against this concentration in Delhi", the Prime Minister said and added, "Mr. Reddi was quite right in saying that this gift was not to any outside agency but to something of which obviously they were themselves a part. I wish people would realise the significance of this better. Because the Government of India happens to be situated in Delhi, it does not belong to Delhi or any part of India specially. It should, and ought to be completely an all-India affair in which all of us are partners."

Proceeding, the Prime Minister observed that the importance of food technology was obvious. The chief difficulty in this business of food was that they were not growing enough food or getting enough food from outside. Having had to get food from outside they were obliged to pay enormous prices and even then they were not getting exactly what they wanted. "I am quite sure we can produce enough in India, given proper facilities for it."

"I am not quite sure what the various duties of this Institute are going to be", said Pandit Nehru and paused for a moment. He enquired whether the Institute was going to tell what they should eat and what they should not, to which Sir Bhatnagar[1] replied that a section of the Institute would be devoted to that work also.

Commenting on this information, the Prime Minister said, "I hope it will be an important section, because I feel this business of eating requires a great deal of investigation in India. We eat wrong things or eat too much of them. I am not talking for the moment of the poor masses, who do not normally have enough to eat. Those who have food, waste too much of food and waste both time and money on it and probably suffer for it too by their digestions going wrong *(Laughter)* and I think it is desirable that there should be such institutes to help us to reform our food habits. In the matter of food, we are terribly conservative with the result that if one kind of food is not available, we are completely upset. Some people even prefer starvation to eating other kinds of food. I am glad my last act in Mysore State during the present visit is opening of this Food Technology Institute.

The Prime Minister then opened the door of the building with a silver key and spent a few minutes inspecting the premises.

34. SCIENTIFIC RESEARCH IN INDIA'S BASIC NATIONAL DEVELOPMENT*

(Speech on the occasion of laying the foundation-stone of the Indian Institute of Palaeobotany, Lucknow, on April 3, 1949. The Institute was the world's first such research institute and the foundation-stone was laid with a silver trowel having a 16,000,000 year old fossil plant handle)

Speaking on the occasion, Pandit Nehru pointed to the need of greater and wider scientific researches in India for what he called "the basic development of a nation". The foundation of the Institute would help in that process.

He told the audience that the world was passing through upheavals and changes. To understand these changes we had to develop a scientific approach to the problems of nature, life and society. Pandit Nehru pointed out that the only requisite for the success of de-

1 Sir Shanti Swarup Bhatnagar, Director, Scientific and Industrial Research and Principal Executive Officer, C.S.I.R.

* *The Pioneer*, Lucknow, April 6, 1949.

mocracy was a scientific attitude being adopted not only by a few scholars but by the millions. "If India fails in producing this scientific attitude among its masses, it will lag behind other countries", he said.

"It was deplorable", Pandit Nehru said, "that millions knew the 'isms' of the modern age but very few knew the 'sciences' which created that age.

It was from this point of view that brains were more important than machines. Even if the country got all the machines it needed but failed to produce the men knowing the scientific problems involved in industrialising the country we could not feel secure in our freedom", he said.

"Our difficulty is that we neither belong to the machine age nor to the primitive one. We simply indulge in slogans and resolutions which will not help us. Our need is to develop a real scientific attitude", he concluded while congratulating Dr. Sahni (Dr. Birbal Sahni, F.R.S.) for the establishment of the Institute.

35. COMMUNICATING SCIENCE TO THE PEOPLE*

(Message to the Journal of Meteorological Geophysics, December 12, 1949)

"In this age when science and the scientific spirit are entering into or should enter the everyday activities of the people, it is important that the results of scientific research should be brought home to the people in an easily understandable manner."

36. ROLE OF THE NATIONAL LABORATORIES**

(Address on the occasion of the opening of the National Chemical Laboratory, Pune on January 3, 1950)

I was thinking that the Government, over which I have the honour to preside, has done something, I suppose, during the last two, three years or more. It has left undone many things for the cynics who point out our sins of omission and commission, but even they have to admit, with some justification, that in the matter of scientific research the Government has done something. The record might have been better, but it is substantial. Of course, during the period what has been done is largely to lay the foundation of future work.

The conception of eleven national laboratories all over India, and the National Chemical Laboratory is the seventh in the chain of eleven laboratories, has been planned not by the Government of India but by their predecessors. I think it is rather an exciting concep-

* *Journal of Meteorological Department*, Government of India, New Delhi, First Number, February 1950.

** Director, National Chemical Laboratory, Pune.

Pandit Jawaharlal Nehru at the opening ceremony of the National Physical Laboratory, New Delhi (January, 1950). Also seen in the picture are Shri C. Rajagopalachariar (Governor-General of India), Sardar Vallabhbhai Patel (Deputy Prime Minister), Dr. Shyama Prasad Mookerjee (Union Minister of Industries and Supplies), Dr. S.S. Bhatnagar (Director, CSIR) and Dr. K.S. Krishnan (Director, NPL).

tion to see large numbers of young men and women coming into these laboratories and research institutes in India and working with zeal and enthusiasm for the advancement of science in India, and through science, the advancement of the Indian people.

I have wandered about a great deal in this country of ours and I have met innumerable persons. I have seen young people, I think, I am fairly conscious of their feelings. I came to the conclusion long ago that generally speaking, the material that India possesses, the human material, is of the most excellent quality, provided, and there are many provisos and 'buts' about it, – but I will not go into these at the present moment. But, in particular, in regard to scientific research, I think there is good material in India, provided they have a chance to advance. They have not had their chance in the past. Some of our brightest students who normally ought to have gone into scientific research have preferred secondary positions in the executive services of the Government. Probably, this gave them a higher status in the warrant of precedence. So, science in the past has certainly not been encouraged, in the sense that neither the man who was able had the chance to do his work properly, nor even if he did it, did he get encouragement when it was due. But in practice, I think, I am right in saying that the opportunities have been strictly limited.

Dr. Bhatnagar[1] mentioned the names of industrial leaders of this country who had encouraged science, and he rightly honoured them. While the names of industrial leaders who had encouraged science have been honoured, I think it might be more appropriate to mention the names of industrial leaders who constitute a majority – who have discouraged science and not taken any interest in it. I am surprised at the amazing ignorance of some industrial leaders who seemed not to realize the importance of science to industries. They are so extremely narrow-minded that they did not see where the country was going and what would happen to it if they did not shake themselves up and do something about it.

There is talent in our country. But the question is how to tap that talent and give opportunities to the young men and women of India, who had the requisite ability. Somehow the door seemed to be barred against them, and when it did open, it opened only in a limited way and to a limited number of people. So the problem before us, for any kind of progress, is how to tap this vast reservoir of talent and material. For material, money is necessary. So, if we have the human beings in this country and if we have the resources and the material, the problem is how to join these two together.

I hope that so far as these laboratories are concerned, they would help to some extent at least in opening the doors to large numbers of young men and women and give them opportunities to do good work for the country in the cause of science and in application of science for the public good. I am not at all against the conception of scientists strictly confining themselves to pure research. It is essential to have that freedom. But in the present day world we have to face tremendous problems. It is the function of a scientist to a large extent, keeping these problems in view – the major problems – to try to help directly and indirectly by creating an atmosphere of objective and dispassionate consideration of these problems. These problems if not solved will swallow us. I think that the conception of a large number of research institutes and laboratories and the like, will help not only in the cause of science, but will also help in creating an atmosphere which is perhaps more important for considering the vital problems.

I came to see the National Chemical Laboratory three months ago. I am to some extent guilty together with Dr. Bhatnagar in having rather hurried the process of building the Laboratory. Many people said it would not be ready so quickly. While certainly I had this in mind that this was a good occasion to have its opening ceremony, I had also something else in mind. Since a long time past, as well as today, we think a great deal more

[1] Sir Shanti Swarup Bhatnagar, Director, Scientific and Industrial Research and Principal Executive Officer, C.S.I.R.

about bricks and mortar than of human beings. More money is spent in putting together bricks and mortar. I would like our public buildings stoutly built and be enduring monuments and not to be ugly and be good enough. Nevertheless, I think it is more important that money should be spent on human beings and not on mortar. We should work in temporary sheds instead of waiting for huge stone structures to grow up. We cannot afford to wait. We must create a psychology for work, whatever the disabilities attached to it. We should be able to work with disabilities. This Laboratory started functioning as quickly as possible – even with disabilities. We must have that psychology and the sense of urgency to work as soon as the slightest opportunity is available.

I should like to express my gratitude not to everybody that has been mentioned by Dr. Bhatnagar, but to the few engineers who have built the Laboratory. I take this opportunity of expressing my appreciation to Dr. Laroia[2], and to Dr. Bhatnagar of course, who are really chiefly responsible for the work being done in record time over the last three months.

With these words, I declare this Laboratory open.

37. THE REAL MEANING OF SCIENCE*

(Speech on the occasion of the opening of the National Physical Laboratory, New Delhi on January 21, 1950) [1]

First of all, I wish to make it perfectly clear that I am not speaking in my capacity of Prime Minister. As such, there is no point at all in my addressing this gathering because you have a large number of distinguished speakers. I believe I am fourth on the list and there are seven more. But Dr. Bhatnagar thought that in my capacity as his Minister, i.e. Minister-Incharge of Scientific Research, it will be perhaps unbecoming if I did not take part in this ceremony. Well, of course, I would have taken part even if I did not deliver a speech.

Well, I am not averse to public speaking *(Laughter)* and sometimes it may even be hinted at that I speak too often and too long *(Laughter)*. On this present occasion, I have been hedged in so much by those who have gone before me and those who will follow me, that there is no risk of my doing that *(Laughter)*.

But I should like, in particular, to express to you, Sir, my gratitude for having taken the trouble to come here today. We all know that you are exceedingly occupied during these days, that it was difficult for you to come and yet I pressed you and put this additional burden on you for two reasons. One was that I wanted to associate you with this Laboratory, in the beginning of which, you were interested some years ago. We wanted to have your particular blessings to this work. Also, we want to see as much of you as we can during these few days and while we may, and we want to hear from you those words of wisdom that always come out of your lips and to profit by them and to think about them.

2 Dr. B.D. Laroia, Assistant Director (Planning), National Chemical Laboratory, Poona.

* Director, National Physical Laboratory, Hillside Road, New Delhi.

1. The National Physical Laboratory, New Delhi, was opened by Shri C. Rajagopalachari, Governor-General of India on January 21, 1950.

We all, and especially those of us who function on the political stage, talk often and, as I said, talk too long, and words cease to have much meaning when there is too abundant a use of them. But what you say is seldom long, but it is always something which makes one think and so we want to profit by that rich stock of wisdom that you possess.

Also, as Minister-Incharge of Scientific Research here, I should like to welcome the distinguished scientists who have come from foreign countries. It has been a great pleasure to all of us in India to welcome them here, because not only do we learn much from them, but they bring a wider vision here and help to remove that limited outlook which every nation is apt to get, if it does not look beyond its own boundaries, and who can give that broader vision and outlook better than scientists who work in the great fields of knowledge.

So, we welcome them and we hope that their visit to us will not merely be a visit of distinguished men, but something that will leave an abiding memory in our mind and in our work, so that we may profit by it and work along those lines.

I should also like to say a few words about two colleagues of mine. There are many people who have worked for this National Physical Laboratory. I shall only mention two. I hope the others will forgive me for not mentioning their names. There is our distinguished Director, Dr. Krishnan.[2] Possibly it will be difficult for you to find a shier and more modest man and yet those who know him know that under that shyness and modest exterior there is a depth and profundity of learning, and so it has been a particular fortune for us, good fortune, to have him as our Director here.

And then, there is my colleague, Dr. Bhatnagar.[3] You, Sir, in your opening address referred to him as a live wire. I come in contact with this live wire frequently *(Laughter)* and I do not know whether that contact does him much good or does me good, even though sometimes it gives me a little shock *(Laughter)*. But it is a fact that Dr. Bhatnagar has certain qualities, which I for one admire very greatly and that quality is to get things done. It is a quality, which I regret to say, most people here lack. We talk a lot about theories and philosophies and what should be done and what might be done, what ought to be done, but somehow all that is not translated in things that are done.

Now, Dr. Bhatnagar has that quality of translating the words into what has been done and it is a tremendous quality and I am quite certain that this large programme of building five national laboratories that we have got would never have gone as far ahead as it has, if Dr. Bhatnagar had not been incharge of it. So, I am very grateful to him *(Cheers)* for the efficiency and vitality with which he has pursued this undertaking.

Well, Sir, we all now-a-days talk of science in terms of trade, in a sense, we all worship at the altar of science at least verbally, and yet I often wonder if science is not going to meet the same fate as religion did in olden times, that is to say, people who are very religious, they all talked in terms of religion, but they seldom behaved as such. Religion became a set of ceremonials and forms and may be some kind of ritual worship and the inner soul of religion left. So, I wonder if the very triumph of science in the modern world will not make it some kind of a ritual, a religion and the spirit of it may somehow fade away, not from the minds of the elect and the select – that, of course, always remains – but I am rather talking about the large numbers of people who talk glibly about science today, and yet who in their life do not exhibit a trace of science in their talk or their actions or anything else.

Science is not a matter merely of looking at test tubes and mixing different gases and producing things big or small or gadgets. Science ultimately is a way of training the minds and the mind's working and their whole life functioning according to the ways and

2 Dr. K.S. Krishnan, Director, National Physical Laboratory, New Delhi.

3 Sir Shanti Swarup Bhatnagar, Director, Scientific and Industrial Research, and Principal Executive Officer, C.S.I.R.

methods of science, of their whole structure, social and other functioning according to it. If science is the truth, then you must follow that truth. But, generally speaking, people think of science as some isolated thing where there are test tubes and other mechanical appliances and which has no other relation to life except something to provide them some conveniences. Well, certainly, science should and does provide conveniences and science indeed has built up the structure of modern life and you cannot exist without it. Wherever you go, you come across some major application of science; that is all right, and yet people who utilise that application from morning to evening and profit by it do not realise what lies behind it, the manner of thinking, the manner of acting, functioning, they take it for granted. They do not know the long history of science, of trial and error and experiments and the hundred failures and then the success, accidental or as you, Sir, said or deliberately tried for, all this long history, patience, work, nor do they think of that thing, which is called the 'scientific temper', the 'scientific mind', the 'method of science', etc. which really is more important even than the actual, some particular discovery because out of that method, many discoveries will come. But if you do not have the method and accidentally reach a discovery, well, you have that in the lore. Therefore, I am a little afraid when I hear so much of praise of science, that science is becoming, going the way of religion and that is a dangerous thing, so far as I can discern.

Also, there is another way of looking at science – as a kind of hand-maiden to others of higher and superior degree. Science helps them in various ways, well, science is meant to help. It is meant to serve; it may serve a good cause; it may serve a bad cause. It serves, you can use it as you will.

So, I hope that you will think in terms of science, not in that limited way, as just something which helps you to gain your ends. Well, of course, if your ends are big, then it is well and good, but if your ends are small and narrow and limited, then it is not really good, and above all, you think of science as a method or approach to life and life's problems in general. I look at this fine building, but I forget the building and I think of the large number of our young men and young women patiently working there, dreaming sometimes and working and producing results, which will flow out and benefit our people in this country and the world for the matter of that, because science – the functions of science – cannot be limited. When I think of this tremendous adventure, *i.e.* science in the past and the tremendous adventure that I hope it is going to be in the future, I am fascinated by this prospect and I feel how much better it would have been for me to be a Director of this Institute if I had the competence than to be the Prime Minister.

(Applause)

38. VITAL ROLE OF GEOLOGISTS IN DEVELOPMENT OF THE COUNTRY*

(Address at the Indian School of Mines, Dhanbad, on April 21, 1950)

The Prime Minister Pandit Jawaharlal Nehru, speaking at the Dhanbad School of Mines, advised educated young men to "keep out of Government service as Government service

* *The Hindu*, Madras, April 22, 1950.

corrupts and degrades."

The Prime Minister said, "I am interested in having a large number of educated young men to serve India and to explore India for its advancement and not young men who want jobs."

Pandit Nehru was replying to a welcome address by the Principal of the School, Dr. R.P. Sinha, who had stressed that the diplomas of the School should be recognised by the Institution of Engineers (India) for the purpose of recruitment to public services. The Prime Minister said that we must not think of education in terms of jobs. It distorted the entire purpose of education. Any number of M.As. and B.As were coming out of universities, but it was astonishing to find the ignorance of a large number of them who come up before the Public Service Commission in ordinary things relating even to India. "I want young men with a wide background of knowledge and culture and specialised training."

From the report of the progress made by the School of Mines, he felt that its progress was good. But if one took the size of India and the number of men required for the "proper discovery of India" at this rate of progress it would take a thousand years to meet her requirements. "We want thousands and thousands of geologists for the development of India. Once I took a degree in geology and I am interested in it and am fascinated by it. It is clear that in India a very large number of trained and qualified geologists are necessary."

For this, he said, there were two ways. One was to send only specially qualified people abroad and the other was to bring competent persons for imparting necessary higher training. He had no doubt in his mind that it would not be possible to send a large number of men outside India and most of them would have to be trained in India to meet her requirements.

39. THE SPIRIT OF SCIENCE*

(Speech on the occasion of opening of the Central Fuel Research Institute, Jealgora, on April 22, 1950 in the presence of Dr. Rajendra Prasad, President of India)

In the course of less than four months we have put up and declared open — or rather are going to declare open — three national laboratories. I suppose, before this year is out some more national laboratories will also be started. This is a great venture, testifying to the faith which our scientists and I hope some in our Government have in science. Of course, the putting up of fine and attractive buildings certainly does some service to science, but nevertheless, as Dr. Raman has often reminded us, buildings do not make science. It is human beings who make science, not bricks and mortar, but buildings with proper equipment help the human beings to work more efficiently. Therefore, it is desirable to have these fine laboratories so that trained persons may work there, and also persons may be trained for future work.

Now, why do we put up these laboratories – these research institutes and the like? Of course, everyone says, to advance the cause of science! Why so? You, Sir, referred to

* i) Nehru Memorial Museum and Library, Teen Murti House, New Delhi, ii) *Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi (1963), Vol. II, pp. 362-366.

the spirit of science. I wonder exactly what that spirit is, or whether we have the same ideas about that spirit or whether many of us differ. Is science, as is often supposed, a handmaid to industry? Certainly, it wants to help industry. Why? Not because it wants to help industry, but because it wants to create — help in creating — greater wealth for the nation, for the people. It wants to increase employment, to have better living conditions for the people, greater opportunities of growth and so on and so forth. That, I suppose, will be agreed to. But, there is something more about it than this. What ultimately does science represent?

I suppose, the active principle of science is discovery. You, Sir, just referred to scientists declaring war on nature. May I put it in a different way – that we seek the cooperation of nature. We seek to uncover the secrets of nature, to understand them and to utilize them for the benefit of humanity. Anyway, the active principle of science is discovery. Now, what is the active principle of any social framework or society? Normally, it is conservatism, of remaining where we are, of not changing, of carrying on, no doubt with some improvement, adding to it something or the other. But, nevertheless, it is the principle of continuity rather than of change. So, we come up against a certain inherent conflict between that principle of society, which is one of continuity and of conservatism and the principle of science which is of discovery, which brings about change, and which challenges that continuity, with the result that the scientific worker, although he is praised and is patted on the back, nevertheless, he is not wholly approved of, because he comes and upsets things as they are. Often enough and normally speaking, science seldom has the facilities that it really deserves, except when some misfortune comes to a country in the shape of war. Then, everything has to be set aside, and science has its way for an evil purpose; nevertheless, it has its way.

It is interesting to see this apparently inherent conflict between the normal conservatism of a static society and the normal revolutionary tendency of the scientist's discovery which changes often enough the basis of that society. It changes the basis of it because it changes living conditions, conditions governing human life, human survival and the rest.

I take it that most people who talk glibly of science including our great industrialists, think of science as a kind of handmaid to make their work easier. Well, so it is, of course it does make their work easier. Something which adds to the wealth of the nation, something which betters conditions : all this science does do. But surely, science shows that it does not just merely better the old but it sometimes upsets the old. It not only merely adds new truths to the old, but sometimes the new truth that it discovers disintegrates some part of the old truth, and thereby upsets not only the way of men's thinking, but the way of their lives too. So, it is not merely a question of repeating the old in better ways, adding to the old, but creating something that is new, that is new to the human conscience.

If we pursue this line of thought, then what exactly does the spirit of science mean? It means many things. But it means not only accepting the fresh truth that science may bring, not only improving the old but being prepared to upset the old if it goes against that spirit. To accept the new, to accept the disintegration of the old, not to be tied down to something that is old because it is old, not to be tied down to a social fabric or an industrial fabric or even an economic fabric simply because you have carried on with it, although it goes contrary to the spirit of science or to a new discovery of science. It means all that.

Now, most countries, whatever they may say, normally do not like to change. The human being is essentially a conservative animal. He dislikes change. He is used to certain ways of life and any person trying to change them meets with his disapproval. Nevertheless, change comes and people have to adapt themselves to it, as they have done in the past. All countries, as I said, are normally conservative. But, I imagine that our country – India

– is more than normally conservative. It is, therefore, that I have ventured to place these thoughts before you because I find there is a curious hiatus in people's thinking, even in the thinking of scientists who plan science and practise science in the laboratory, but discard the ways of science, the method of approach to science and the spirit of science in everything else they might do in life, and they become completely unscientific about it. Even if you approach science in that way, it does some good no doubt. It will always do some good. It teaches us new ways of doing things. It improves, may be, our conditions of industry or life etc. But the basic thing that science should do we miss – that is, to teach us to think straight and to act straight – not be afraid of anything, of discarding anything or accepting anything, provided we have sufficient reason to do so.

I should like our country to understand and to appreciate, that idea. More because our country in a sense, in the realms of thought, has been singularly free in the past. It has not hesitated to look down into the deep well of truth, whatever it might contain. Nevertheless, in spite of a mind so free, in social practice it encumbered itself so much that it came in the way of its growth. It comes in the way of its growth today, in a hundred ways – our customs, our ways of looking at things – the little things that govern our lives, which have no real importance but, nevertheless, which come in our way.

Now that we have attained Independence, there is naturally a resurgence of all kinds of new forces, both good and bad. Good forces are, of course, let loose by a sense of freedom. But there are also a number of rather narrowing forces, which narrow our minds, narrow our outlook, which under the guise of what people call 'culture' really mean a restriction of culture and a denial of any kind of real culture because culture is a widening of the mind and of the spirit. Culture is never a narrowing of the mind or a restriction of the spirit of a man or of a country.

Therefore, if we look at science in the real way, and if we think of these research institutes and laboratories in a fundamental sense, then there is something more than just finding out little ways of improving things, of how they should be done. Of course, they have to do that too. But, these institutes have to gradually affect our minds – not only the minds of those who work here, but the minds of others too and more especially the minds of the rising generation, so that the nation may grow up imbibing the spirit of science and be prepared to accept a new truth, even though in doing so it has to discard something of the old. Only then will this approach to science bear true fruit.

It is because we attach importance to these research institutes, we have ventured to ask you, Sir, Mr. President, to take the trouble to come all the way here to open this third of our great national laboratories and we are very grateful to you that you have taken the trouble to do so. I am sure that your visit here and the visits of so many distinguished scientists and others will, not only through their addresses to this institute but also as such help in drawing people's attention to the value of science — not only to external applications and implications but to the real value of it, that is, it widens the spirit of man and thereby betters humanity at large.

40. THE MODERN SYSTEM OF MEDICINE*

(Inaugural address at the Health Ministers' Conference, New Delhi, August 31, 1950)

Two years ago, I am reminded, I came over to attend and inaugurate another meeting of this kind. I have not the least recollection of what I said on that occasion. I am sure that on that occasion we must have uttered many platitudes as we always do on such occasions. I have no doubt also that we meant them seriously and that most of us, if not all, tried our best to give effect to such policies and programmes as we had decided on. But the fact remains that while we make progress in various directions, somehow the overall view is very very far from satisfactory. I am not for the moment talking about the activities of Health Ministers but of the general activities which go to promote public good. Whether it has been our fault or the fault of circumstances beyond our control, I do not know. Normally speaking, of course, we are not right or justified in blaming the stars for what are our own failings.

We are judged by results. A commander in the field of battle is judged by his victory or defeat in the field and the longest and most eloquently written report of his failure will not exonerate him. Historians may later consider on whom to lay the responsibility for the success or the failure but the fact remains that the battle has either been won or lost. Therefore, the only real test of any report you may write or I may write is victory or what we have achieved. There is another thing to be considered which is almost as important as what we have achieved, and that is what people think we have achieved. That is important, not merely from the publicity or propaganda point of view but because when you have to undertake vast social schemes it is highly important what people think of them.

You cannot attain success without the people's cooperation, you cannot attain success without raising the morale of the people for the task. If the people think that the country is going ahead, their morale goes up and thereby their capacity to work increases. If the people think that we are where we were or worse, their morale goes down, their desire to help goes down, their capacity to work goes down and this affects you and me and everybody else and all our work suffers. Now, of course, there are many kinds of work, very important work, which do not show immediate results and there are many kinds of research which the public are not in a position to judge. In fact, the public may even be rather amused or critical about research and yet such work is highly important and every country must carry it on so that it may yield results in the future.

Nevertheless, the important thing is that results are achieved in the present and that they are appreciated. That is to say, the results must have a social bearing. It is not much good from the public point of view if some laboratory could do something which is odd and unique. Of course, it may have some bearing on the future but generally speaking this question must be looked upon -- whether it concerns health or something else -- from the general point of view of the social well-being and advancement of the people as a whole. I should like to lay stress on that. As you know, more and more stress is laid on this aspect all over the world. In fact, the whole science of medicine, which some hundreds of years ago was largely concerned with what might be called individual treatment, has undergone a change of outlook. Of course, the aspect of individual treatment is still there but that is now a very minor aspect of the problem and certainly from the State's point of view it is infinitely less significant than the other important aspects, namely, general public health, sanitation, hygiene etc. The whole conception of health and medical treatment has changed

* *Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi (1963), Vol. II, pp. 536-545.

in the last few generations, and because the conception has changed, because people now look more to public health and not so much to the private health of the individuals, there has taken place a tremendous improvement not only in public but also in private health.

Now, public health is, I repeat, something that is obvious and probably somewhat trite; nevertheless, trite things must be repeated again and again. Public health depends far more on factors other than just drugs and medicines. It depends primarily, I should say, on the sufficiency of food. What is the good of your trying to treat a man who is starved or who is undernourished? He is weak, he cannot resist disease. Public health depends next on decent living conditions, such as housing. Next to food, housing seems to be far more important – from the point of view of public health – than all the medicines in the world. This accounts for the fundamental idea of changing the environment, of providing environmental hygiene. Not only are its effects physical but they also affect the mind tremendously.

So, from the point of view of health you branch off into subjects which are not directly concerned with you at all and yet which fundamentally affect you, such as the question of food and housing. Of course, there are other things, too. You might speak of education but leave this for the present. I would like to lay stress on food and housing. We have been talking a great deal about food. In the last two months or so, to our great misfortune, we have had to face great calamities. If we had met three months ago and if I had then referred to the food situation of the whole of India, I would have struck a hopeful note. I might have said that in spite of difficulties we have turned the corner and I would have been right in saying it. It would not have been wishful thinking. And I think that the good that we have done in regard to the Grow More Food and other schemes is, in spite of a great deal of waste, a basic and substantial good which will endure and which will pay us dividends in the years to come.

And, yet, today we have to face a difficult situation for a variety of reasons, the chief of them being the failure of rains in many parts of the country and tremendous floods in other parts – the failure of rains in Madras and floods in Kathiawar, Orissa, Bihar and U.P. There has been an amazing succession of unfortunate calamities. On top of these comes the tremendous earthquake in Assam which is of a colossal character, bigger than any earthquake we have known. We do not yet know what the exact damage is. The fact that the area affected in Upper Assam is relatively thinly populated and is not a developed area is the reason why the loss of human life and property has not been as great as it might have been in a more populated region; even so, it is heavy. And, apart from the actual damage, we have, today, to face the problem of the changing course of rivers and of marooned people. Hills have disappeared and the whole face of Upper Assam has changed. All these ravages have been a trial for us as a nation; few catastrophies – not even a war – could have put a country on trial in this way. Therefore, we have to realize in all its fullness the extreme gravity of the situation and of not one problem but all the problems that face us. We must have a sense of urgency in dealing with them. If I may say so, I have, for the moment, lost interest in distant schemes as one has to lose in the face of grave urgency.

Let us take the housing problem which is not quite as urgent as the food problem but which is, nevertheless, of extreme importance. We were discussing it in the Planning Commission the other day and the result of that discussion was a realization of the overwhelming character of the problem. The problem, of course, was bad enough, say ten years ago – very bad, indeed. The living conditions of workers, peasants and others were bad and they grew progressively worse during the war. Then the partition came and with it came the problem of refugees and displaced persons, and all that has happened since has created a stupendous and overwhelming problem. And, yet, what exactly are you going to do

about it in your education and health conferences if one is condemned to live in the gutter? What is the good of your talking of health and education without housing, which is the basic thing? A man must have fair, sanitary living conditions, if not luxuries. You go to the cities like Bombay or Calcutta. It makes one despair to see the conditions in which people live there.

I have laid stress on two matters: food and housing, which I consider basic for health. These are not normally within your purview and probably your Conference will not consider them.

I just referred to the gradual change-over during the last few generations from the idea of individual treatment for diseases to the idea of public health. From the Government's point of view, this idea is very important. It is gradually spreading more and more and social systems of medicine and treatment are being adopted which are not unlike what is being done in England, for instance. In such systems, the State comes in and takes charge practically of the whole population. In the end, this is not only good in itself but probably cheaper: that is to say, cheaper not in terms of rupees, annas and pies but in terms of the general health of the nation, its productive capacity and the mental and physical well-being of the individual and the nation. The money you spend upon it is very well worth while. We must progress in this direction. All these things cost money and money is just the thing that we lack; and yet, while we lack money and while that is a great drawback in the ultimate analysis, I do not think that it is money alone that comes in the way.

Money does come in the way and delays matters. But, in my opinion, it is the human factor that counts more. Even if we have all the money in the world, we obviously cannot raise our standard to the standard, say, of America in a short time. We just cannot do it all of a sudden. It takes time. And we have to take things as they are; and taking things as they are I should welcome money, but, for the moment, there are things which are infinitely more important than money and I go back again to the human factor, the morale of the individual and his capacity to have some objective in view which he can look forward to and work for. If you have that in the people, progress will be far more rapid than if you do not and even have all the money in the world. I want you to remember this. In the modern world, money is undoubtedly important but infinitely more important is the human factor. Money minus the human factor will not go very far but human factor minus the money will take you some distance, though, perhaps, not very far. Therefore, we must always think of the human factor, of getting public cooperation and public understanding in the things that we do. It is, perhaps, not the expert's job. I realize that. I cannot expect each one of you to go into these things and approach the public and convert them or make them understand. It is difficult but I am merely putting to you a certain governmental point of view, because I should like public servants to approach this and other problems in this manner. Experts as you are, if you keep that viewpoint before you, I think it will help you and it may help others, too.

I find from your agenda that you are going to consider reports of the Indigenous Systems of Medicine Committee, the Homoeopathic Enquiry Committee etc. I understand that our Health Minister is going to address you on this subject. I have an inkling of her views as she has expressed them to me on several occasions and she feels strongly on this subject. First of all, we have to be clear in our minds about one thing, namely, the bearing of this question on public health which the Government has to consider as being more important than the aspect of individual treatment. In so far as public health, sanitation and the prevention of diseases are concerned – I speak subject to correction – I do not know that much attention has been paid to them by the older systems of medicine. From that point of view, there is a vacuum or something near a vacuum. If you want to consider anything from the aspect of public health, you have to adopt what is called the modern

method. Now, what does this word 'modern' mean? A thing that is modern is not necessarily good because it is modern; and a thing that is old is not necessarily bad because it is old. The converse is also true. A thing that is old is not necessarily good because it is old; and a thing is not necessarily bad because it is modern. Now, if you look back to the development of science and the applications of science – and the development of the science of medicine in particular – it is a very interesting history. In early days there were various theories in the domain of physics, chemistry, medicine etc. in India, in Arabia, in Europe, in Greece and in Rome. Gradually, step by step, old theories changed as more experience was gathered and new methods were adopted. There were also new methods of understanding, of approach and ultimately of treatment, too. Each successive step that you take is built on an older experience. If you agree, then you will also agree that every achievement becomes outdated sooner or later. If you attain perfection, then of course, there is no question of building further. I do not know if it is possible to say of any activity in human affairs that it is perfect. If a human being becomes perfect, that human being, if I may say so without disrespect, at once attains *nirvana* and is out of our sphere of activity. It is only imperfect people who function in this world. Perfection means a complete solution, a complete balance of everything and becoming part of some other sphere.

It is absurd for us to say that any system, any thought, or any line of activity has attained perfection. It would be equally wrong for us to say that any system of medicine, at any time in history – including the present time — has been anywhere near perfection. What Dr. Jivraj Mehta or any other eminent doctor would advise his patients to do today, he might not ten years later on account of new developments. You may strongly recommend something today, but if something new happens you will revise your opinion. That is the way of advance – having an opinion, accepting all the experience that lies behind you and adding fresh experience and knowledge to it.

I say this, because it is obvious that the old systems of medicine in India the Ayurvedic and Unani systems, have been great systems. There is no doubt about that. In their day, they exercised considerable influence not only in our but also in far-away countries. Harun Al Rashid sent for Indian physicians to cure him. Our systems spread to Arabia and to Europe and influenced the systems of medicine there. From this very creditable record however, it does not follow that our past systems were the *optimum bonum;* nor does it follow that you should ignore them and put them aside as worthless.

What then should our approach be? Obviously, our approach should be one of trying to profit by past experience and integrating it with the best in other systems. One approach I would for want of a better word call the 'scientific approach', the approach of a knowing mind, an experimenting mind, which is prepared to accept anything that factually or theoretically justifies itself and which goes ahead on the basis of it. When something else takes its place as an improvement, the scientific mind accepts that. In theory at least what is called modern medicine is based on the scientific approach. I am not prepared to admit that every practitioner of modern medicine has the scientific approach. I think many of them are very far from scientific in their outlook and in their work. But a scientific approach is essential in whatever domain of life you are functioning. If you do not have that approach, you lose yourself, flounder and cannot make any progress at all.

I dislike, I may tell you, calling the modern system of medicine 'Western' medicine. I think it is a wrong thing to do so, because it is as much Eastern as it is Western. It has grown out of what we have done here and what the Arabs and the Greeks have done in their countries. So, to call it 'Western' is just to give credit to others and not to take credit for something that we ourselves did. It is like people calling the modern system of numbers 'Arabic'. As a matter of fact, in Arabia they are called Indian figures. The invention of the

zero and the decimal system two thousand years ago is one of the most amazing instances of the Indian genius. It is one of the greatest inventions of all time and to call it 'Western' or 'Arabic' seems to be absurd and wrong. So also to call the modern system of medicine 'Western' is completely wrong. Certainly, the West had a great share and a dominant share in its development in the recent past. But the whole thing is based on generations of experience in India, Arabia and other countries. It is this concentrated experience that is known as modern medicine.

There is no doubt at all that the Ayurvedic and the Unani systems have excellent remedies. There should be no difficulty whatever in integrating all their old and tried remedies with any other system. It is fairly easy and, in fact, many of them have been integrated in this way. The difficulty is really more basic and fundamental. That again takes me back to the scientific approach.

I believe that an Ayurvedic physician thinks and talks in terms – you will forgive me if I am wrong – of *vayu, kaph* and *pith*. I am no scientist and I do not wish to go into this matter but undoubtedly that basic line of reasoning is opposed to what might be called the basic line of reasoning in modern science. Mind you, this idea of *vayu kaph* and *pith* is very similar to those that prevailed in Europe. It is not a speciality of India. May be these ideas originated from India but this kind of approach was prevalent everywhere in the Middle Ages. From experience and by experiments, different approaches, which seemed to fit in more with the realities of the case, gradually evolved. So we have to decide very clearly whether our approach is going to be that of *vayu kaph* and *pith*, or some other.

Many people in India practise some kind of medical system whether it is homoeopathy, electrohomoeopathy or whatever they may like to call it. There may be nothing against these people; they may be very good people, but the trouble is that anybody can put up a board and practise medicine without any knowledge of medicine or even of that particular type of medicine. That is an extraordinary and dangerous thing which we should forbid. There must be certain standard which people must reach before they can experiment with human life.

The conclusion I arrive at is this. First of all, the modern system of medicine deals with many aspects of public and private health and surgery, which are practised by other systems, too; and we have to keep them. Secondly, the approach to any system must be on scientific lines. Our approach must be as friendly as possible, as respectful as possible but also as critical as possible. We should imbibe and accept all knowledge that we have in medicine and profit by it. As far as the basic approach is concerned, I cannot see how we can combine the two approaches, the modern treatment of disease and the older one which prevailed in the Middle Ages in Europe, in Asia and in India and which is, to some extent, represented by Ayurveda and Unani, that is, the *vayu, pith* and *kaph* approach. I do not wish to come in their way but I would insist that adequate training in modern medicine should be given to every medical practitioner. I do not mind what system he practises after he has received that training. I should like both the Ayurvedic practitioner and the Unani practitioner to have this training. Let him practise his own system. But, if he has the modern training and is prepared to abide by that training, he will function more or less rightly. That would apply to homoeopathy also. Indeed, where the homoeopaths and the like are concerned, by and large their training is more or less the same. So, the basic training in modern method should be common to all. For people to say that a certain system is cheaper than the other serves no purpose, for after all, the cheapest thing is to give treatment to a patient at no cost whatever.

The modern system of treatment, I believe, lays great stress not only on preventive health measures but also on more natural treatment, though drugs have no doubt become popular. But the trend is obvious. Fortunately, although I have good friends among doctors,

they have not experimented on me too much – either the practitioners of modern medicine or Ayurveda or Unani hakims or homoeopaths or anybody. And I believe that the less of medicine and drugs that one takes the better for the individual but, of course I cannot rule it out entirely. There must be occasions when one has to take them. But where it is, we must lay greater stress on the prevention of disease and on the general raising of public standards of health than on individual treatment.

41. SCIENCE AND INDUSTRY*

(Address at the opening of the National Metallurgical Laboratory, Jamshedpur on November 26, 1950)

I have come to Jamshedpur after many years – eleven and a half years to be accurate. The first time I came to Jamshedpur was, I believe, nearly thirty years ago. Since then I have come here from time to time and I have seen this city grow and I have occasionally visited the great steel works here. I have felt attracted to this part, in one sense, more than to any other part of India. I wander about India a great deal and wherever I go some kind of a picture of the past of that city or of that part of India comes up before me, because my mind is filled with galleries of pictures of India in the past and in the present. But when I come to Jamshedpur, it is not the past of India that comes up before me but some vision of the future comes before my eyes. So, when I come here, I feel attracted to Jamshedpur in a different way – because the problem before me and before many of us who think about these problems is how and in what manner to combine what is of value in the past of India with what we hope for in the future. That is the great problem, perhaps not only of India but of other countries also, but in particular for us, who have in the present a measure of responsibility cast upon us. We have to think of the past and the future, balancing ourselves on the razor's edge of the present.

So, I am happy to be here today for a variety of reasons. First, because it is a long time since I came to Jamshedpur, and I have wanted to come here, often enough during this period. Secondly, I wanted to be here for this occasion – this special occasion – of the opening of another of our great national laboratories. My name has been associated to some extent with the opening of these laboratories and with the Department of Scientific Research. But, as a matter of fact, it is a very formal association, as you all know. The real burden of the work has fallen on others. Nevertheless, it has been a privilege to have one's name associated with this great work that is being done in India. And in so far as I have been able I have tried to help it – not to the extent I would have liked to, for unfortunately it is becoming increasingly difficult for us to give effect to our wishes and desires because of the limitation of our resources at the present day. And so, it is sad for all of us to have great dreams of what we want to do, and what we should do, and then to have to smother them for the moment at least. But still, in spite of these difficulties and limitations, it might be said that in a measure, scientific research has advanced in India.

Now coming to Jamshedpur and opening this great laboratory, I think of the combination of this laboratory with the great steel works in this city, of the marriage of science

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

with industry, for the progress of both. Neither this laboratory, nor any other, by itself makes for progress. It is the tools out of which progress can come and it depends on those who use these tools, as to how far progress can come. What is the measure of progress? I do not know. You can define it in a multitude of ways, but, today in India, at any rate, we can think of it only in one precise way. Ours is an urgent way, how we can deal with urgent problems in so far as they affect hundreds of millions of our people. It is they who count and nobody else counts in the ultimate analysis. And if anything that we do, does not directly or indirectly affect their lives and hopes – and what they live for and what they hope for – then, for the moment that is not progress, although ultimately in the long run it may lead to progress.

I say that, realising that so far as science is concerned, we must give it a free hand to grow, unattached and not tied to any particular problem. Even so and in giving it, it is so that with free hand science grows and benefits humanity. I realise that perfectly and realising it for the moment I do wish to give it a free hand. Nevertheless, I want to tell you and I want to tell the scientists present here – that the burden of today is a great burden and we have to meet that burden with a brave mien and not think of other things, but try to solve them as far as we can – whether it is the burden of providing food to our millions or whether it is the burden of providing something else which they lack.

So, this marriage of science and industry has been approved, because that means that we utilise science to the immediate advantage for the betterment of our people, and that is typified by this metallurgical laboratory being situated here in this city of Jamshedpur. I said that these laboratories are not progress in themselves, but they are the foundations of progress. I do believe that there can be no real progress, either in this country or in any other part of the world, without its being founded and based on science, on the scientific application to many things in life. If I may say so further, on the scientific temper of the minds of the people, and this last perhaps is as important as any other. Because science represents not only the devoted study of a particular subject, but the devoted search for truth.

But in the process, it produces a dispassionate mind. It makes a person study objectively. It prevents an individual from being swept away by momentary passions and it rejects anything that it considers wrong or untruthful mercilessly. If that is the true temper of the mind of the scientist and of science, well, we find it less and less in the world today. Science grows, industries grow, great scientific laboratories grow, in the great countries of the West, and the East to some extent. And yet, somehow or the other, in spite of the growth of science, the temper of science grows less and less. It is a curious thing as the Director of this Laboratory just stated, that science may be used for good purposes or ill. That is true. When I think of these laboratories, I think, primarily because of this urgency at the moment, how far they can solve our present day problems and help us to meet the needs of our people. I think of many other things too, but I think also that. With a large number of our bright young men and young women working in these laboratories, they will help gradually to spread the temper of science, the temper of dispassionate study the temper of the search for truth, regardless of consequences. That is so much needed, not only in this country but in every country today.

Now, we are an ancient country, and old countries have great privileges and great drawbacks and great failings. We carry a very heavy burden of the past, and the past helps us and the past hinders us. And always the problem is, as I said earlier, how to combine that past with the present and the future. How to have change and how to have continuity, how to have both these together. Continuity demands large chunks of the past, if you like, going on. Change demands a break from the past. You may have too much of continuity, which means no change, which means a static continuation and stagnation and

death. You may have change – too much of change also – which means a complete break from the past. Thereby, perhaps you may gain something, but it is much more likely that you may lose a great deal.

After all, what are we today – you and I and all of us? Wherever we might be, we are the ultimate products of this past behind us. Whatever culture we have, whatever science we have, whatever in any way the world possesses today – the way of thought, or writing, or action or deed – it is the accumulation of the past, accumulated up to this present. From the pinnacle at which we stand and from the pinnacle of the present, to ignore that past and to throw it away is to throw away the whole fundamental on which we have grown. We cannot do that; but what we cannot also do is to consider that past as a permanent basis for us – to sit and not to go forward or upward. If we do so, then we forget the lessons that life ought to teach us – that life changes always, changes minute by minute and second by second. The only changeless thing – that which is not changeable – no doubt is death, anyhow that is the end of life. And a nation which does not change, or which is not prepared to change, is a nation which goes straight to stagnation and decay. So, the problem is the problem of continuity and is yet the problem of change, and continuous change. Whether we can solve it – we shall try to do so, and I hope we shall succeed.

Dr. Bhatnagar told you of that replica – of that Ashoka Pillar – that the people of Jamshedpur have put up here. It is a noble symbol of many things, and perhaps you know that we, as a country, have adopted its top – the capital of that pillar – as our crest and symbol. We did that after long thought and deliberation. That pillar – the original one – was put up about 2200 years ago by one of the greatest sons of India, Ashoka. Thinking of what one wants to be done, and sometimes facing these problems of the nation and of the world, one suffers a heart-break. But, at any rate, when I think of this magnificent chain of laboratories – national laboratories – that has grown up in India, and all the fine set of men and women who are working there, I feel hopeful and glad. So, it is in a spirit of hope, and in a spirit of faith for the future, that I open this National Metallurgical Laboratory.

42. SOCIAL APPROACH TO MEDICINE*

(Inaugural address at the 12th annual conference of the Association of Surgeons at New Delhi on December 30, 1950)

A 'social approach' to medicine in India was visualized by Pandit Nehru while inaugurating the 12th Annual Conference of the Association of Surgeons in New Delhi on Saturday (December 30, 1950). Poverty, he told them, should not stand in the way of the masses getting proper medical attention. In certain other countries, he said, the State regulated medicine for the benefit of the community and had achieved a great measure of success. "There is no doubt that we too, in our own way, shall have to move in that direction," he said.

In his 30-minute address Pandit Nehru commended "a scientific and not conceited approach to ancient Indian knowledge of medicine and surgery." "Learn all you can from it but do not believe that the last word could have been said a thousand years ago." Ad-

* *The Statesman*, New Delhi, December 31, 1950.

vising surgeons to emphasize the preventive rather than the curative part of their work he devoted much of his address to the controversy over the relative merits of Indian and Western systems of medicine. He objected to their being named "Western" or "Indian" systems. Science, he said, belonged to the world generally and systems of medicines, even though they originated and made initial advances in certain particular countries, should not be given a national character.

It was a fact that in ancient India the science of surgery was very advanced, but it was also a fact that, at a certain stage, many centuries ago, it had become stagnant. It stopped growing because the "priests and priestly minds" began treating books on the subject as revealed scriptures to which nothing could be added. He considered "men with priestly minds more dangerous than priests themselves". In the present day also there are men with priestly minds who talk of ancient Indian culture and they want us to adhere to it in complete disregard of what has happened during the last thousand years. This attitude, besides being unintelligent, harmed their culture. "We must go ahead and pile up knowledge step by step."

Ancient knowledge could be useful to surgeons and they must approach it with respect and due deference. But they must treat it critically and measure it with a "scientific yardstick" while determining how far it could fit into the modern scheme of things. "Supporters of the so-called Indian system of medicine had argued", said Pandit Nehru, "that they were inexpensive and suitable in a country where people were so poor." "But if cheapness is so important, death itself is the cheapest thing. There is no expense involved in it at all." The really important thing was the usefulness and efficacy of a system.

It was true, he admitted, that modern medicine tended to be expensive and that the services of eminent surgeons and physicians were generally beyond the means of most people. It was not a desirable state of affairs to have medical men working exclusively for the wealthy. This inevitably raised the important question of a social approach to the problem of medicine. There was a certain stage when the State must come in and decide what was good for the community generally.

43. SELF-HELP IN BUILDING CONSTRUCTION*

(Extract from the speech delivered on the occasion of the foundation-stone laying ceremony of the Central Building Research Institute, Roorkee on February 10, 1951)

The development of research laboratories is very important not only from the practical point of view of keeping pace with developments in the world but also from another point of view, which may perhaps not be so obvious even to the average scientist. It is what I would call the development of the temper of science in all our departments of life.

Science occupies a dominant position in the world today. Nevertheless, it is extraordinary how the temper of science is absent from most of the things we do. It is my firm conviction that the scientific temper could be developed provided a dispassionate research after truth is made. Unless we develop this temper of science, the world will go farther astray as it is going today. Whether we can catch up with that, I do not know. But the only way to do so is to approach the problems in the particular way which I have described

* Director, Central Building Research Institute, Roorkee (U.P.)

Pandit Jawaharlal Nehru presiding over the Governing Body Meeting of the Council of Scientific and Industrial Research at New Delhi (March, 1963). Others seen in the picture (from left) are Shri V.K. Krishna Menon (Union Minister of Defence), Shri K.C. Reddy (Union Minister of Commerce and Industry), Shri Morarji R. Desai (Union Minister of Finance), Prof. Humayun Kabir (Union Minister of Scientific Research and Cultural Affairs), Dr. S. Husain Zaheer (Director-General, CSIR) and Shri A.J. Kidwai (Secretary, CSIR).

Pandit Jawaharlal Nehru presiding over the Governing Body Meeting of the Council of Scientific and Industrial Research at New Delhi (November, 1951). Others present are Lala Shri Ram, Dr. S. S. Bhatnagar (Director, CSIR), Sir Jehangir J. Ghandy, Sir C.V. Raman, Dr. Homi J. Bhabha and Dr. K.A. Hamied.

Pandit Jawaharlal Nehru at the Indian Association for the Cultivation of Science, Calcutta (January, 1952). Others present are Dr. J.C. Ghosh (President of the Association), Dr. S.S. Bhatnagar, Dr. M.N. Saha, Prof. P. Ray and Dr. S.C. Mitra.

Pandit Jawaharlal Nehru at the Central Glass and Ceramic Research Institute, Calcutta (January, 1952). Also seen in the picture are Dr. Atma Ram (Director, CGCRI) and Dr. S.S. Bhatnagar (Director, CSIR).

as the temper of science. I hope today's function might draw further attention to this basic question.

Housing is our most important and urgent problem and the Building Research Institute would be doing a national service of enormous importance if it devised means of building durable and cheap houses in the country for the low-income group of people.

Let us not bury ourselves under the burden of the past traditions and customs. Old traditions and ways of work had their place in the past. But today in the changing world, they cannot be of much use. Of course, what is good in the ancient principles had certainly to be retained. But in many ways we seem to have fallen in the rute of traditions and customs in which there is hardly any life. With bows and arrows no country can face modern weapons, although it is true that these very bows and arrows were formidable weapons once. So if a country sticks to old and outdated things, it is bound to remain behind and suffer.

Whether it is building houses or anything else in this country, there is a habit, may be derived from old times, of looking to governmental authority to do it. The capacity of self-help and self-reliance in the people is becoming less and less. Of course, to some extent governmental help is necessary. But without the wholehearted cooperation of the people nothing much could be achieved.

Mere attainment of academic degrees is not of much use. Unless those who qualify from the universities apply the knowledge in doing creative work, the country would have no use for them. There is a tendency among some people to consider not using their hands as a special virtue. They consider it as menial work and something which is degrading. A widespread idea is that a clerk sitting at a table and getting a paltry salary, less than that of a factory worker at times, is more respectable than others. In fact, manual labour is looked down upon as menial work. This is an extremely foolish idea. We must get rid of this idea and realise that dignity comes from dignity of labour. Creative effort also comes from labour of the mind.

Creative effort means making something out of nothing. Whether you make a house or a road or a factory, you are making something. If you do that thoroughly, you will have added to your status and to the wealth of the nation and the whole world.

Often students come to me with grievances that they lack a proper hostel or a club or a reading room. They want more grants from provincial governments and expect somebody to come and do that work for them. Of course, it is the function of the Government to do so. The point is that the resources of the Government are limited, but the resources of men should not be limited. I think, it should be a part of the course of students in the university to build hostels, to build houses or whatever they want in their spare time. They should build them with their own hands.

During my visit to the U.S.A., I saw in a college a hostel built by the students. They did so as the college was short of funds. Why do you not do the same in your spare time? The college authorities will of course supply you with the necessary materials. Next time I come to Roorkee, I hope to see some buildings set up in the University by the students themselves. I assure you, once you begin to support yourselves in these ways, you will grow in your own estimation.

I would ask the people to keep their minds open to new and changing influences in the world and be ready to accept new ideas. India has to learn all that the other countries like the U.S.A., Britain, Russia and China have achieved. The real meaning of Swaraj is not just a change-over of Government, important though it is. The people must feel the effects of the change-over for their good in their daily lives. There are some sections of the people who criticise the government. But I want those critics to come forward with their constructive suggestions to improve things. Mere criticism does not help.

44. ESSENTIALITY OF DRUG RESEARCH*

(Speech at the opening ceremony of the Central Drug Research Institute, Lucknow on February 17, 1951)

I believe we have exceeded the time allowed for speeches. Nevertheless, I want to clear up some misconceptions chiefly relating to myself. The first thing is that I am not at all opposed to drugs; I only dislike the person who takes them. *(Laughter)* I think that it is quite essential, specially from a national point of view, to promote drug research and the manufacture of important drugs to treat epidemics etc., to improve the general public health, even occasionally to allow the individual to have them, where necessary. So, I have come here, without any reluctance or any reservations in my mind to perform this opening ceremony, because I do think that drug research, on a scientific basis, is essential for any country, and more especially for our country. It is necessary for a variety of reasons, among them being to check quackery and superstition in this country, and we try to hide this quackery and superstition under rather noble-sounding words.

Now, that is a dangerous thing. Whatever we should do, we should do with a clear conscience and not try to say something and do something else, or be ourselves rather wily-minded about it. My mind is absolutely clear on this subject, that anything that savours of quackery and superstition should be put down, without any mercy shown to it. It is a straight-forward question and I am giving you my opinion. If I may put it very crudely, I would rather die without quackery than live with quackery, because I may survive possibly by some accident by the use of quack methods, but then I encourage a hundred other people to do that and they are more likely to die. Therefore, from the larger point of view of public health, even saving an individual by quackery is not good enough. It is a dangerous thing.

Therefore, I think that the encouragement of scientific institutes of research is important to spread this scientific atmosphere and habit of mind in the people, quite apart from supplying certain essential things that are necessary in civilised life. Having said that, may I also say that I have long had a dislike for what might be called the valetudinarian view of life. I imagine, with all respect to those present here, that it has been evident probably more in the city of Lucknow than anywhere in India. People consider themselves gently bred who, if they see an orange at ten yards' distance get influenza and call in all kinds of doctors to treat them. In the old days, perhaps you will remember, the Begums and others whose pulse was felt through a bit of string that was taken out because they could not be touched, and plenty of money was spent--and plenty of money was earned rather by the Hakims and Vaids and doctors and all that, giving them, I hope, normally innocent concoctions, sometimes bad ones, but nothing to do with their condition anyhow. And so, in this country, and more especially the city of Lucknow, it seemed rather vulgar and low-down to be healthy. *(Laughter)* One had to be not so well, and in fact it is well known that it is almost an insult for you to go and tell somebody how well he was looking. You have to tell him or her or perhaps more her, that "Oh! how weak you are, how thin you have grown; how pale you are." The fellow might be like a pumpkin but you have to say, "How thin you are, how you have lost weight, how pale you are! I hope you will look after yourself carefully and not overdo anything." This is the kind of polite conversation that normally used to go on in Lucknow. I do not know what happens now. And to some extent that type of conversation used to take place in other parts of India, too.

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* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

Now, that is a bad thing — this outlook. I happen to be fairly healthy and am rather proud of my health and dislike anybody coming to me and telling me that I am not healthy, that I am leading a miserable life, and commiserating with me on my miserable health. I am not miserable, I am healthy and good and I feel healthy. I might also tell you — it is rather a delicate thing to say — that I dislike disease and diseased people. I just don't like them. I have to force myself to consort with them. Many people are ill, not because of any fault of their own, but because of social conditions, addiction, this and that. That is a different matter. We have to treat them. But the person who wants to be ill, so far as I am concerned, can exterminate himself. I do not want to cure him. This mentality of wanting to be ill, wanting to be delicate and wanting to be nurtured, and wanting to be commiserated with — I have no sympathy with them and it is for these reasons that I dislike drugs, because these are the real drug-takers that count.

Long ago — many years ago — I read a book, which evoked a strong response in me in its favour. As far as I remember, it was a book by Samuel Butler, and it was called 'Erewhon'. Now, that book was about a new country, a strange country where some travellers had managed to reach, a country which was quite cut off from the rest of the world. Many interesting things they found there. It is a very good book and if you can get it, I would advise you to read it although it is rather old now. Many other interesting habits and conventions of these people were strange and perhaps according to you rather perverse, their view in regard to disease and in regard to crime. In regard to crime, they felt that this poor man who may have stolen or committed some other crime had no opportunity to learn better. He has got a diseased mind, and he ought to be treated to cure him of it. They did not punish him, but they treated him. But any person who had a disease, they punished him; they did not treat him, they sent him to prison for that. Now, that was a satire, no doubt, but there is a great deal of truth in it. Those visitors found that in that country health conditions were tremendously good. In fact, they never heard of anybody being ill. If anybody was ill, he dare not say it, because he would be punished. Now, that was a satire, no doubt, but it was a satire of the right kind, and I like it. I wish that all these malefactors who pretend to be ill, and who are not particularly ill, should be punished for saying so and feeling so and trying to impose themselves upon society as people who are ill and should be cared for and looked after.

I hope I have made my position perfectly clear to you. I am all in favour of these drug institutes, subject to those reservations in regard to individuals that I have pointed out. I am in favour of it partly for obvious reasons that we are importing drugs from all other places and from foreign countries — very expensive things, and very necessary things in the life of today, and we should produce them ourselves.

Secondly, because I think that by our research work, we can find out new methods of doing things, new drugs possibly for treating or curing disease etc. not only for ourselves but also for the world. I have no doubt that an intensive research in many of the old household remedies or traditional remedies — research on scientific lines — would probably yield fine results. I entirely agree with Sir Edward Mellanby that if after research something is found to be ineffective and not good, it should be discarded absolutely and completely and not permitted to function. But you may find — and you are likely to find — many good things. The point is that we should approach everything with a reverent scientific spirit — with eyes open, ears open and try to experiment. That way one should approach everything in life, that way one should seek truth, and that is the only way to find truth and not with eyes closed and ears closed, and just trusting any kind of rumour that may reach our ears.

And, finally, I like these scientific laboratories growing up, because I believe and hope that they will gradually make the Indian people more and more scientific in outlook—

scientific not merely in the sense of dabbling in test tubes and beakers and the like, but get that type of mind and that type of thinking which scientists ought to have and which they do not always have. That is the poise, the dispassionate type of mind, which is not swept away by passion and prejudice, and which can consider problems of life reasonably, logically, and with as great a spirit of detachment as possible and thus come to conclusions.

45. THE DESTRUCTIVE AND CONSTRUCTIVE ASPECTS OF WAR AND THE MEDICAL PROFESSION*

(Address to the medical historians of the Commonwealth Countries and the United States of America at New Delhi on March 5, 1952)

Prime Minister Nehru today (March 5, 1952) told medical historians of the Commonwealth and the United States "If you could introduce something of the healing art in the treatment of the mind of man, both as individuals and in the mass, then indeed medical science would have done tremendous service to humanity".

"If you function merely in the limited sphere of waiting for somebody to be struck down and then trying to lift him up," he said, "somehow it seems to me that is not quite enough. Why not prevent him from being struck down?"

Mr. Nehru was addressing the official Medical Historians Liaison Committee of the Commonwealth Countries and the U.S.A. which chose the Indian capital as the venue for its fourth meeting. The Liaison Committee was formed after World War II and acts as a central agency for the exchange of information between the medical historians.

Mr. Nehru said, "It struck me as rather odd, and represents I suppose the oddness of life itself, that simultaneously we should march on two fronts -- the front of trying to do as much injury as possible, maiming, disabling and ultimately killing the enemy, and on the other hand, having maimed and half-killed him trying to revive him, not only your own people but the enemy's also. So this business of destruction and construction or revival goes on side by side. It is very extraordinary. In any event, whatever one might say about war – and a great deal can be said about war which is not very flattering – there is no doubt that the aspect many of you here represent is the best aspect of war — the healing touch. Certainly war has given a tremendous push to progress in the sphere of technology generally and in the art of healing."

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* *The Bombay Chronicle*, Bombay, March 6, 1952.

46. TOPMOST PRIORITY TO ROAD BUILDING*

(Address at the opening of the Central Road Research Institute, New Delhi on July 16, 1952)

Prime Minister Nehru, opening the Central Road Research Institute, said that topmost priority should be given in this country to the building of roads. Pandit Nehru wanted the Institute to keep in mind the need for opening up the village areas and not think too much of fine and latest types of roads connecting some big cities. The latter were bound to come because people who went about in motor cars shouted a lot and they were heard. But the poor villager did not shout and so he was not heard. The Institute should devise roads which may not be so up-to-date or so expensive but still good enough for the villager to begin with. They could be made better later.

Pandit Nehru pointed out that this was the eighth national laboratory started in the course of the last two years and a half in the country out of the total of 11 national laboratories that had been planned. The remaining three were under construction. Meanwhile, he said, they were functioning in the sense that even without the new buildings being ready, work was being done round about them, which was good because "we should not wait too long for structures of brick and concrete. Unfortunately, we require buildings for everything – for our offices, schools, hospitals, dispensaries etc. Work of every kind can and should be carried on even without buildings. I just do not wish that we should wait in a supine manner to start work until we have a solid building. I am not against solid buildings, but I am against this business of waiting till we have a pucca structure of brick or cement or something else."

The Education Department for instance, he said, should spend far less on buildings and far more on teaching, not that buildings were not important but teaching was more important. If no buildings were available for starting classes, straw-covered sheds or huts could be put up. Again, talking of housing, he did not want the housing programme to wait for the availability of sufficient cement and steel. "I am quite clear", Pandit Nehru said, "that a housing programme in India should essentially be based on materials which are found locally in a village. Have houses of cement and steel where you can get them, but the programme must not depend on some special article which is not easily available. We should increase our cement production and so many other things, but we should not wait for them. Before we proceed to building our schools, dispensaries, our little hospitals and the like, let us have by all means 'kutcha' buildings or straw-huts. As a matter of fact, some of our modern structures of brick and mortar are horrid and uncomfortable. Our Central Public Works Department will say that they are lasting, but the first idea that strikes one on seeing some of these buildings is how soon they can be put an end to. Why should they last if they are ugly and uncomfortable? So, the sooner the Central and Local Public Works Departments begin to think not in terms of 'lastingness' but of present utility and some artistry and beauty, the better for the country and even for the P.W.D. But it is difficult to see how the P.W.D. mentality can be reformed."

"In everything that we do we always come up against this big problem – how to get so many things done that we want to do in the least possible time. There are obvious limitations of finance, trained personnel and so many other things. You cannot simply wave aside the limitations and say, 'we will do it.' You must be practical. You cannot be just airy. Nevertheless, I think there can be ways and means of getting over many of these limitations. That is what we think about most of the time, whether it is in the Planning Commission or

* *The National Herald*, Lucknow, July 18, 1952.

elsewhere.

We come up against rigid outlooks. We are conservative in the sense that we do not like taking a new step because we are used to a certain routine or rut. Yet, what is absolutely necessary is some new step. You cannot meet a new situation in an old way because it is the old way that created the new situation. So we should realise that we have got to do things rapidly and quickly and it is not quite enough to say that there are limitations which prevent our going fast. I want the mind which tries to get over the limitations and does not submit or surrender to them easily, because if we do not get over them, then other difficulties and dangers arise."

47. IMAGINATIVE APPROACH TO ENGINEERING ACTIVITY*

(Inaugural address at the twenty-third annual meeting celebrating the silver jubilee of the Central Board of Irrigation and Power at New Delhi on November 17, 1952)

I am happy to be present here today, not only because of the importance of the subject with which you deal, but also to pay a tribute to the work done by Indian engineers. When I read the name on your board, the words "Irrigation and Power" excite my mind and all kinds of ideas come into my mind – ideas of history, long perspectives of human progress and the rest. I do not know what kind of history books are written nowadays for the schools but the real histories which should count should be histories which trace humanity's progress and occasional setbacks; in other terms, the names of kings and big individuals in terms of development in various ways. The biggest development, I suppose, in the history of humanity was the discovery of agriculture and then later comes irrigation. I think it would be a fascinating subject to find out how the development of irrigation has affected human progress. With that you would of course touch the development of various devices, the techniques and the rest of it which have made agriculture, ultimately coming to the latest techniques and to the latest uses of power.

These are the themes over-riding the so-called national conflicts and boundaries which affect the whole human race. In spite of the fact that we have developed so much in the application of science, our minds remain narrow and limited and cannot get over these narrow boundaries not only of geography but, what are much worse, of the mind. So these subjects excite me. They are full of adventure for me. When I look at the map of India – I look at it very often — it stares me in the face in my office — a huge map with not only the boundaries of States etc. but the physical features somewhat marked and that mighty chain of mountains in north and north-east, called the Himalayas given a particular colour – I often think not only of the fact that great mountain chain is a boundary of India, the frontier of India, not only that it rises up like a sentinel, not only that it has been the inspiration of so much of our culture and thought in the past, but I think also of that mighty chain being a suppressed source of vast energy. The energy flows out in great rivers coming from those mountains and watering the plains of India, running into the sea, then it takes the

* "Irrigation and Power", Central Board of Irrigation and Power, Vol. X, No.1-4, January 1953, pp. 27-34.

shape of minerals and the rest of it. So it seems to me, here is a mighty reservoir of energy which if only we could utilise to full purpose, what could we not do of it? This is not a subject for me dry or dull; it is a subject of adventure and excitement and human progress. I should like you to consider it in that way, because then you give life to something that is dull and dry.

Now, as a politician and as one who meddles in many other things not directly connected with politics, nevertheless with a politician's outlook, the outlook of dealing with human material which is very difficult to deal with. I know you can measure with your techniques and rules the hardness or the strength of this metal or that, of stone and iron and what not. How do you measure the content of a human individual? You deal with something which you can more or less understand and lay down averages and the like for it. But a politician in the real sense of the word has to deal with human beings as material, not stones and steel and iron and the like – and that is not only a difficult material but an exciting material because it is a live material, a growing material, a changing and dynamic thing. No two persons are alike and we have to build with that material. So in thinking of that problem, my mind goes to other problems too.

When you deal with stones, with cement and steel and iron, if you deal with that in a dead way without that feeling of building life or something that is akin to life, then you are second-rate men. You have not grasped the problem; you are just people sitting down with pen and ink on a table writing down figures and calculations, which may be useful, of course, but then have lost the essence and the meaning of the work you are doing. That of course applies to every politician; it applies to every profession; it applies to politicians who may look at the problem in that narrow way, forgetting the wider context of it, the wider objective of it and the wider objective is something dynamic, growing. But more especially most of us and more especially like me when we grow in years inexorably without being able to stop it we grow static in mind. It is extraordinarily difficult to prevent one's growing static. One loses that resilience of mind that is a necessary concomitant of life. When that resilience goes in one, then a person begins to recite pet phrases and pet dogmas whether it is religion and whether it is science and whether it is any other branch of human activity. That mind is a dead one, that mind has lost the capacity for growth and I find so much of that narrower growth. "We have the truth, you have not. We know this, you do not." When a man says that, I suspect him. I feel that he has lost touch with something that was growing, he has got left behind. So even in this business, the work you do, I want you to appreciate my point, that is, it should be infused with life, life and adventure, the things that come out of it. Think you are building a bridge, what does it signify, not a bridge only, something infinitely more. You are building or making a river valley scheme. See the vast things that flow from it, not only in the shape of canals and irrigation and hydro-electric works and industry and all that. Certainly it is important but something even more than that, the progress of humanity in a particular direction. All that comes up and then it will be work that you may do, whether you do it as a chief engineer or a small engineer or a mechanic engaged there or even the unskilled labourer who works there. They should all feel this and should be fired with that imaginative approach to this problem. It is sad that that imagination is so lacking today. We work in grooves. Well, too much imagination may lead us astray because we have to get our feet on the ground. But too little of it is also dead-weight.

I find that here in this city of New Delhi, one could do with a good deal of more imaginative approach but it is a man who sits in an office who becomes static and a dead-weight. And that is why, if I may make a personal confession, I want to run away from New Delhi from time to time, rushing about from place to place. I want to get out of this deadly static atmosphere of this place which cannot think, which forgets that there are people, that there are human beings in India, which thinks in terms of paper and files and ink and all that,

which thinks even in terms of figures, but figures are not human beings; figures are only hints or some suggestions as to what human beings are. I go out and I see the faces of people, of my people and your people, and derive inspiration from them and derive what is much more important, something dynamic, something growing. I grow with them, and I get to some extent in tune with them, and I hope, to some extent, I also affect the mood and tune of their mind. So, I want you to consider all these matters. Engineers are rather lucky, fortunate, because the person who always sits in an office, as I said, becomes static in mind - tends to become that was - but not everybody. If engineers or any of you do that, you are likely to become - even if you might be a first-rate engineer - you will deteriorate, I am quite sure, unless you go down to the field, unless you do the job yourself and unless you do not consider any job too low for you. You will not maintain that direct contact with the living thing that you are building. A bridge is a living thing if you look at it imaginatively; everything is a living thing if you look at it with that eye of imagination - what it is, what it means to humanity. It is part of human progress, human life. Therefore, you are fortunate, because, normally speaking, you have to work in the field which an average person sitting in an office has not got to do.

Now, you know that even our ideas of education which are very slowly being given effect to - I wish the pace was faster - go round what is called basic education. Now, there are many virtues in basic education but the main thing is you get down doing something not repeating something from a book; you get the smallest child to do something. Of course, that is nothing specially Indian. That is modern education everywhere. There is a certain twist to it given in India certainly, notably by Mahatmaji, which we are trying to follow up, though slowly. Now, take basic education again. Get down to the job with your hands and feet and not talk about it. I am tired of people who merely talk about things. Because however wise you may be, you can never enter into the spirit of a thing if you only talk and not do it.

So also are scientists. They do things - very good, but there is a tendency, I find, for them to do a wonderful experiment and it remains an experiment after that. The next stage somehow does not come. Of course, they may say it is somebody else's job to do the next stage, but I think if the scientist had that practical application in him, he would either try to do it himself or get somebody else to do it. It is of utmost importance – this association of thought with action. Thought without action is an abortion; action without thought is folly. They must be allied, and they must be allied in your and mine and everybody else's life whatever we may do – whether it is the educational process, whether it is some profession or some particular sphere of activity that we indulge in; whatever it may be, they must be allied. Fortunately, as I said, for you, in an engineer they are normally allied and therefore he keeps, well, fresher – perhaps more than others do. Also the engineer is actually building; he is not planning for others to build. Now, there is a great deal of difference for people to make plans or issue directions from an office for others to do the work. There is some value, of course; it has to be done, but the man who does the work in the field is actually creating something and there is nothing like actual creation to make you grow, to make the individual grow or the community grow.

So, as I said, you are fortunate, but you are fortunate only of course if you realise that fortune and live up to it. If you also become static under the enervating atmosphere of New Delhi or wherever you live, well, then, of course, all the worse for you. However high your intellectual attainments might be, you lose the living touch and it is the living touch that counts in life, whatever you may or may not do.

Now, you mentioned, Sir, in your address, something about some materials, some samples being sent for testing to distant countries. I confess I was surprised to learn that – very surprised. It may be of course that some particular object sometimes may have to be

sent abroad, but, normally, for such a process to be adopted here seems to me an amazing confession of our weakness and inability to do anything. What are all these dozens of laboratories here for – scientific institutes and research institutes – if you have to send things for testing abroad? I think this matter should be looked into.

If I may take this a little further, I am not at all enamoured, and as the days go by, I become more and more suspicious of the crowds of people who go out of India for so-called education. There has been a change in this undoubtedly from the old days, from my days when I went abroad, when the great majority of Indian students, chiefly in the United Kingdom, went in the hope of later adorning the profession of Law. Well, some of them did; most of them did not. Now it is far better because people go more for technical studies which is infinitely better. And such information as I have, goes to show that the average of students in England – Indian students in England and America – is a good average. I have nothing against that, it is a good average. Many of them are doing well there. So far as I am concerned, I dislike and hate nothing so much as the approach which narrows the mind, as the approach which might be called, if you like, the narrow nationalistic approach in any matter, whether it is education, science, culture or anything – an approach which starts by thinking that we are all in all, we have attained the summit of wisdom and we need not learn anything more and so on and so forth. I dislike that approach. Again, that approach itself denotes a static condition. Anything that is static becomes stagnant and gradually that leads to ultimate death. I am all for opening our minds to every kind of knowledge —information, that can be obtained. I am all for free intercourse with the other countries of the world; I am all for inviting others to come here to learn from us and to teach us, from every country wherever it might be. I want no barriers. So it is not with a view to having a barrier that I say what I am going to say.

Having explained my basic position, nevertheless, I feel surprised at this excessive enthusiasm for people to rush abroad to learn something — and it is just amazing how many people are constantly going abroad – some years, some two years ago, I think, we became rather alarmed at this prospect. I am not talking for the moment of students; that is another thing; students should go, but I should only qualify that by saying that students should go if only they are capable of profiting by going – not everybody whose parents happen to have superfluous cash need go, but people who can profit and learn certainly should go. I am talking for the present of others. In the course of the last two or three years, there is an abundance of all kinds of things, scholarships, fellowships, this, that and the other, that I have lost trace of them. So we became rather alarmed at the large number of people who went, including a very large number of officials of the Government of India and State Governments who, instead of doing their job here, were constantly trying to learn something from there — very laudable no doubt! Then we tried to make a rule that nobody could go, who is in Government service, without special reference to, often enough, the Cabinet itself. The result of that rule was that half the Cabinet's work was to consider these applications! It is amazing. The other day, I had a chart prepared of how many people had gone and it astonished me to see the number. It ran into many hundreds, in the course of one year, of officials who were supposed to be working here going off to learn something. Now, I agree that we should aim at higher efficiency; we should learn; our officials should go and learn. But it is the scale at which this has happened because of all kinds of, as I said, scholarships, fellowships and things like that. And people feel that we are not paying for it, that United Nations are paying for it, that F.A.O. is paying for it, that somebody is paying for it. So there is a tendency to accept something not realising that it is not for nothing.

First of all, a good part of the expense does fall on us. Secondly, we lose the services of a highly paid man for a period. What do we pay him for? But apart from that, there is another aspect of this problem. That applies to students as well as to others who go abroad.

We want to learn the highest technique. We want to make our people as efficient as anybody in the world. But we should like them to be efficient and yet to fit into the scheme of things in India. Obviously, the highest type of efficiency is the type which can utilise existing material to the best advantage and if one has to work in India as an Indian must do, then he must know how to work in India. It is no good a man coming back from America and telling me, "I will do this and that if you get this and that equipment from America." If you cannot get all kinds of expensive machinery which we have not got, which we cannot afford to get, he bemoans his lot, 'how backward we are, we cannot do this; we have not got this and we have not got that' and he gets frustrated and the very special knowledge that he has obtained is of precious little use to us because his mind has been somehow conditioned to a different environment. That environment is very good but it so happens that our environment is different. And the result is we cannot profit by all the time and energy and money spent on his education, whether the student or an official whatever he is.

You have to function in India; you have to function with the material of India and the environment of India and you have to make that do as far as possible. Certainly, we shall get equipment and machinery from abroad where needed but it should only come when it is needed, when it is absolutely needed. And as far as possible it should only come once—twice if you like— and we should produce it later. What is this business of our constantly thinking in terms of a different environment, different equipment and different apparatus and different everything, shouting for it, not realising the resources of India, the poverty of India, and all that. If you like putting up a magnificent structure somewhere which may function, of course, and which may yield some results it may be; but not a showcase which nevertheless does not fit into the general scope of the development of India.

In this connection, I entirely agree with the President in what he said of the far greater importance of our development of smaller valley systems. Generally speaking, instead of getting tied up with enormous undertakings which are very important—and to a large extent we have to do that, of course, I have no objection to that, but it is a question of emphasis because we must develop India as a whole. We are not out to develop one little part of it, developing it a little more than the rest. So the more we spread out the development, the better it is. Everything of course has to be judged ultimately from the general progress, development, advancement of the human beings involved, not of putting up a show structure for others to see, for you to just show off your skill. That has to be a test. I do not mean that we should not experiment, go ahead with specialised things which also we must, otherwise we do not progress, our levels remain low.

There is always a difficulty, whether you look at the political field, economic or any other field, you feel two slightly contradictory tendencies. One is the tendency to centralise. Now centralisation is important in the modern world; it is inevitable whether it is Government, whether it is anything else. It may give you better results, it may produce better efficiency and all the rest of it, although a stage arrives in the process of centralisation when perhaps efficiency does not grow, it lessens. But on the other side, apart from centralisation, you have the other feeling, shall I say, the growth of freedom, individual freedom, human freedom. Undoubtedly, the greater the centralisation, the less the individual freedom, although some better results might be obtained. Therefore, some people talk of the processes of decentralisation and prefer them, because they allow the individual to grow more. It is true. On the other hand, there are certain things, very important things, in modern life which cannot be decentralised if you want any progress at all. Well, you have got to balance all these things, but the main thing is that the growth of the individual, the group, the human being cannot be imposed upon him. A human being grows, well, ought to grow like a flower which grows, like a plant which grows. You cannot pull it out; you can water it, you can help it grow, you can give good soil, you can put it in the fresh air or in the sun.

But it has to grow itself, you cannot make it grow by imposition. Sometimes many of our people think that by some decree from above, you could make something grow, but you do not. You can help the growth of the person by that. That is what I said, that a static mind thinks that it is by decrees things are done, while really you have to carry the human mind with you and prepare the ground for its own growth.

Well, I do not know if I have talked relevantly or not about irrigation and power. But being somewhat imaginatively inclined, my mind runs off in various directions. I was talking to you about the effect the Himalayas produced on me—the map of India with the Himalayas, the tremendous source of power there running to waste often enough, the potential energy which is there which you can tap, if you like. I wonder if ever there will be somebody, wise enough and knowledgeable enough, to write the story of our rivers. What a wonderful story it would be. Let us take the story of the Ganga. It will be the story of India, Northern India more especially of course, far more important, far more living and real than all your trumpery history books that you have; it will be the story of the growth of Indian culture and civilisation; it will be the story of the growth of cities of the Ganga; it will be the story of the waters of the Ganga and the Gangetic valley helping irrigation and what not; it will be the story of the rise and fall of empires; it will be the story of human life developing, people coming from the North-Eastern frontier, whether Aryans or other races, coming up to the broad plains of India and stopping at the Ganga. It will be a magnificant story if it could be written properly. Here is something; it is not for the engineers to write, it is not their job. But I want the engineer who works on these rivers to have that imaginative approach to this problem. Then you will see the water becomes alive, the water you deal with. Even the stone that you deal with tells a story. I should like you—not only the big engineer, the middling engineer but the small engineer to think in this way and to convey something of this exciting approach to this problem to the workers there in the field. Make him realise that he is also working with live material even though it might be stone or steel and that it will give birth to further life. Let him be the partner in this adventure which you are starting and ultimately if you approach your problems in this way, the results of course will be far speedier, but other results will also follow. It is important and that is, that the worker and the engineer will also progress and advance and become better men and women.

48. A SCIENCE-BASED INDUSTRY*

(Speech at the inauguration of the Rare Earths Factory. Alwaye on December 24, 1952)

This factory, which I am supposed to open has in fact, been functioning for some time. This was what Mr. Choksi[1] referred to in the closing sentences of his address. Now, some button will be pressed and some shutters will be going up, just an act to delude the public to imagine that it is going to begin now! As a matter of fact, it has been functioning for some time.

But, that is a small matter. I wonder how many of you who are present here appreciate the fact that this factory is not just a factory. In fact, it is something other than just providing employment to a number of people here, desirable as it is to provide employment. It is not just a little bit, a little step, towards the industrialisation of India. It is something different in quality; it is not a quantitative thing, because it deals with sub-

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

1 Mr. J.D. Choksi, Chairman of the Board of Directors of Rare Earths Ltd.

stances which are playing and are likely to play a very significant part in human development or human destruction. Now, so far as we in India are concerned, we have not got the resources to think in terms of those weapons of destruction. What is more important, we have no intention, no desire, to do so. In fact, our desire is definitely and deliberately not to do so. Therefore, when we think on these matters, we think in terms of peaceful progress, of atomic power used for peaceful purposes, and that is very necessary in a country like India.

Now, these terms perhaps are not very well understood by most people. Even so, when people talk glibly about the atomic bomb or the hydrogen bomb or fissionable material or of monazite — these terms become words of mystery and power, something like, as in the old days, the priests used to throw about words surrounded by mystery. Now, the modern scientists, taking the place of the high priests of old, use these terms and frighten the public with them, and to some extent, enhance their own importance with them, as the old priests used to do. Undoubtedly, it is a fact that scientists are important, or rather, the stuff they deal with is important, not so much as they as individuals. And so, these questions which revolve round the concept of atomic energy become important — whether you look at it from the point of view of war or peace.

So far as we are concerned, we look upon this question entirely from the point of view of peaceful development. There is no question of our even thinking in any other way, because we have neither the resources nor the wish to do it. I am not scientist enough to talk about these matters with any degree of clarity or precision. Even previously, but since last evening, Dr. Bhabha has been trying to instruct me as to what I might tell you in more or less clear language so that you might understand something about not only what is going to be done in this factory, but the results of that. But the joint efforts of Dr. Bhatnagar and Dr. Bhabha have not succeeded in making me quite so confident of what I might say on the subject. I think to some extent I do understand; but it is one thing to understand and it is quite another thing to make others understand. And I fear lest, in using these terms and words and phrases, I might expose my ignorance. But, fortunately for me, a little pamphlet has been provided for some of you if not all, which gives you some essential and basic facts. That will help you somewhat to understand. In addition, I have been provided with other brief notes to refresh my mind on the subject.

Some years back — I think it was in 1948 — the Atomic Energy Commission of India was constituted by the Government of India. It was a wise thing that the Government did, not because we are going to make the atom bomb, but because atomic energy is a vast resource for power of the future, which can be used. Like everything else which can be used, it can be misused also. It can be used for human development. I do not mean it as a prophecy, but it is quite likely that in the course of the next decade or two it might change the face of the earth.

We live in an age of technological change and progress — whether it is progress or not, but anyhow there is change. And the pace of technological change becomes more and more rapid, the pace almost becomes rather maddening and thereby changing, resulting in all kinds of changes in our environment, and we find adjustment increasingly difficult. We — I say we, the people all over the world — find it increasingly difficult to adjust ourselves to this changing environment. While we use the products of science in many ways, the odd thing is that, while we physically use them to a large extent, mentally we do not adapt ourselves to this changing state of affairs, with the result that there is a tremendous lag somehow, and maladjustment, all over the world.

You might indeed draw the inference that it is because of this maladjustment that we have most of our troubles all over the world, including international conflicts. A lack of realisation exists that the technological changes that have come about in the world

have made the world different, we are making it different and we can no longer live in an isolated way, separately in our nations or within the nation. We almost sit on each other's doorstep or lap all the time, and either we pull together and co-operate together, understand each other, or destroy each other. There appears to be no third way about it.

So, here in India, there is a very extraordinary amalgam, mixture of many things, good and bad — where we have the latest types of technological and technical advances and where we also have the most ancient types of functioning; where we have the highest and the latest type of minds functioning and fairly ancient superstitions at work too! Of course, in every country there are these amalgams and mixtures, but perhaps in India it is even more marked. It is interesting here to start this Rare Earths Factory, which is symbolic even more of the future than of the present: symbolic of the direction in which we are looking, *i.e.* the direction of growth through science and implementation of the discoveries of science. That does not, of course, mean that we uproot ourselves from the soil on which we live and where we have grown, because any people that uproot themselves fade away. They cannot survive without roots, they cannot even profit by the sun. They have to have roots in the soil like a plant, or a race, and derive sustenance from it. But the plant requires the sun too, and the fresh wind too, and if you surround yourself and shut yourself off and put up all those shutters around you, then you cease to get that fresh air and fresh sun and wither away, as we did as a race for hundreds and hundreds of years.

So, apart from the various very important uses to which the products of this factory will be put, apart from its helping our country and particularly this State of Travancore – Cochin to go ahead, there is an additional significance attached to this factory — that it is a symbol and a promise of the future for us. Therefore, I attach a greater importance to it than, may be, to some bigger factory which may grow up in any part of India.

I just mentioned to you that about four and a half years ago, we formed an Atomic Energy Commission consisting of three eminent scientists, Dr. Bhabha as Chairman, Dr. Bhatnagar, and Dr. Krishnan who is the head of our National Physical Laboratory at Delhi, and we passed an Atomic Energy Act too because it became essential to control the development of this work and of the minerals etc. connected with this work. It is obviously quite impossible for the Atomic Energy Commission to function if private interests or sectional interests were free to do what they like with this very valuable material, which went towards the making of the various ingredients etc. required for atomic energy or a like purpose. Normally, people thought more in terms of uranium than anything else in connection with the atomic bomb or atomic energy. As a matter of fact, uranium existed only in very small quantities round about Travancore-Cochin. Fortunately, you have got plenty of uranium or much more of it in other parts of India, notably in Bihar. We have to look at this problem of our gradually developing atomic energy for social purposes. We have to look upon it from an all-India point of view. We cannot deal with it in one place, because the material is spread out, and even our factories will be, because some are required here, some elsewhere. It has to be considered, therefore, from that all-India point of view to make the best out of it. I say that, because even taking from all-India point of view, our resources are very limited compared to the enormous resources of some other great countries, among them the United States of America and the United Kingdom. Nobody quite knows what the Soviet Union's resources are, but they are very considerable and, no doubt, they have gone pretty far too.

Now, we are not out to compete with anybody, but we do want to do this work ourselves — not to be helpless and dependent upon others, but to cooperate with others in this task. While our financial resources are nowhere near to other countries, we hope, certainly to have scientific talent of the first order so that we may go ahead with this by

ourselves or in cooperation with others. Anyhow, this is not a question which can be tackled in India except on an all-India basis. I repeat that, because sometimes people think and some States think that because there is a certain raw material in that State, therefore, it can be considered and dealt with on behalf of that State rather than on an all-India basis. Now, I want to impress on you that this is neither feasible nor desirable. This big work cannot be done in that way, and that is why the Government of India passed that Act, and under which notifications are issued controlling the export or the utilization of various minerals and substances connected with this atomic energy work. As a matter of fact, that is also the way to make the most of it, even for the particular State concerned, because if this whole work progresses, it brings rich dividends with it.

Mr. Choksi was telling you that, unlike a normal factory, more especially unlike Government concerns, this factory even before I have come to open it has started paying dividends. It is very extraordinary. And, the factory being owned jointly by the Government of India and the Government of Travancore-Cochin, we jointly profit by it. But this is rather, if I may say so, a subsidiary aspect. It is important, no doubt, and it will grow, no doubt, but in future both the Governments — both India as a whole and the State of Travancore-Cochin — are likely to profit much more, not by this factory alone but by this joint work of development. And so, apart from this State being an important centre of the development of this new phase of work in this country or in the world, it will lead to other activities from which the State can derive benefit.

People talk vaguely about the atomic age and yet, there is something in it, though not in that rather crude popular way of thinking. We are on the eve of changes — technological, scientific and others — which will change the structure of modern life fairly rapidly. It is seldom realised how tremendous has been the change in the world during the last 100 years or so. We are accustomed to it and we take for granted what has happened for the last 100 years in spite of the fact that enormous changes have taken place. It may be that those changes are continuous and the process does not stop. Nevertheless, sometimes they come in rather rapid strides and I am inclined to think that we are likely to have, in the next decade or so, some big spurts in the direction of these changes, which will affect not merely the external but the very texture of human life. Because anything which affects our entire environment, anything which affects our methods of production and distribution, anything which brings great resources of power in human control, is a tremendous factor. It changes the life for you, and you may adapt yourself to it and profit by it, or you may go under. So, when this kind of thing is happening, what is important is — the very first thing is — that we should be wide awake, alert, and not passive and static.

People talk about the industrialization of India — we want that industrialization. That does not mean that agriculture in India becomes less important. It will always be most important. That does mean that we must pay the greatest attention to village industry and cottage industry. They will be very important for generations to come. That is so.

Industrialization is important, no doubt, but I have sometimes got the idea that many of our business magnates — owners of factories and industries etc. — think of industrialization as some mechanical process like putting some penny in the slot machine — you put money in one end and industrialization comes out of the other end — also dividends at another end — as if industrialization is something which you can buy with money. Well, money has some importance in this life, but I think it is terribly overrated and the sooner we realise that, the better. One wants money to do things. You cannot, unless you have got the right men, the right competence and the right way to do many things. The sooner this is realized the better. Now industrialization is not putting money — a penny in the slot machine and out comes the factory. It requires trained human personnel to do it; it requires a mental approach. Ultimately you have to go back and realize why this indus-

trialization affects the world. Because, science came into the picture. The giant strides and the implications of science and the results of science brought about this tremendous change, which changed the world more in a generation or two than it had changed for a few thousand years previously. As I am very fond of repeating elsewhere, the world, from the point of view of transport or travel or communications a hundred years ago or 150 years ago was exactly the same as it was a thousand years ago or two thousand years ago, or any previous period. That is so, and then suddenly this change! Science comes in and upsets so many things, in particular communications. And it goes on upsetting them, not only by the steam engine, and the railway train and the steamship, and the aeroplane and the jet engine and radar and wireless and telegraph, and telephone — all these are communications; they completely upset life.

All this is not, I repeat, a penny in the slot business, like many of our businessmen seem to think. It requires a scientific background, a scientific approach, a scientific mind and a scientific temper. And it requires, it means, that we grow all that in our country, not hire it from outside. Certainly we may hire it; we take help from outside where necessary. But, if we have not developed that temper here ourselves, it does not matter if all the bright scientists of the world come here. We do not grow, although brick and mortar factories and buildings may go up. Therefore, one of the most important things that has happened, I think, in this country — important from the point of view of this development of science and from the point of view of the future — is the building of a number of great national laboratories all over the country — research institutes, laboratories and the like, which will, I have no doubt, produce results, but the main result I am interested in is the result affecting, what I could call, the 'mind' of India, the 'temper' of India.

Now, I do not mean that even how our big scientists are really scientific in mind, which I find often they are not. They are scientific in their laboratories; take them outside these and they appear to be very frail human beings. They make mistakes on the simplest of things. But, that is the fault of our age today because we specialise so much that we lose sight of other things. Today, you know more and more about some odd things and nothing at all about the other things. We become clever and clever and more and more foolish at the same time, or less wise if you like.

Anyhow, one of the big things that is happening in India, I think, is the development of these laboratories. It becomes a starting point for an adventure of the mind and of thought : an exciting adventure. And I want you to some extent, the people of India, to share in that adventure of the mind. It is an exciting business. And I do know you will enjoy this excitement of the mind, seeing the future gradually develop in bold relief. I do not know if it is worthwhile for me to tell you the very useful facts that Dr. Bhabha has given to me in a little note which I have before me. We are told, as you will see from the book itself you have been supplied and as Mr. Chokshi told you, India has the biggest deposit of monazite. And monazite contains all kinds of what are called 'rare earths'. These rare earths are necessary, not only from that atomic energy point of view, but from a large number of other points of view. You will see a chart in that book, monazite yielding all kinds of things — uranium for atomic energy, thorium for special alloys for industry, special glass and alloys for jet engine. Not that everybody knows its importance since it is in mysterious words which nobody understands. I have already told you that scientists now want to become some kind of a mysterious high priests, so that we may give them full praise without understanding anything — polishing or enamelling of cast iron and steel, polishing of optical glass, tinkling of optical glass, carbon for arc lamps — all these things. I am told that monazite contains rare earths phosphates, thorium and a little uranium. Now, most of the production of this factory is likely to be exported and bring good money in place of it. I understand the factory will enable India to supply one-third of the total world

demand for rare earths. This is a great step forward.

Now, as you know, this factory is the result of cooperation between the French Rare Earths Factory and our own scientists. To Mr. Choksi and others I would like to say this, because this kind of question has often been asked in the Parliament : we have been bitten so often in the past by foreign concerns coming in, planting themselves here to the disadvantage of India; that naturally the Parliament is anxious not to get entangled in anything of that type. It is obvious that everything depends on the way things are done. Obviously, we want co-operation; it is something good to give it and to take it. We take it and cooperate and there is absolutely no reason why we should not cooperate with foreign concerns or foreign governments on that basis. Take this atomic energy business. Well, it is perfectly clear that other countries are much more advanced than India. If we can learn something from them we will learn. Fortunately, we have something to give them which they want. So, we make a bargain; we give them something they want from us; and we take something technical knowledge, know-how etc. which we want from them. There is nothing mysterious about it. It is a good plan on this bargain and both sides can profit from it.

Now, our relationship, as I know with the French Rare Earths Company, has been completely, above all, a straightforward business in which we have profited, and I hope they have profited too. And I am glad that perhaps the Chief Director of that Company is here today. We welcome that co-operation on that basis, which is to our mutual advantage. I have no doubt that in the atomic energy work in future, we will cooperate with other countries. We draw no line on any country. The country which can give us what we want, and give us with what we have considered, advantage. We shall take it and give it what we have in exchange for what it can give.

As you have been informed, this factory in the very first year of its existence has made a small profit of a few lakhs. This was really by having monazite treated for themselves by the French concern. Probably, the annual profit of this will go to over Rs.30 lakhs very soon. You remember half of it will go to the Government of India and half to the Travancore-Cochin Government. But, as I pointed out to you, its being commercially an extraordinarily profitable venture is rather by the way. Its importance lies elsewhere. We did this not to make profit, although profit is good, but we did this for other reasons — for more important reasons — because we are concerned with what are called 'strategic materials' which are very important. Nowadays, some of these have become still more important because of their increasing use in jet engines. While thorium is what is called a 'secondary atomic fuel', it is of great importance for the atomic energy development in the future. It is a secondary atomic fuel — remember, the primary one is uranium — and here in Travancore-Cochin you have not got primary fuel in good quantity; there is very little. You have got uranium much more in Bihar and elsewhere in India. But the secondary fuel can be used together with the primary, which becomes very helpful. Therefore, in order to make this very profitable, you have to combine activities in Travancore-Cochin and Bihar and other places. There again, you come up with this working on all-India basis.

I might inform you — it is not much of a secret — that the Atomic Energy Commission has drawn up a plan for the development of atomic energy in India during the next four years, and this has been agreed to by the Government of India. This includes the setting up of a medium-size reactor within three years. Now, I have absolutely no intention of telling you what a reactor is. You will find it out yourself later. Anyhow, a medium-size reactor is something which helps you in experimenting and getting to the next stage of producing atomic energy. The Government of India attach great importance to the development of atomic energy, because atomic energy will make a very important contribution to the world resources of power for industrial use, social use, in the future.

Jawaharlal Nehru visiting the Central Laboratories for Scientific & Industrial Research – 1952. In the picture (Left to right) are : Prof. S. Bhagwantam, Dr. S. Husain Zaheer, Pandit Jawaharlal Nehru, Shri Baldev Singh and Dr. P.M. Bhargava. (1952)

Pandit Jawaharlal Nehru at the Analytical Laboratory of the Central Fuel Research Institute, Jealgora, Dhanbad (March, 1952). Also seen in the picture are Sheikh Mohammed Abdullah (Prime Minister, Jammu and Kashmir State), Dr. J.W. Whitaker (Director, CFRI) and Dr. A. Lahiri (Asst. Director, CFRI).

Pandit Jawaharlal Nehru delivering address at the opening ceremony of the Central Building Research Institute, Roorkee (April, 1953). Seen on the dias (from left) are Shri Keshava Dev Malaviya (Parliamentary Secretary to the Minister of Education, Natural Resources and Scientific Research), Pandit Govind Ballabh Pant (Chief Minister, U.P.), Maulana Abul Kalam Azad (Union Minister of Education, Natural Resources and Scientific Research, Dr. S.S. Bhatnagar (Director, CSIR), Shri K. Billig (Director, CBRI) and Sardar Swaran Singh (Union Minister for Works, Housing and Supply).

Now, Mr. Choksi has told you how well and rapidly this factory has been built! Construction started in March 1951 — in effect, really it was in June 1951 — completed by July 1952, and the factory was in regular production by August. Thus, within less than a year and a half from the beginning, this whole structure has been put up and has been working for some time now. I must congratulate all those concerned who Mr. Choksi said, put up the factory in such a short time, and in particular, Mr. Choksi the person who is responsible for all that is being done here in regard to this factory. He referred to it in Paris four years ago or so. Again, we happened to be in Paris together, and the first talks we had there with the French concern. From those early days, Mr. Choksi has taken great interest in it, and in fact has shouldered this responsibility of putting it up. It has taken a lot of his time and energy in an honorary way, and there is no doubt that this factory practically owes a great deal to him more than anybody. I would like to express the Government of India's appreciation of the work done in regard to this factory. *(Cheers)* Well, I need not say much about the three high priests who form the Atomic Energy Commission in India, namely, Dr. Bhabha, Dr. Bhatnagar and Dr. Krishnan. In fact, I warn you not to allow them to develop as high priests — them or any other scientist if we want them to do good work. *(Applause)*

49. STUDY OF FOSSILS IN UNDERSTANDING OF HUMAN BEINGS*

(Speech at the opening ceremony of the Birbal Sahni Institute of Palaeobotany, Lucknow on January 2, 1953)

Prime Minister Jawaharlal Nehru today (January 2, 1953) performed the opening ceremony of the new building of the Birbal Sahni Institute of Palaeobotany, the foundation of which he had laid in April 1949.

Pandit Nehru was very happy to see the building completed and gave full vent to his feeling. He said : "Laying of foundation-stones has become a sort of profession for me. *(Laughter)* Sometimes, the laying of foundation is fruitful, at other times, it takes time to bear fruit. There are also occasions when the stone that I lay remains alone on the spot where it was laid" *(Renewed laughter)*.

Pandit Nehru said that when he first decided to help Dr. Sahni to build up the Institute some people objected to it, saying, what was the use of knowledge about stones millions of years old, "And they were right in a way", he added. There was a pause. Then amidst laughter, Pandit Nehru explained "Why worry about fossils millions of years old when you have so many at your right and left without, in the least, stretching the meaning of the word". "I wish", Pandit Nehru continued, "somebody was told enough to start an institute for research on these human fossils". "But", he warned, "I am afraid these fossils will not agree to examination and will put up terrific resistance creating tension".

"The study of fossils", Pandit Nehru said, "led to the understanding of human beings, since it helped in opening the doors and windows of one's mind. The most dangerous thing today was that the doors and windows of one's mind were closed. This was a great hurdle in the path of progress."

The Prime Minister emphasised that the progress in scientific knowledge of any country opened the minds of its people and this was of advantage and counted in the ultimate analysis. A big country had many advantages and disadvantages. The disadvantage was that,

* *The National Herald*, Lucknow, January 3, 1953

being self-sufficient, its people became introvert and did not like to learn from the people of the other countries. This closed their minds, and ultimately, they became narrow-minded. This was the most harmful attitude that any nation could develop and it was due to this attitude that India had to undergo great sufferings a number of times. He averred that this narrow-minded attitude still existed in India, though not on a big scale. However, in the present situation this attitude of isolation could not be maintained for long. "It is specially difficult when the world was knocking at our door", he said.

Pandit Nehru was sorry that the scientists in our country did not get the respect and love that was their due. At best, they got lesser respect than the holders of high offices in the country. Someone or the other had to occupy the chair which could not be left vacant., *(Laughter)*., though he might not be as big as the chair. "But really great is the man who gets the respect of people without any office", he said.

Pandit Nehru paid glowing tributes to the late Dr. Sahni and said that "the very fact that a large number of scientists had come from foreign countries specially to attend this function showed the regard in which Dr. Sahni was held in the scientific world. It was a misfortune that he died just after starting this Institute and at an early age," he added. Recalling his first meeting with Dr. Sahni, Pandit Nehru said that he was impressed by his (Dr. Sahni's) sincerity. He was attracted by the proposal put up by Dr. Sahni for building a research institute of palaeobotany, partly because of his interest in the subject that he had developed during his stay at Cambridge but mainly due to the personality of Dr. Sahni. He was a balanced man, a man of even temper like every great scientist. "Such men are always few", he added.

The Prime Minister expressed his pleasure at the good work that was being carried on in the Institute and in the other research institutes of the country. These institutes, he said, were putting India on the map of the world of science.

"I feel immensely happy when I see young boys and girls doing good work in these research institutes and laboratories because I feel that they are laying the foundation of our progress", he concluded.

50. UNIFORM CALENDAR NECESSARY*

(Message sent to Prof. Meghnad Saha, chairman of the Calendar Reform Committee at its first meeting held on February 21, 1953)

"I am glad that the Calendar Reform Committee has started its labours. The Government of India has entrusted to it the work of examining the different calendars followed in this country and to submit proposals to the Government for an accurate and uniform calendar based on a scientific study for the whole of India.

"I am told that we have at present 30 different calendars, differing from each other in various ways including the methods of time reckoning. These calendars are the natural result of our past political and cultural history and partly represent past political divisions in the country.

"Now that we have attained independence, it is obviously desirable that there should be a certain uniformity in the calendar for our civic, social and other purposes and that this should be based on a scientific approach to this problem.

"It is true that for governmental and many other public purposes we follow the Gregorian calendar, which is used in the greater part of the world. The mere fact that it is

* *The Statesman*, New Delhi, February 21, 1953.

largely used, makes it important. It has many virtues, but even this has certain defects which make it unsatisfactory for universal use.

"It is always difficult to change a calendar to which people are used because it affects social practices. But the attempt has to be made even though it may not be as complete as desired. In any event, the present confusion in our own calendars in India ought to be removed.

"I hope that our scientists will give a lead in this matter."

51. BUILDING RESEARCH FOR RURAL HOUSING*

(Speech delivered at the opening ceremony of the Central Building Research Institute, Roorkee on April 12, 1953)

Two years ago, I came here to be present at the foundation-stone laying ceremony of this Institute which has since grown and become this very attractive building. This laboratory is a unit in the series of eleven. The original plan we had of building the national laboratories has been completed with the opening of this Institute. Of course, we shall have more research institutes and more laboratories. In fact, some more are actually under contemplation. But the completion of the chain of eleven national laboratories, the map of which we made a few years ago, is, to my mind, a very great and historic step in the advancement of our country. Scientific research is the only sure way by which science can be harnessed for the best of public use, and for the betterment of nation. Many other countries have beaten us in such developments, and though we cannot make up the work of centuries in a few years, there is this distinct lesson to be learnt that humanity can be lifted out of misery only by science and its proper use.

If we do not use science, we will be a backward country, and a third-rate nation. Even though we have completed the chain of eleven national laboratories, we must not be content with this achievement. In fact, this is only the first step in the difficult ladder of progress which we have to climb. It must always be our endeavour to increase the pace of development of the country.

It is a dangerous thing to assume that whatever we are doing is enough. To my mind, complacency is a dangerous thing — the person who is complacent naturally falls out of the race. I want that we should be impatient and dissatisfied with the pace of our progress, so that we always have the desire to increase the tempo of our work. But we must also remember that we have to change this impatience into activity and not froth and foam as many people are tending to do these days. Such people are really stumbling blocks in the nation's path to peace and prosperity. Our hurry to increase the pace of development should not be such that we stumble and fall, thus bringing to a standstill all the work in the country and jeopardizing its very stability.

The task before every true Indian today is to help in bringing about a speedy advancement of the standard of living of the 360 millions in the country. It is not easy to give a new face to so large a country which contains one-fifth of the world's population. Perhaps the only way of doing this difficult job is to bring about a temper of science so that it takes the people out of the rut of sluggish habits and brings about an era of blissful prosperity. The task is immense and the heart quails before it; but we must move forward with boldness and imagination. We have now to see how we can attack the roots of poverty, so that we can sweep it out from every house. The biggest problem today is how to improve the

* Director, Central Building Research Institute, Roorkee.

condition of the villages. The Five Year Plan is intended to tackle the problems of the villages. This is being achieved through research and by employing the findings of such research to help build better houses and community facilities for the masses. These things cannot be done by the Government alone; the people too must cooperate. It is a huge task, but at the same time it is great fun.

We have made these national laboratories basically to improve science and adopt scientific methods which will suit our country's needs. In the Central Building Research Institute which is the last in the chain of the eleven national laboratories, methods of building construction will be researched, so that we can make good houses speedily. In the past few years, the cost of construction has increased considerably, and it is imperative to investigate how we can reduce these costs. This is not a new school or college but it is a basic institution. From here waves of knowledge will emanate to improve housing in India and ensure better living conditions for our people.

I am always happy to be wherever constructive work is being done, and I hope that under the guidance of Dr. Billig[1], an experienced scientist in the field of housing, great benefits will accrue to the nation from the work done at the Institute. I must congratulate Dr. S.S. Bhatnagar and others who have been working on the plan of the Institute and who have helped to see it through.

The people of Roorkee are fortunate to have such a mansion of science in their midst but they and those who work in the laboratory must never forget that the Institute belongs to the Nation. I rejoice today, because I see that the new India is in ferment and out of the womb of this ancient motherland, something magnificent is being born.

52. ELECTRONICS IN NATIONAL DEVELOPMENT AND DEFENCE*

(Speech at the foundation-stone laying ceremony of the Central Electronics Engineering Research Institute, Pilani (Rajasthan) on September 21, 1953)

Prime Minister Nehru, stressing the importance of science in the life of the people, said here today (September 21, 1953) that a country where science was neglected would become dependent on others and ultimately lose her freedom.

Pandit Nehru, who was speaking on the occasion of the foundation-stone laying ceremony of the Central Electronics Engineering Research Institute, added: "The future of India is connected with what we are building here. We will not get immediate results from such institutes, but they will help in laying strong foundations of new India. Such institutes are vital for the life of the country and will give good results in the future."

The Prime Minister said he was happy to come to Pilani which was growing into a big centre of learning. He had visited it earlier when it was in the midst of construction.

"I am happy to be here in Pilani, situated in a more or less desert area, where a big centre of learning has been built. I have come here to lay the foundation-stone of the new electronics engineering research institute this time. But I would have been happy to come here otherwise also."

Pandit Nehru said that the electronics institute was necessary for the good of the country in many ways. It was necessary for the defence of the country. The Indian army would also benefit from it. It would also help in furthering other development work in the country.

1. Dr. K. Billig was the first Director of the Central Building Research Institute, Roorkee.

* *The National Herald*, Lucknow, September 22, 1953.

The Prime Minister asked the people to pay more attention to swadeshi goods. This did not mean that the country should isolate herself and stop trade with others. But the old swadeshi spirit had to be revived in the interest of the country's economy.

"We should try to make ourselves independent of others in as many ways as possible," he said. "This holds good most in the economic sphere. We should not have to depend on outside help for our essential needs. If we do so, we will stumble and our country will again become a slave country even though on paper we may still be classed as free."

In the world today, Pandit Nehru said, there were 60 to 70 countries on the map, but several of these were being tied more and more to a few powerful ones. "We do not want that our country should be like those countries. We want to stand on our own feet and for this we must work hard to improve our economy in every way."

The world today was a world of science, Pandit Nehru said. Scientific progress in the country was very essential for improvement. Otherwise, the country would remain backward and outsiders would be in a position to dictate terms. "If we depend on outside powers they will be able to throttle us," he said.

Referring to the problem of unemployment, the Prime Minister said that this was a bad thing as people who wanted work did not get it. But there was another kind of unemployment, the "unemployment of the higher order" comprising those who lived off the back of others. This parasitic class was as large a drag on society as the real unemployed. Both were useless for the country's progress.

He included some fifty lakh sadhus in India also among the two categories of people who lived on the earnings of others. There might be some very high personages among the sadhus and the like, he said, but the majority were mere parasites living on public charity. All this was bad for any country as they were consuming without producing anything.

"This kind of business of these sadhus living on other people's earnings can be classified as theft even though in law it may not be termed so," Pandit Nehru said.

Pandit Nehru deprecated the tendency on the part of some people to resort to fasts to get something done. This kind of thing, he said, was "fantastic nonsense". Such people gave previous announcement of their forthcoming fast which was published in newspapers. The undertaking of fasts unto death was a very strange phenomenon. "Do you think the country can progress if people behave in this stupid way?" he asked. "This has become a big joke. We have to understand whither we are going. The younger people must understand this more as they will have to bear the responsibility of the country in the future," he said.

The Prime Minister said that whatever economic policy was followed, a lot of hard work was necessary to make a success of it. Whatever progress had been achieved in America, Russia, China and England was done through hard work although different policies were followed in those countries.

53. IMPORTANCE OF ENGINEERING PERSONNEL IN NATIONAL DEVELOPMENT*

(Inaugural address at the twenty fourth annual meeting of the Central Board of Irrigation and Power at New Delhi on October 26, 1953)

It has become a common practice with us — this applies to me also to some extent — to organise gala functions at a time when we should all be absorbed in work of great magni-

* *"Irrigation and Power"*, Central Board of Irrigation and Power, Vol. II, No. 1-4, January 1954, pp.23-30.

tude. There is a lot of effort for pomp and show and very little for work. I am not particularly referring to the Board but it is well known that we do exhibit ourselves as though we were some commodity. This is true of all organisations — Government or non-Government.

In Delhi, nowadays, there are any number of conferences, and they are so many that one does not find time even to breathe. Of course, I too attend several of them because I am very much interested. How I wish for some days that silence should prevail in Delhi and all the conferences should be stopped. This does not mean that they should be stopped altogether.

New Delhi is a jungle — a jungle of able men, still it is a jungle. You get yourself lost in this jungle because there are thousands of offices and roads. It is rather difficult to control this and it is for scientists to examine this problem. What sort of a jungle is this? It is a jungle of administrative mazes and labyrinths. True, the activities of a growing nation must expand but how and in what direction should they expand? The child grows and looks handsome only when the body along with the hands and legs grows proportionately. If the hands alone grow and not the feet, the growth is defective. Similarly, if an office does not expand on correct lines, another kind of defect results and that is, good work will not be turned out.

In India, as in any country of the world, there is a great need for engineers, and as our plans and schemes get materialised as we hope, we shall be needing more and more engineers. Why only engineers? Take, for instance, teachers; we need them in great number but we cannot recruit them straightway. As our educational development plans mature, we shall be needing *lakhs* of teachers. And, unless we foresee even now what we need after two or five years, we cannot plan in such a way that we have enough of trained men to teach after two or five years. In any undertaking, there are a number of plans and always some difficulties and bottlenecks. We have to improve and extend our health services but we cannot achieve this by merely planning on paper. Even money which is required in large amounts will not help us achieve this. Ultimately, this could be done only by experienced men who have had sound training. But it takes time to acquire experience, whether it be engineering or medicine or any other profession one has to learn and work hard and gain the necessary experience. Therefore, if we plan to extend our health services in the next five years, we must begin from right now, getting prepared for it, so that we have the requisite number of qualified doctors after five years. Training and experience are therefore quite essential for a doctor or a health officer, more so for an engineer. It will be very risky to entrust an engineer who does not know his work with a great responsible task for which he does not have the necessary experience, for it can result in a lot of damage. The country can sustain small losses but losses in works of great magnitude cannot be tolerated because their repercussions will be serious and injurious. You know very well that if we undertake construction of a dam somewhere and if by some reason of neglect, or inexperience, the dam gives way at a future date, it will result in untold loss to the country. Not only will it be a great monetary loss, but it will also create misery and ruin everywhere. Therefore, we cannot afford to take any risks in such undertakings.

In such works, it is not enough if we have men with mere academic degrees, we should have men with ripe experience; they would not commit mistakes even inadvertently. Their eyes are ever vigilant and their hands are ever ready to work. But it takes time to have such men as proper and thorough training are needed to make such men. It leads us to one obvious conclusion that, whatever be our plan, we must keep one fundamental and basic fact in view, and that is how best to train and equip our men properly, be they engineers or doctors or teachers or members of any other important profession, so that we may have men with training and experience when we need their services. Though this fact applies

to all fields, it is much more essential in scientific and technical activities. In these fields, we cannot even allow slips to occur because slips can cause disaster.

And if we do not train our men properly it means only two things. Either the work will have to be entrusted to second or third rate men or we shall have to depend upon the trained personnel of other countries. I have no objection to foreign personnel being employed when there is need for it, because work cannot be postponed or suspended simply because trained men are not available. Let it be clear, however, that I do not like this very much. We should import foreigners only when there is absolute necessity. But, why should there be such necessity? Why should we not so arrange as to have no such need? I agree, of course, that in India the number of engineers is less than our requirements but even then the number is large enough. We should endeavour to increase their number and give opportunities for such training. Our country has produced a good number of engineers of high calibre and some of them have risen to international reputation. We have ultimately to depend upon our own men in engineering as well as other fields. Opportunity for further training, if necessary, should be given to our engineers so that we have a large number of engineers of high quality. We may have foreign men if we must under extraordinary circumstances, because we should never allow work to suffer. A big work can be completely ruined by employing an inexperienced Indian in preference to a highly experienced foreigner. If we have the doubt whether or not we have the requisite experience for an important project, I have no hesitation in employing an experienced foreigner; because the work will not be mishandled and secondly our men will have the opportunity of getting training and gaining experience. Normally, however, we shall have to do the work ourselves. It is of no use to depend on others and look to them for help. We must keep in mind this basic fact in all our plans, that trained personnel should be available as and when we need them and this must not be left merely to chance. All planning is nothing but this. When we are asked to undertake ten or twenty schemes, it is no use that we simply sit down to decide the number of schemes we will be able to take up. We have hundreds and thousands of ambitions in our minds, and if we cannot undertake all at once, we have to decide what and what not to do. Planning is essentially to prepare for the future. We have always to keep in our mind the picture of our country that we plan to have in the next five or ten years and then go forward to that end. For example, let us visualise the improvements that we should have in our country. Then if we must have those improvements, we should have with us suitable men to prepare plans for such improvements. We must produce enough materials in our country so that the execution of the plan shall be easy and economical. And we should decide as to what is within the scope of our endeavour and thus decide upon the priorities in our plan. This is I think what planning should be like.

In our country, as in other countries probably, there is a weakness and a tendency to look to the sky and stars rather too much for guidance and to try to foresee the future by astrology and the like. Blessed be those who are interested in this way. But our work lies in visualising the future of our country not by looking to the stars and basing our calculations on their movements but by assessing our strength, resources and means and knowing how best to use them. Several factors and efforts go to the making and developing of our country, but the engineers probably have the most active role to play. For, the engineers have the largest share in the execution of any plan. Of course, there are difficulties inherent in every creative activity and it is very difficult to say which profession has this most. To my mind the engineer plays the maximum part in creating things; by 'engineers' I do not mean engineers of any particular branch but all branches included. I attach great importance, as you know, to the fact that our engineers should be of high class and good quality, in fact the very best. For, it is never profitable to get the job done by second rate men. Neither the job is done well nor there is progress in this manner. We should therefore

have engineers of high class and quality and plenty of them, and, they should be properly absorbed.

The Chairman has raised a few questions with regard to the fact that while previously engineers used to be Secretaries to the Government, they are no longer so now. This question can be viewed in a different light, though I have no objection to the engineers being Secretaries to the Government. But I have objection to one thing, and that is, those who are specially qualified for a particular profession should sit in the office doing quill-driving. I consider it a waste of their talents, knowledge and experience. Enough number of persons who can use their pens well in the office are available in India, but the number of good engineers is inadequate. But what is the difficulty, and why is it so? This is because, for some reason or the other, we have classified people according to the position occupied by them in their official life and we consider one class better than the other accordingly. Everybody desires to go to the upper class. But the irony of it is that such classification and gradation itself is absurd. You all know Prof. Einstein who is well known in the scientific world. He is working as a professor in an American university and is engaged in research work there. But how many of you, may I ask, know the name of the principal of that university? You do not know it. You do not even know the name of the highest officer of the said university, but you know the name of one of its professors because of his exceptionally brilliant work. It is plain that according to the rules and regulations the head of the university is the superior officer of that professor and he has the power to appoint or dismiss any professor. But, in the eyes of the world, Einstein is a much greater man – one amongst those who count in the world. His name will be remembered not only now but even after his death.

Our services are steeped in a system of gradation or caste system which is probably the legacy of the British rule. This reminds me of the old system but perhaps one could then explain such a classification because it was the very basis of the administration. All persons in the employment of the Government were under the viceroy, who was supreme and perhaps such an arrangement was suited to those times. Such a pattern is totally out of place in the present set-up and conditions. But the pity of it is that people's minds still cling to the old system. It is possible that a renowned first class engineer might be much more needed by us than any of our Secretaries. Secretaries are available in abundance but engineers are few. This can also be the case that though the engineer is working in his own sphere, yet in official status Secretary is, in a way, his superior. This is just a gradation for whereas engineers have a reputation all over the world, the Secretaries are not known by any one outside Delhi. What I am driving at is, that this is a wrong way of assessing a man's worth, simply by the salary drawn by him or the designation attached to his post. Such a notion does not appeal to me because, as you know, I entered the administration at quite an advanced age. Whatever I learnt about assessing a man's worth had nothing to do with his salary, with his dress or with his house. All my life I have gauged people from altogether a different angle, and I still believe in the same method. It is quite possible that I may consider a peon with more pride and respect than his own officer, and I do not see any flaw in it.

So, gradually we have to change our old attitude in regard to this. Ultimately, respect is due for work and not for the salary drawn. For example, one may be a famous poet, an honourable man but his income may be meagre; still, he should and will be respected much more than officers drawing high salaries. In short, this idea of money being made a yardstick for assessing a man's worth has clouded the issue and created confusion. The practice of grading people according to their status in official capacity should vanish gradually. As I told you earlier, the need for engineers will be increasing day by day in India, – nay, in the world. Even now, there is a great need in the world. Today in every country which

progress and progresses in any field, whether in industry or in any other branch, the engineer comes into the picture. There are so many types of engineers. Even in irrigation and power alone, there are so many. By engineer I mean a worker. An engineer who sits in the office and does not know how to work with his own hands is useless. However big an officer he might be, and whatever his age might be, he should be retired. The test for engineers should be whether they are working with their own hands or not. An engineer becomes useless and reaches the stage of retirement when he begins to desire an office chair of comfort and to merely issue orders.

I would say that I want all people, whether engineers or non-engineers, to possess an engineering approach to the problems facing them. You may call it an engineering approach or a scientific approach or take them together and call it a scientific approach. The scientific approach means that a person should have a systematic way of thinking and should arrive at the reality by reasoning. The engineering approach would be scientific approach coupled with the urge for creation, the urge to make and produce new things for the common good. When the people of a country have such a combined scientific approach to their problems then that country progresses. For this, it is not necessary that all people should study engineering but it is essential that all should have the right and proper approach to their problems.

In your address, you have covered a wide range of problems and thrown light on some of them and I am wiser for it. Many of the problems are worth serious consideration and I do not propose to talk about them today. I will just repeat one thing, namely, that our future status amongst other nations and the good name of our country shall entirely depend upon our work and work alone. Nothing will happen by merely telling repeatedly "we are all workers". Of course, we have done big works. Our river valley projects like Bhakra, Nangal, Damodar, Hirakud, Tungabhadra etc. shall all remain landmarks for ever. Yes, it is our job to do these gigantic projects. We have to successfully complete thousands of projects in a planned way. We must always remember that in all our undertakings we have to carry with us our people and keep them well informed. This is a very important matter. Whether he be a labourer working under you or whether he lives in a village or town, confide in him; then only big works can be done. Big works cannot be executed in vacuum. That work alone is great which appeals to the commonsense of the masses. It is really, if you carefully think, an extraordinary thing to regenerate a country as we plan to do and as we are doing. It thrills one to feel that one is engaged in such a great and useful work. The same thrill should also be felt by the masses.

Now let me warn you against one pitfall. Be careful and vigilant about the work you take in hand. As I said earlier, there should be uniform development everywhere. I see a strange mal-development in the country and it conjures up before me a figure of a man five feet high having arms four feet long. This is worth close study; the way the Government organisations and departments multiply as also the staff engaged by them, leads nowhere but to waste. Then arises the problem of coordination between them who have grown so big, for, each is an independent unit. A coordinating agency is created and as usual, its size also goes on increasing. Then again arises the problem of how to coordinate the activities of the co-ordinating agencies. All this is at once baffling and confusing. I am astonished to see all this and in my opinion, this should be stopped; otherwise, I tell you the head will be small and the body will be increasing in size. Such mal-development in our organisations is dangerous to our country. And this is rather ugly, for, it is the head that is essential for doing work. In other words, it means that quality will suffer and quantity will increase.

Now I want to say a few words further. I don't like to go on talking and talking. In a few days I will be going to Bihar and will be flying over the areas recently devastated by

the floods there. I will also talk to the engineers of that State. Though I have read enough details of the havoc created by the floods, seeing the affected places with one's own eyes will give a better idea. You know, lots of things have been under active consideration about Kosi for the last so many years and probably some action has also been decided upon. I am glad to know that schemes are to be taken in hand to prevent floods in the river Gandak. Whatever is within our conception and whatever is within our capacity, that is almost that we can do; how can we do more? There is no use of talking unnecessarily.

Coming to the problem of floods in Bihar, should we build a dam there or do something else? The problem of floods in Bihar is one of the major problems which need careful study on scientific and engineering lines. We should know how to tackle this problem. I am not prepared to admit that we are helpless. These floods are governed by natural phenomena and we must consider what we should do. We should carefully study the rainfall during the last 40-50 years. What are the meteorological reports that we have? What do they say? What cycles of floods are mentioned therein? When do high floods occur and when low floods? These require careful study. The Meteorological Department has been with us for nearly 100 years now. Recently that Department celebrated its centenary and we have data and figures collected over the last 100 years. We should examine all this data relating to floods and also study the hydrology from every angle and arrive at some decision as to when these floods occur; what are their causes and cyclic periods. This is the scientific approach to the problem. When floods appear we run with shovel in our hand to collect earth for preventing floods. That is neither a scientific nor a planned approach. The proper approach is to study carefully what should be done in the affected areas, may be in Bihar or in any other part of India.

I do not like that for these studies a big office should be opened forthwith and about hundred or fifty men should take the whole year to decide the number of staff necessary, that there should be elaborate application forms for recruitment and that the senior members of the Public Service Commission should then start considering them. And after three years, decision is to be taken as to who should be appointed in the organisation. This is all waste of time and energy. I consider that this is not a matter to be delayed like this. The proper thing would be to form a small unit consisting of a few engineers who should select a particular area, whether in Bihar or Bombay, and study its hydrology and its effects. Only such areas where there is immediate necessity and not the whole of India should be taken up for such study. But again, we may wander aimlessly — we would plan big schemes for studying hydrology. India is a vast country, and so it will be proposed that there should be one Director-General of Hydrology. Then we will think how many Deputy Director-Generals should be under him. Next we will think about Assistant Director-Generals. Then we will think of some high officers or an inspector above all these people. The aim is to evolve a reasonable scheme. We then require accommodation, both for office and residences. Where will the Director-General of such a big office live? Again, there will be proposals for a Secretary, Joint Secretary, Deputy Secretary, Assistant Secretary and so on. So to say, it will take two to three years in deciding these proposals. When these proposals would be ready, we will forget what for we started all this! We may not even remember it. This is all strange and funny. In Delhi, you would have noticed, there are no Directors; all are Director-Generals! We consider that bigger the designation for them, higher is their status. What can you say to this?

I have spent my life in quite a different sphere. It is six years since I am in this office and yet I fail to understand what is this affair. I do not want that you should convert the whole of India into Director-Generals. What I want is that you take up only one area at a time; material is with you; and after planning for this area, then take up another. Why, consider even Bihar the big and foremost problem. What should we think of? We have to

Pandit Jawaharlal Nehru in the Composite Wood Branch of the Forest Research Institute and Colleges, Dehradun (December, 1953). Also seen in the picture are Dr. D. Narayanamurthi (Officer-in-charge, Composite Wood Branch) and Shri C.R. Ranganathan (President, FRI and Colleges).

Pandit Jawaharlal Nehru on a visit to the Indian Statistical Institute, Calcutta (December, 1953). Addressing the meeting is Prof. P.C. Mahalanobis (Director of the Institute and Member, Planning Commission).

Nehru addressing the gathering at the opening ceremony of CLSIR (Hyderabad), 1954. In the picture (Left to right) are : Jawaharlal Nehru, B. Ramakrishna Rao, Pince of Berar, Princess Nilofer and S. Husain Zaheer (1954)

study the basic position there in the light of rainfall and hydrology data. Then we should think what we can do. This way we should approach these problems in a scientific manner. But this approach needs only three or four brains, not a big staff. I do not want a big officer to come to me and say, "We have to do this and that; we want so much staff; we want so many peons because our status is so high that each should have three or four chaprasis." I have neither any complaint nor any grudge against peons. They are very good men. But as long as this practice of getting the work done through peons lasts, Delhi will not be out of the old rut. The new age will dawn only when there are no chaprasis. But the practice is entirely different. Even in this age of telephones, nobody wants to talk even to the neighbouring room. Everybody wants to send messages through peons. May be, we need a couple of messengers or boys, surely not a big crowd of peons. I have heard that before the war there were only 3,200 peons here in Delhi but now this has increased to 19,000. No doubt, the work would have somewhat increased, but the pomp has increased much more. This is puzzling. The poor chaprasis do work and they are not to blame. Nor do I mean to dispense with them. But I mean the mentality. I will tell you what this is — one is the pomp of the office; the other is the pomp of the staff which cannot make a move. They sit in their rooms, press the button and the peon comes. May be just two steps. They won't like to go personally and discuss for five minutes. They won't even like to talk on telephone. One will be writing and sending long notes to the other because they have their own rooms. What fun is this? What is this method of working? If you plan and execute your projects this way, not only will they not be done, but also we will waste time and money. This is useless. We have to work in a different way. This is a very important aspect, as I told you, which requires deep consideration. I have several other things in my mind which, I think, can be done without any pomp and creation of big departments. When I see the immense devastation caused by floods and sometimes by famine, I at once think what are the basic causes of scarcity, famine and floods. This study has to be done by a few men only, and without peons. They will not be provided with any peon and they will neither be designated as Generals of any army. We just want a few men who can work as scientists. After detailed study they should send the report which can form the basis of our planning.

Now, if you examine your problems in this way, I am confident you will be successful in your projects because on you — I mean the engineers of India — rests a great responsibility and you have to show how you shoulder that responsibility.

54. ROLE OF FUNDAMENTAL RESEARCH IN DEVELOPMENT OF SCIENTIFIC CAPABILITY*

(Speech delivered at the foundation-stone laying ceremony of the buildings of Tata Institute of Fundamental Research, Bombay on January 1, 1954)

Most of the speeches that we have heard today have been largely concerned with mutual congratulations! *(Laughter)*. Well, it is all very pleasing to congratulate each other, and right too. Let us consider and acknowledge the work done by others on this occasion. We see that beautiful shamiana and all that, and you will presently see me fixing that foundation stone, but we do not see all the work that has gone behind it.

You do not see all the work that lies behind it – the tremendous labour, thought and discussion. I might take you into a little secret. A reference has been made to me in this

* i) Director, Tata Institute of Fundamental Research, Bombay. ii) Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

connection that I helped in getting this land for the site. That is true. I did come to the aid a little – it was no easy matter I can tell you, and the Defence Minister had to go into repeated conferences with the Prime Minister on the subject *(Laughter)*; and ultimately they convinced each other and there was an unanimous decision *(Applause)*. But, it is rather odd that on this New Year's Day we should gather here and I should perform this function: odd in the sense that it does represent – if you think about it – a step forward in a new direction. Well, there are seldom any jumps like this and if this step is taken today there are many steps behind it. Nevertheless, some steps stand out. We are taking this step, we are taking it for this Institute – whatever it is going to be called – the Institute of Fundamental Research. May be its name has to be revised because its work is going to be a much bigger, on a bigger scale. But anyhow, it somehow brings to my mind – at least it brought to my mind, and I want to put this idea across to your mind – that we are stepping forward into some kind of a new age, I mean not only in India but all over the world. We, who live through this period of transition and change – we are so occupied with our many small problems — even though those problems of transition may be big as they deal with world war or peace and the like — and that is a pretty big question. Even so, perhaps this age may be known in future as the age of transition to the atomic age or nuclear age or call it whatever you would.

Something very important is happening to humanity. Dr. Bhabha mentioned that we might be on the eve of a momentous discovery. That may be so, but nothing is happening on the 1st of January anyhow. You might say, if you like, that so far as the world is concerned, we entered this age when the atomic bomb was hurled at Hiroshima. At any rate, the world became conscious of it, although it started earlier. Now this is the important fact to realise, that this enormous change that might come about in the world in the course of some years — not overnight but still pretty rapidly — may be in 10 years or 15 or 20 or 25, I do not know. But that is really nothing, considering the big change — provided, of course, always that these vast forces and energies that are released do not turn on their inventors and swallow them up. It is well known — history teaches us — that often the men who make a revolution become victims of the revolution. As revolution is sometimes followed by a counter-revolution, the same forces that the revolution releases sometimes kill the makers of the revolution. Well, we have heard of various major revolutions in human history — the American revolution, the French, the Russian, the Chinese — these stand out. But obviously a far bigger revolution than all of these put together was the Industrial Revolution, which changed the face of things in this world; and an equally big, or bigger revolution may be the one brought about by gradual command over atomic or nuclear energy.

When I say that there is a danger — there is a possibility — of these vast forces, instead of being utilised for the humanity's benefit, tearing up humanity, you realise that there is that danger through war or the like. I am surprised at the casual way people talk about the war; still more surprised at the casual way they talk about the use of atomic bombs and atomic energy in the war. Either they do not understand what they are talking about or — I do not know how to say it — they have become completely callous to the future of humanity.

Here are these terrible forces coming more and more under the control of man and that unfortunate man who controls them cannot even control himself. That is the problem of humanity today and either he controls himself and then controls the other thing or the other thing controls him and he vanishes. Well, I do not know just what will happen in the future. But anyhow, it is up to us to try to understand these forces with such resources as we possess, such ability as we possess. If our resources are not so great as we would like them to be, we have certainly first-rate ability and we can develop it. We want to give opportunities for that ability to develop and to increase our resources to that end.

This Institute, of which I am going to lay the foundation-stone presently, is one of the major ways in which we want to develop that ability — with those opportunities for fundamental research which is so basic today if we are to understand the world today and the constant changes that are taking place in human knowledge. So we attach very great importance to this matter. When I say "we", I do not know — it might mean the Government of India— it might mean anything. And therefore, we have collaborated in this matter fully and will continue to do so — the Government of India, the Government of Bombay and the Tata Trust.

Now, I am not going to add to what has been said in praise of various persons, but I should like to say that the work that the Tata Trust have done in the advancement of science in India has been commendable in many ways. One is the mere fact that they have taken interest in the advancement of science, but more especially, because they have the vision to look ahead and they have advanced it equally in certain pioneering ways, which brought them no profit and was not intended to bring them any profit. Now the profit motive may or may not be commendable — I have nothing to say about it. But certainly it is commendable to do this thing without a profit motive and have some larger vision before them. Therefore, I may add my word of appreciation to this tradition of the Tatas in the fostering of pioneering work in science. *(Applause).*

Dr. Bhabha has mentioned to you that in this Institute here he has divided up the work they might do in regard to nuclear energy into two parts; one part which is — which may be partly secret; the other in which there need be and should be no secrecy. Now, so far as this Institute here is concerned, there is going to be no question of secrecy about it, unless some very grave emergency arises. That is a different matter. In this, like in any other Institute, science in fact does not flourish in secrecy. It is a bad thing, having too much secrecy about scientific work. Very often, modern advancement in science is due to the enterprise of commercial firms; that enterprise is good, but they develop secret processes and that is not so good because they do not spread to others.

So, science should have as little secrecy as possible. In this Institute there will be none. Personally, I do not see why there should be secrecy about the other — the other work we might do elsewhere about the atomic energy. But unfortunately other countries — and these other countries are more advanced than we are and if we have any association with them in regard to this work, they want us to keep it secret, even if we do not. So the other work has to be somewhat secret because of our association, more than anything else. So far as this is concerned, we shall let it be a higher institute of research and learning; which may not be connected with the University of Bombay, but I have no doubt that the University of Bombay and the students and professors of Bombay will somehow, in a distant way profit by it — may be after some time in a more intimate way. And the Institute itself will not be isolated somewhere living a life apart from the common humanity. But living in this great city of Bombay, with its cultural, educational, research activities it will also have a somewhat more human outlook, I hope.

So, I congratulate all those who have been associated with this undertaking, and I hope that this Institute will benefit India and mankind. *(Cheers)*

55. REGIONAL DEVELOPMENT THROUGH SCIENTIFIC RESEARCH*

(Speech at the opening ceremony of the new buildings of the Central Laboratories for Scientific and Industrial Research, Hyderabad-Deccan on January 2, 1954)

Jawaharlal Nehru said that not only laboratories in different disciplines but also general-purpose regional laboratories were necessary for the scientific progress of a big country like India. He emphasized the necessity of impressing upon the common man the need for scientific progress. For ultimately, in a democracy it was the public opinion that would prevail, he said. The Prime Minister was declaring open the new buildings of the Central Laboratories for Scientific and Industrial Research here.

Jawaharlal Nehru referred to the scientific progress the world had made during the last few years and said that science had no doubt changed the whole world. Man had conquered nature to a great extent. He had exploited natural resources considerably. He had discovered and utilised the power and energy of electricity and the atom. But, at the same time certain things like the atom bomb had been used for destructive purposes.

While the people in India had begun to realize the importance of science, he thought there were still many who did not realize the necessity or importance of scientific research. They had to impress upon the common people about it. They should know all these things in all their aspects.

Mr. Nehru said that a scientist should not have a narrow outlook. He should have an open mind. Science being a search for truth, they would have to accept the result of their experiments. The mind should be developed in that way. In India some people, as in other countries, suffered from narrow-mindedness. Narrow-mindedness should go, if the country was to progress.

The Prime Minister added that without science a country would be nowhere, however able the administrators might be. Therefore, it was necessary that scientific research should progress in the country. Scientists and engineers were far more important than administrators. The administrator had no doubt his place but that was secondary to scientist and engineer. They should create an atmosphere wherein people who understood these things could come forward and accept responsibility.

Mr. Nehru said that India had remained behind in scientific progress, but it was no fault of her people. They had no opportunities. He added that now good work was being done in the various scientific laboratories and institutions in the country.

Dealing with the division of work among the various laboratories, the Prime Minister said that for a big country like India, both general and specialised laboratories were necessary. It was desirable to have the laboratories spread out in different regions so that scientific outlook was spread in the country. But, he added, there should be no waste of energies in regard to the work done by these laboratories. One individual or institution could not do all jobs thoroughly and efficiently. They should not do the work in a manner that lowers its quality, as was unfortunately the case with the universities. They should, therefore, set up their laboratories in such a way that there was no waste. Duplication of work was necessary to some extent and to the extent it was necessary, it was not a waste, he said.

Mr. Nehru felt that Hyderabad should have a general laboratory for the South. He referred to Dr. Zaheer's address about the laboratories contributing to the progress and prosperity of the State and said he did not understand why the benefits of these laboratories should be limited to the State of Hyderabad alone. The State would no doubt be benefited by these laboratories but the neighbouring areas should also be benefited by them. They

* Director, Regional Research Laboratory, Hyderabad (In

could not have any demarcation in scientific progress. He hoped that the Hyderabad Laboratories would be doing excellent work and contribute to the progress and prosperity of the whole country.

The Prime Minister stated that many laboratories were opened during the last few years in the country. At times, he had a suspicion that people might be wondering if the magnificent buildings of these laboratories would guarantee scientific progress. He said beautiful buildings were necessary but they should not exhaust all their energies merely on constructing buildings. For, then, work would suffer.

Incidentally, Mr. Nehru referred to the dignity of manual labour and said there was a tendency in the people including students to look down upon manual labour. By sitting on a chair and issuing orders or listening to lectures they seemed to think they were doing big work and doing manual labour was mean.That was not so, he said. The social structure of the nation was such that attitudes of this type would not fit in the modern times. He was glad that outlook was now gradually changing.

56. RELEVANCE OF SALT RESEARCH TO LIFE OF THE PEOPLE*

(Address delivered at the opening ceremony of the Central Salt Research Institute, Bhavnagar (Saurashtra) on April 10, 1954)

It would appear that all that could be said about salt, on this occasion, has already been said by the previous speakers and there is now little left for me to say.

To my mind, the subject of salt does not mean the eating of any particular variety of salt, although obviously there is hardly any commodity so essential as salt for every one of us and even for the animals. This is the reason why salt features so prominently in the history of nations. In France, before the Revolution, there were riots against taxation of salt. As salt is the symbol of commodity essential to all classes of society, any taxation on salt amounts to taxing the common man. In other European countries also, there were salt riots which were forcibly suppressed. In our own country, Mahatma Gandhi had led a *Salt Satyagraha* with the main object of resisting taxation on the commodity (salt) essential to all, as such a tax would be a great burden on the poor. Thus, an ordinary thing like salt has played an important part in staging political revolutions both in our country and abroad.

My profession has not been to produce salt, though I have been using it as all of you do. I have been interested only in political activities and so I am acquainted only with the relation of salt to the revolution which took place in our country. Those days are now gone. Political revolutions of that type are not required now because we have passed through that stage. However, our task is not wholly completed. After completing successfully the first stage of our long journey, we are now embarking on the second stage — the economic and social uplift of the masses. A social revolution is not brought about merely by legislation but by organising the people on right lines and by infusing in them a new spirit. There are many ways of doing it.

America, England and other European countries are far more advanced than India in certain matters, for example, in fundamental and applied sciences. Many discoveries have

* Director, Central Salt and Marine Chemicals Research Institute, Bhavnagar.

been made in those countries which have added to their overall strength, defence and armaments. New means of producing wealth have been found and these have strengthened their economy. We too have to learn these things; some, we have learnt; others, we are learning, and many, we have yet to learn.

I think that in paying special attention to scientific and industrial research during the last four or five years we have laid a solid foundation of science on which we could build a splendid edifice of New India. Without a strong foundation, no structure can last for any length of time. Just as the foundation of a building is not seen, but the entire structure is supported on it, so, our efforts in advancing science may not yield immediate results in terms of money, but I have no doubt they have been directed along right lines. I am moving from one place to another for the sake of these research laboratories. At noon today, I was in Ahmedabad and there I opened two research laboratories — the ATIRA (Ahmedabad Textile Industries Research Association) which is a very big laboratory for research in textiles, and the other a smaller one, but very important nowadays, for research in cosmic rays. Now, I have come to you to open the Central Salt Research Institute. I had been thinking about the establishment of this Institute for some years, because the question of salt is obviously an important one, as it is related to the life of every one of the 360 millions of our people.

Among other questions, every one of us is interested to know details about the production of salt, its price and its quality. It is necessary that we should be able to provide our people with enough salt of good quality at cheap price.

The other important aspect is that the whole of our country should rise to prosperity. For this reason, we have located the national laboratories in different parts of the country. We do not want one part of our country to grow at the expense of the other. The path of progress has to be followed by all of us and not by a select few. These research laboratories are just symbols, to focus our attention on newer aspects and to raise the country as a whole. I do not view these laboratories from the consideration that they will handle particular problems which lie within their scope. I look upon them as temples of science built for the service of our motherland. I do not wish any worker to come to these laboratories merely with the aim of earning his living. What I wish is that our young men and women who come here should have a zeal for working out problems which would have great consequences. That would give vitality to these institutes. They should realise that service to science is real service to India — no, even to the whole world; science has no frontiers.

It gives me great pleasure to be present here on this occasion. My hearty congratulations to you all on the occasion of the inauguration of this new research institute.

57. IMPORTANCE OF STANDARDS*

(Extract from the address at the foundation-stone laying ceremony of the building of the Indian Standards Institution, New Delhi on August 21, 1954)

Urging Indian manufacturers, big and small, to produce first rate goods of lasting value, Prime Minister Jawaharlal Nehru said, "Whatever is produced by our big industries or cottage industries should be good, so that the people who buy them have confidence that they

* *I.S.I. Bulletin*, Vol. 6, No. 4, October 1954, pp. 113-114.

are taking with them something worthwhile. Often it happens that a thing looks quite dazzling from outside but breaks soon after it is put into use. This brings us a bad name. I do not like that anything produced in our country should be third rate or even second rate. All goods produced in India should be beautiful, lasting and up to the mark."

Shri Nehru said that all manufacturers and producers should observe the fullest honesty and integrity in producing standard goods of quality. It had been noted in certain cases that the finished goods supplied did not conform to the sample shown earlier. This dishonest practice must be brought to an end without delay.

Referring to the Swadeshi movement, he warned producers not to exploit the sentiment for Swadeshi and sell second rate stuff to the people. "Our Indian people may, out of sentiment, buy stuff of inferior quality. But no foreign country is going to touch anything that is below the general standard. So, whatever we produce should be of good standard quality", he said.

Shri Nehru began by saying that he did not relish the idea of indulging in the 'profession' of laying foundation-stones of buildings, and cited amidst laughter the case of the stone which had been stolen after being laid. At another time, only the stone remained where it was, and no building came up.

"It was my colleague, Dr. Katju, who once laid a foundation-stone of some building. Later, it was found that the marble stone had been removed by a thief. I have, however, been assured by Shri Krishnamachari that the stone I am going to lay now would be properly guarded *(Laughter)*. But this practice is wrong. It would be much better if the actual foundations of a building were dug and the foundation walls built up to the floor level before the foundation-stone was laid. In that case the people too would know that something was in the actual process of construction", he said.

The Prime Minister said that every new building that was constructed should reflect, in some form or the other, the great traditions and grandeur of Indian architecture. He said that in new public buildings provision should be made for having some statuettes and frescoes by way of decoration. This would give encouragement to artists. But all this must be of first rate quality. The conception of new architecture should be simple but noble. He commended to architects Delhi's magnificant Jama Masjid and said: "This building inspires you with its simple but noble architecture."

Referring to the United Nations building in New York, Shri Nehru humorously said that sometimes he felt whether the wrangles that went on inside were not due to the ugly conception and structure of the whole building.

In a reference to what he called the palaces of the rich, the Prime Minister said that these palaces stood in cities not far distant from the slums. "I want some standardization in these palaces. It will be good if the palaces become a little smaller and less decorative, and the slums disappear and more houses come up for the common people. This will be a good thing for the entire society as the current of world affairs is fast changing.

Shri Nehru said that equal opportunities should be created for all. These opportunities did not exist for a large number of people now. It was not only good to wish for such a thing, but it was a pressing demand of the present day world. The gulf between the high and the low had to be bridged. It would be a good thing in India if standardization was brought about among her different castes, and all this casteism disappeared.

In conclusion, the Prime Minister said that the country must become self-sufficient in essential goods and must produce them herself. The people must stand on their own feet and not depend on outsiders for their essential goods.

58. PHYSICAL AND MENTAL HEALTH*

(Inaugural address at the seventh session of the WHO Regional Committee at New Delhi on September 21, 1954)

On my own behalf and on behalf of the Government of India, I am here to welcome you to this seventh session of the South East Asia Regional Committee of the World Health Organization.

There are today a large number of questions on which people do not see eye to eye with one another; but fortunately the subjects dealt with in WHO are not matters on which there can be, basically, much difference of opinion. And, although you do not touch upon the controversial issues of the day, I have no doubt that the kind of work you are carrying out must exercise a soothing influence on fevered minds who are engaged in those controversies.

You deal with various aspects of health — with the fight against malaria and other scourges or, on the other hand, with maternity and child welfare and related problems. You are, I believe, primarily concerned with physical health; but I know you will agree that mental health is in a sense even more important. For mental health, to a large extent, governs physical health. If the mind of the individual or of the group is disturbed, it becomes difficult for the body to find equilibrium or any proper balance.

We live in days when there is a great deal of disturbance in the mental apparatus of humanity. Even though your Organization may not touch upon these matters directly, I imagine that the kind of work WHO is doing must have a considerable effect on the disturbed state of the world's mental health. We are faced with many problems which do not easily yield to satisfactory solution. In the realm of politics, specifically, one finds attempts being made to solve these problems by what might be called the direct approach. One goes along head foremost in the effort to solve them, usually coming across somebody else's head which is bent on solving the problems in the opposite direction. Then the two heads come into conflict.

It may be that it is easier to consider and to solve this kind of problems in a rather indirect way with indirect approaches. The indirect approach sometimes reaches the desired objectives much sooner than what I have called the direct approach because it undermines and goes around the defenses of the opposition which it may have to meet. It takes them almost unawares, while the direct aggressive approach often leads to direct aggressive defense and conflict occurs.

I mention that because the activities of some of the important organs of the United Nations, like WHO and UNESCO or others, would appear to be some distance removed from the political conflicts of the world. In these activities it is possible to adopt an approach which does not bring about active opposition and conflict. You use the direct approach, of course in dealing directly with health problems. This is certainly the correct approach. But it also becomes the indirect approach in dealing with world problems of another kind — the mental conflicts, the political events — because it can produce an atmosphere which soothes and which enables people at least to talk to each other in a quiet and dispassionate way. Therefore, quite apart from the good work that these agencies are doing directly, there is the indirect aspect of their work which can help create an atmosphere favourable to the solution of our daily problems in the political sphere.

The direct work that you do in regard to health is particularly needed and welcome in the countries of this region from which you as representatives have come together today.

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* World Health Organization, Regional Office, New Delhi.

in health matters these countries are rather backward and the more we can do to improve health and sanitation, the better. There are, of course, many different aspects of this work and you who are dealing with this work know much more about them than I know. But the one aspect which seems to me to have greater importance than any other is work that concerns children. I think that first priority should always be given to children — to the young people who are building for the future. They are the essential 'human material' which has to be looked after first and above all else. I do not mean to say that you should ignore others; but after all it is easier to deal with children than with those who are confirmed in their habits and their ways. And our children are our tomorrow.

For this reason I hope that in all these countries, whether from the point of view of health or other similar points of view, the children will always be considered first and that provision will be made for their proper growth, adequate opportunities being given them to live in an environment suited to the development of their full powers and creativity. Nothing is so sad for me as to see little children not looked after and not cared for, not having the basic needs met which should be fulfilled for every child — quite apart from the loving care that a child deserves. If we can provide even some background for raising levels of child welfare — not merely by putting up more clinics and hospitals, but in a wider sense by creating a better environment for children to grow up in — then it will be a very great thing indeed that we have accomplished.

In many of the countries that you represent here today populations are large and growing larger every year. Some people are greatly alarmed at the rate of population growth in the countries of South East Asia. I myself do not like it. I should like this rapid growth to be checked. But I am not alarmed about it and I see no reason, as some people do, to consider that the end of the world is coming because some populations are getting bigger and bigger.

I think we should take a balanced view of these matters. While certainly working to check the growth of the population in the best ways that we can devise, we should nevertheless not get cold feet and draw up imaginative statistics of what the world's population may be in 20 or 30 or 50 years from now. I am amazed when I see eminent statisticians working on some imaginary basis to produce fancy figures of what the population of India will be 30 or 40 years hence. They seem to assume that if there is a certain rate of increase at any given time, this rate will necessarily continue, that every year the population will go on increasing and practically nobody will die and ultimately you will get to the dangerous point they predict.

Of course, the fact remains that the population problem is an important problem and should be dealt with. Efforts must certainly be made to control it. Even though the growth of the population may not lead to any such grave crisis, it undoubtedly results in a lowering of standards. Moreover, we cannot raise standards of living very much if the population goes on increasing at a rate so rapid that economic gains are offset by it. We have not only to catch up with it in raising the standards of our peoples and come to what we consider a normal economic level, but we must also meet the rise of the population which tends to pull that level down.

One has to deal with the population problem in this way and make people appreciate the need for seeing it in these terms. Many persons who discuss this question talk about it either theoretically or academically or heatedly, bringing into the argument their own particular prejudices and their own special outlooks. Neither approach is very helpful because in this matter — as, indeed, in all such matters — one has to do with human beings. It amazes me how often we forget the human being in our statistical conferences. We think in terms of blocks and curves or other such figures, forgetting that all these things represent individual men, women and children not very different from us.

I should like therefore when I talk about the human approach to the population problem, to stress the need to remember that it is human beings we have to deal with. They are not blocks, they are not some mechanical gadgets that you can play about with and order about. Not even the most authoritarian state can get very far in this way. It may go some distance towards teaching people how to act as regimented human beings, but not even in this can it go very far. Much less can such things be done by the State which is not authoritarian.

You have to treat people as individual human beings who must be convinced, who must be made to understand and must be won over to any cause we seek to further. Also, since it is in this way that we must deal with human beings, we cannot deal with them effectively if we presume to speak to them as their superiors. No person who goes to another with an attitude of superiority is likely to find any kind of real opening to the mind or the heart of the other man. There is too much of this superior approach of 'doing good to others', too much of imagining that we are better than others. We may know a little more, we may have more comforts, we may have more privileges. But the presumption that we are better than others just because of these things is, I think, not only totally unjustified but also foolish.

Any division of people into various grades and classes of superiority or inferiority is untenable. No one, of course, would claim that all human beings are equal in character, in working capacity and so forth. Nevertheless, the approach to other human beings on the basis of inequality of any kind — whether it be of class, or race or of nationality — is a wrong approach. It does not lead to results. One has to win the goodwill and the friendship of the persons one deals with.

Although I may not know much about many subjects, I do know something about the masses of human beings who live in India and I think they are very fine material. They have their failings and their weaknesses — many of them, such as all of us have — but they are fine material provided they are given opportunities. I have no doubt that this applies to the other countries in this region and in other parts of the world. Given opportunities our people are fine material. These opportunities must come. As a part of these opportunities the friendly human approach of equals to equals must also prevail. If you want to teach them something, then try also to learn something from them. Make them feel that you are both teachers and learners. Then you are on a level where you are welcomed and what you say has some effect. Otherwise you or I may go and deliver a harangue to them and come back, imagining that we have done our duty but probably leaving little trace behind us.

So, in conclusion, I should like to lay stress on three aspects of your work. Of these, one is the special importance of children and their health. Another is the human approach to the masses who live in this part of the world — the need to think of them always as individuals and not as graphs or curves or figures. And the third is the necessity always to remember that physical health is only a small part of total health, the rest being mental health. For if we do not have mental health, physical health will go to pieces. Therefore, in an indirect way — not directly, but in your own indirect way — you are trying to help soften the conflicts that exist in the world and thereby creating an atmosphere which may contribute to the solution of the world's problems.

Pandit Jawaharlal Nehru at the Central Leather Research Institute, Madras (April, 1954). Prof. Y. Nayudamma (Director, CLRI) explaining the prospects of leather as a dollar earner.

Pandit Jawaharlal Nehru at the Tata Institute of Fundamental Research, Bombay (January, 1954). Also seen in the picture are Dr. Homi J. Bhabha (Director), Shri Morarji R. Desai (Chief Minister, Bombay State), Shri M.C. Chagla and Dr. S.S. Bhatnagar (Director, CSIR).

Pandit Jawaharlal Nehru laying the foundation-stone of the Indian Standards Institution Building at New Delhi (August, 1954). Also seen in the picture are Shri T.T. Krishnamachari (Union Minister for Commerce and Industry and President, ISI) and Dr. Lal C. Verman (Director, ISI).

59. SCIENTIFIC RESEARCH RELEVANT TO INDIA'S NEEDS*

(Address to the directors of national laboratories of the Council of Scientific and Industrial Research at New Delhi on November 25, 1954)

Mr. Nehru told directors of India's national laboratories in Delhi on Thursday (November 25, 1954) that their work should be related to the "vital current of Indian life".

In a brief address to them before they assembled to discuss their common problems, Mr. Nehru said that the specific work that the laboratories were doing, should be closely connected "with the larger picture of India that we have".

Unless they and their work fitted in with this larger picture, the laboratories would become isolated. Everything should, he said, have some relation to the vital current of India's life, much more so in scientific and industrial progress.

"If we are to make good as a nation — making good in terms of the 360 million people living in the country— then it becomes essential for us to approach our problems in a scientific way," Mr. Nehru said.

Mr. Nehru said that he had just spoken to a large number of defence officers, among other things, about what would be the best weapons for the country, taking into consideration its circumstances. The average officer was inclined to get the latest type of weapons from abroad. But the point was that the best type should be successful in the environmental conditions of India. Among other things, any weapon produced in India was of far greater utility to the country than anything that came from abroad.

In every problem that the country had to face today, he added, science came in. Therefore, deep thinking on this question was necessary. Learning from other countries was good. But "we must do independent thinking of our own in relation to what we require here. Go ahead along our own lines, on something which is necessary here."

The national laboratories, Mr. Nehru said, could become of greatest importance provided the directors looked upon their work from this point of view. Indeed, one should look upon the universities also from this point of view, he added.

The Prime Minister said that the human race was passing through a critical phase of its existence, chiefly because of scientific development which had given enormous power to human beings. India was playing an important and dynamic part in this period. Ultimately, the part she played depended upon her own strength.

"I say this," he added, "to show you the importance I attach to science. It is not merely a job, a profession. There is a tendency in our governmental establishments and research institutes to live in a kind of ivory tower. Whatever they do, the country should profit by it. You must also have a cooperative outlook." (P.T.I.).

60. STATE DEVELOPMENT OF ATOMIC ENERGY**

(Inaugural speech at the Scientists' Conference on the development of atomic energy for peaceful purposes at New Delhi on November 26, 1954)

This is, as you know, the first attempt, the first occasion, on which such a conference is being limited mainly to scientists and others interested in atomic energy. In a

* *The Hindustan Times*, New Delhi, November 26, 1954.

** *The Hindustan Times*, New Delhi, November 27, 1954.

sense, everybody is interested but rather chiefly those who are particularly working either directly in regard to atomic energy, or with its many allied activities.

Of course, so far as the public is concerned, they are much more interested and excited about the uses of atomic energy, the atomic bomb or the hydrogen bomb. This conference, or for the matter of that, the Government are not interested directly in that thing. This conference is meant to consider how we can develop atomic energy for peaceful purposes. Nevertheless, I should like to say a few sentences about the state of affairs that we have to face in the world because of the development of these new weapons.

We have found during the last two years a terrific pace of development in the art of warfare, both in the quality and effectiveness of the weapon and in the speed of delivery of that weapon, *i.e.* both, if you like, the hydrogen bomb and how rapidly it can be delivered at the other end. Now, as you know, it can be delivered at a much speedier rate than the speed of sound. So that we arrive at a stage when it is possible for a country that possesses the weapon to use it within two or three hours of the decision—within a few hours it can annihilate all the targets before it.

This is a terrific prospect. Within a few hours, because of both the speed of delivery and the effectiveness of the weapon, vast areas can be completely annihilated. Of course, only very very few countries possess that power and everybody knows that the two major countries, the U.S.A. and Soviet Russia, are supposed to be in possession of this weapon. But apart from this prospect, it has to be appreciated that even today it is possible if a decision is once taken, in the course of a few hours or so to destroy entirely large areas of the earth's surface. And remember also that this pace of development goes on.

I do not know what tomorrow might bring, but one thing is already clear; scientists may know what possible developments are likely in this thermo-nuclear age in regard to the effectiveness of these weapons—in regard to speed we have gone pretty far.

But a third prospect now comes before us — that of the aircraft which carries it being "uninhabited" as it is called, that is, it is a guided missile; no human being sits in it. That is the third stage of which we are on the threshold. All this terrible annihilation and destruction takes place really by the pressing of a button on the order being given, and this uninhabited aircraft carrying these terrible weapons goes off, guided by other methods and they do their work of destruction.

Now that is the prospect for humanity and it is a terrible prospect. And those persons, or that group, whoever it may be, who happens to be sitting with his finger on the trigger, has a terrible responsibility. And suddenly as a part of the cold-blooded decision, he may let loose the plug on others. That has always to be remembered by us, because all other activities and schemes may be completely ruined because of this happening. Therefore, a dominating factor in the modern world is this prospect of these terrible weapons suddenly coming into use before which our normal weapons are completely useless. And that is the background of atomic energy so far as war is concerned.

Now so far as peaceful purposes are concerned, obviously we want atomic energy for the generation of power. Power is the most important thing to develop a country's resources. You may judge a country's advance today merely by seeing how much power it produces or uses. You may judge it in another way, how much power plus iron and steel is produced by it. It is a very good test. It shows where the country is in regard to the modern industrial age, but the power is the basis of it.

Power is normally produced, as you know, by coal or oil or hydro-electricity. These are the various normal methods. So far as hydro electric power is concerned, we know, more or less it is increasing. So far as coal and oil are concerned, various estimates have been made from time to time. I believe one of the recent estimates was that of a committee appointed by the President of the U.S.A. According to that estimate, the world fuel reserves, if they

are consumed at the present rate of consumption, will last 350 years more or less. But then look at how their consumption is distributed. In fact, the U.S.A. itself consumes a vast percentage, a very great quantity, out of all proportion to the rest of the world. And Western Europe and other developed countries also consume large quantities.

So, for us to say that the world reserve will last three and a half centuries presumes that the rest of the world will remain static without development. If for the sake of argument it is assumed that the whole world was as developed as, or used its power resources at the rate of the U.S.A. today, if it is so presumed, then I think the calculation will show that the world's power resources will last slightly under 35 years. Of course, the whole world is not going to do that, but I am sure that the present day calculations are based on the fact that a large part of the earth's surface has remained under-developed and backward. Therefore, the more the vast areas of Asia or Africa are developed, the more these fuel resources will be used up. In other words, if you utilise all the present resources of coal and oil for power generation, you cannot look forward to any very great development of the entire world. These are not enough.

It is in this connection that atomic energy comes into the picture as something which gives us power. Again, I do not know exactly—I have seen some figures of the possible reserves we have for the production of atomic energy — how long it would last. I am told that, at a rough estimate, it will last 800 years on that bigger scale, that is, with the whole world as highly developed as America. Then again, we calculate power derived from atomic energy today on the basis of fission. Now, it may well be— and it is highly likely to be—that the next stage will be the production of atom power by fusion, which again produces an enormous, fresh vast quantity of power.

The hydrogen bomb is, in fact, something which is caused by fusion, but is completely uncontrolled. One of the new features that is coming in is the release of uncontrolled—energy which the hydrogen bomb possesses. There can be little doubt that the next stage will be to control it, so that you can get enormous quantities of energy placed at the disposal of humanity. That is the importance of the development of atomic energy for peaceful purposes.

Relatively speaking, atomic energy is more important for the under-developed countries than for the more developed countries, because the more developed countries have got greater resources. The under-developed countries will take a mighty long time to develop these energy sources. As you perhaps know, we in India are far behind the great countries, the big Powers, in this matter of generation of atomic energy. Nevertheless, certainly in Asia, leaving out the Soviet Union, there are few countries which are more advanced in this work than India. In some ways, India is more advanced even including countries outside Asia. In India, a fairly solid base for the development of this work has been laid.

As long back as 1948, you will perhaps remember there was a Resolution on Industrial Policy by the Government of India. In that Resolution, industries were put in different categories. Some, like the defence industries, generally were stated to be the exclusive monopoly of the State. "Atomic Energy" is mentioned in that Resolution as long ago as April 1948 as the exclusive responsibility of the State. And that was natural, because we found that no State can allow atomic energy to be developed in a private way — it is much too dangerous a thing for a private agency to develop. Apart from its possible use for war purposes, even in the peaceful use itself, it can be converted into some other use which is dangerous. So that, even six years ago, we envisaged the development of atomic energy and stated that this is the exclusive responsibility of the State.

Apart from the major reasons I have mentioned to you, this work on atomic energy is an exceedingly costly affair, and only the State can meet that cost. So that, obviously, that type of technological work has to be undertaken by the State. We have this Atomic

Energy Department of the Government which is setting up establishments and plants for the purpose. I think we are making fairly good progress, and that people in other countries have also appreciated this.

Now again, there can be absolutely no comparison between the money spent, let us say, by the U.S.A. or even by the U.K. and by us. The U.S. figures are astronomical, the U.K. spends much less, but, nevertheless, much more than we do. It may be said that we should spend more because it is highly important. As a matter of fact, I think we have been spending rather liberally on it, considering our general responsibility. I want to tell you that certainly our Finance Ministry has not at any time come in the way of development of atomic energy, because they realise its importance. But you have to remember that, with regard to every expenditure — whether it is atomic energy or anything else — it has to be balanced with other necessities, requirements, demands etc.

Atomic energy does not grow out of nothing. It grows out of the large number of other developments in the country—just as for war-time purposes you cannot have a weapon by itself and you have, behind that weapon, industrialisation. So that it is not much good telling us that atomic energy is the most important thing in the world today and therefore we should spend much more on it than necessary!

We cannot spend anything on atomic energy if our people starve. The ultimate strength of a country comes from the people, and not from atomic energy or anything else. Therefore, one has to balance all these developments. Of course, the balancing process is not easy, but Government does its best. The whole question of balancing means that we have to advance on all fronts and lay down a strong foundation for our growth.

Now, normally speaking, this atomic energy work, may be divided into two parts. There is a more developed technological work of it, let us say, the setting up of a reactor and the like, and the other type of work, the scientific work. Nuclear science is something that should normally be taught in the scientific section of our universities because it is an important subject which every student of science should know, and the more the better. But, inevitably, in the circumstances, you cannot have a university taking up these huge technological developments like reactors and the rest. Apart from the cost, it has to be a State monopoly. And what with our universities not having at the present moment, unfortunately, even adequate equipment for normal good scientific work, it is rather fantastic for us to think of a university undertaking these technological developments in regard to atomic energy. We have to create a wide foundation and a strong basis for science in this country; all kinds of science.

We have set up the National Physical Laboratory and there are, as you know, similar laboratories all over India. I think it is one of our most creditable achievements in the last few years. It is the foundation that we have laid; these great national laboratories. But the national laboratories are not enough. All our universities essentially must be on that wide basis and foundation. But if our universities start, if I may say so, specialising too much in one thing, going too far ahead, it is possible that they will become lopsided. Therefore, it is far more important that the universities should give a general education in the whole scientific field, rather than by itself do the work which a national laboratory does. Beyond the national laboratory, you come to the next stage of specialised establishment, dealing with atomic energy work, which in so far as the technological development is concerned, has to be a governmental monopoly.

Now, Dr. Bhabha will tell you about the actual details of the work being done, our intentions and how far we have gone in setting up a reactor, which is one of the preliminary things that has to be done. But in this connection it is our intention, perhaps as you know, to make heavy water that is a very expensive thing. We are thinking of producing heavy water in India, not by itself — it will be too expensive an operation — but in connection

with fertiliser. It requires a great deal of electric power. Therefore, at present the only feasible place where we can do it is near Bhakra Nangal where the power is available and where we have to produce the fertiliser for the surrounding area as well as heavy water.

61. VETERINARY SCIENCE AND EDUCATION*

(Speech at the Golden Jubilee celebrations of the Madras Veterinary College, Madras on January 17, 1955)

I am happy to associate myself with this occasion—the Golden Jubilee of a famous institution in Madras and a very important one I realise completely the importance at any time and more especially now of such an institution but I want to tell you quite frankly that I know nothing about the veterinary sciences. I know nothing about the animals except that I like them and get on well with them. The only animals that I do not get on well with are lizards, chameleons and scorpions, and some poisonous insects, but generally speaking, I get on very well with animals and am fond of them and therefore I am interested in the science of their treatment, of looking after them and improving them. But, apart from that personal aspect, it is obvious that in any country, and more especially in an agricultural country like ours, veterinary science is of the utmost importance because these animals are the principal wealth of the country. Now, this institution has got a good record. There are other institutions of the kind, perhaps not quite so ancient, and perhaps not so distinguished as this, but there are others. Nevertheless, there are remarkably few such institutions in India considering the importance of the problem and the vast extent of this country.

Some little time ago, in our Planning Commission, we were considering the question of training personnel, and among the lists of personnel that had to be trained in very large numbers were people who know something about veterinary science — veterinary doctors and surgeons. Just like for our normal health services for human beings, a vast number of doctors and the like are required in this country. So also a vast number of veterinary surgeons or doctors or whatever they are, are required in this country to look after the animal health and wealth of this country. In fact, the big problem before us in connection with planning — in connection with any kind of development of the country — is the question of training people or trained personnel. Some people imagine that money is the chief handicap. Well, of course, money has its uses and in our present economy money plays a relatively important function, but let us not praise money too much or attach too much importance to it. It is human beings who count, and not money ultimately; and in our planning therefore the thing that we came up against again and again, was not so much lack of money but lack of skilled personnel to do the job. If you make any kind of calculation, whatever it may be — teachers, doctors, veterinary people — a calculation having some relation to the population of India — you arrive at vast figures. I am not giving you any figure or any calculation. You may arrive at a figure that you want five-hundred thousand doctors in India or you want several hundred thousand veterinary doctors in India and so on. You will want a million teachers in India, or millions. You arrive at vast figures. Then

* Nehru Memorial Museum & Library, Teen Murti House, New Delhi.

you look round and see our medical colleges — good colleges — one producing a hundred or another 50, another may be 150 — I do not know. You add up the total number and you come across to some thousands — let us say 5000. I doubt if we reach that figure. Well, at that rate, we require 100 years or something like that before we get our full quota of trained doctors, but that is not good enough. Obviously, something has got to be done. What is to be done? Another difficulty arises — a doctor takes round about 5 - 6 - 7 years to get trained. It is a long time. Are you going to wait for 7 years before we can supply — well, if not the full quota, at least an adequate number of doctors to our various rural areas, especially areas which need them? What are we to do? We do not want to lower our standards. So, there is conflict all the time between the high standards that we want to maintain and the fact that having high standards delays the process of producing the numbers needed.

Now, it is all very well to keep high standards, but there are places all over India where there is nobody at all — no standards at all — nobody to do the job. So, are we going to wait till a fully qualified person comes, say, seven years from now, to send to a particular area which is demanding a doctor? You see this difficulty. One thing I want to be quite clear about. There must be no lowering of standards. That is there. We do not want any lowering of standards in India in anything. We do not want to be a second rate country. We want to be a top ranking country in everything — science, technology, medicine, whatever it be. But then if you do that, the only other way is to have some stop-gap arrangement to fill in the gap, because the gap has to be filled. There is a demand for it. I do not call them — for the moment talking in terms of the medical profession — I do not call them full-fledged doctors. Give them a year's training or two years' training, whatever it is. Connect them with full-fledged doctors and send them to the rural areas after a year's training, give some help to refer the very important cases to the doctor to whom they are attached — the fully trained doctor at the headquarters of the district or wherever he may be. You have to find out some way of solving this problem. We cannot wait year-after-year till we produce our medically qualified, fully trained doctors.

Well, I do not know what the position is exactly in regard to these veterinary colleges and training institutes, but I presume it is far worse, and I am worried about it. We come here and celebrate the Golden Jubilee of this old and great institution and we no doubt feel happy that it has lived for over 49 years — it has not died in between — and there is an air of complacency all round us; how well we are doing! But, it is not justified — this air of complacency. This kind of growth — growth at a snail's pace — is just not good enough. So, we have to consider this problem in a bigger way — consider it because it is of the utmost importance to deal with the various animals in this country which form a very big part of the wealth of this country. Another thought that strikes me is that in India, cattle, especially the cow, is thought of highly. It is revered, it is almost worshipped in India; but there is no other country to my knowledge where the cow is treated worse than in India. By and large, the people of India are gentle people. They do not like to inflict suffering, but most of them will pass by seeing suffering inflicted and not interfere. They will see a poor animal that had fallen down on the roadside and probably pass by without helping it to get up or finding out what is wrong with it. So, we in this country have developed what I call 'passive' and 'inert' virtues; and it is about time our virtues are more positive and even more aggressive, if I may say so.

It is an odd thing that in this country of India, where cattle are so highly thought of, they should be in such a bad way. It is hardly possible in most parts of the country to get good milk — I do not know what the position is round about here — except for selected areas in the Punjab and Hissar and elsewhere and even there, there is progressive deterioration in the cattle in spite of our veterinary colleges and doctors and the like. So, what is

wrong? Something is wrong, and to be happy and complacent is just fooling ourselves. Now, we must get hold of this question — and not just get hold of it from the sentimental or religious point of view. Some people start agitations, partly I imagine for sentimental reasons, partly for pure political reasons but you cannot solve this or any other question by sentiment. I agree it has to be solved. We have to protect our cattle wealth; we have to augment it, improve it, and that we are not going to do so by starting a vast number of *pinjrapoles* in the country. I just don't understand them and therefore I have told them—that those people who want to adopt, instead of a reasonable, logical attitude to deal with an important problem, this kind of a sloppy sentimental attitude, do more harm than good to the cause. Certainly, so far as I am concerned, they leave me utterly cold. But nevertheless, in spite of them, the problem is an important one. We could not ignore it and the only approach can be a constructive approach.

Many of you may know the Aarey Colony in Bombay. It is a very fine thing — a constructive way of dealing with the cattle problem, and there is good milk supply there. The other day, about two months back, I visited a similar place in West Bengal — I forget the name of the place — but it was run on more or less similar lines, and a very fine place and a developing place, getting bigger and bigger. They propose to have some such thing near Delhi and others elsewhere; so, these are constructive approaches to the problem. The approaches that other people suggest are approaches which, if acted upon, will probably result in serious harm; worst of all, in the rapid deterioration of the cattle population in India. That is, the quality will go down and the numbers will go up; all the cattle — even bad cattle and diseased cattle — will increase and the good cattle will die off. If this kind of sloppy approach is adopted, we will gradually find that human beings will die off in this country at the cost of diseased animals.

But, in any event, much as I want cattle to benefit and profit, for I like them, they are the wealth of the country; nevertheless, I attach more importance to human beings in this country and I am not going to give first place to the cattle — the cow or anything else. Human beings are going to take first place; other things come next.

Well, I do not know if I have talked pertinent to this occasion to the distinguished people assembled here to celebrate the Golden Jubilee of this Veterinary College. But I hope that this Veterinary College will, in its second half-century, spread out more — not only continue its work but spread out more and think of these problems we have to solve. We have to solve the problem of cattle and agricultural wealth, live-stock etc. and not merely produce graduates from the College.

62. GEOLOGICAL MUSEUM*

(Jawaharlal Nehru visited one of the world's best Geological Museums which contains 20,000 specimens of the Ural region at Sverdlovsk on June 18, 1955 and recorded in the Visitors' Book)

"This is a fascinating museum for anyone, specially for anyone interested in geology. As an old student of geology, I have found it of the greatest interest and I wish I could study the very fine collection of specimens here at greater leisure."

* *The Times of India*, Bombay, June 19, 1955.

63. MEDICAL EDUCATION*

(Speech at the inaugural session of the Medical Education Conference, held under the auspices of the Ministry of Health, Government of India at New Delhi on November 19, 1955)

You have invited me, I take it, not because you think I can throw any light on the subject which you are going to discuss, but rather because the Prime Minister's presence here might draw more attention to the importance of this Conference. I agree that the subject of medical education which you are going to discuss is of great national importance, but I would like to view it in the larger sphere of education itself. In this field from time to time, a number of committees and commissions consisting of eminent persons have been appointed and they have presented valuable reports. Yet somehow we are still struggling with this problem and many of us are exhibiting a feeling of impatience and a sense of frustration that progress in this larger field is not as rapid as we would like it to be. This kind of hiatus between what we want to do and what our commissions decide and what is ultimately actually done is unfortunate. It may not be entirely the fault of the Government as in implementation of these recommendations all kinds of other considerations including unfortunately the question of finance come in. Our ultimate object is, of course, to produce such conditions in India whereby everyone has abundant opportunities to grow. Your point of view, of course, is to see that the same opportunities exist for health whether it is public health or individual health. I do not know how many have such opportunities. Some may have them and others may have no opportunities at all. This is a difficult problem. I realise it may be absurd to expect any sudden change and that our difficulties will be solved suddenly as if by magic. Nevertheless, we have got to do something about it. Again, we have to maintain adequate standards in education. I think it would be the greatest pity if we reduced our standards for the sake of speeding up, though I am terribly keen on speeding up also. How one has to combine these two things in the problems of health is really a matter which you will no doubt consider, but in doing so, I hope you will pay some attention to the practical side of learning. We in India are apt to pay more attention and more time to book-learning than to the practical side. In our country there is far too much of a habit of memorising things in order to pass examinations. It is a very dangerous habit. Apart from a person not learning anything, he becomes stultified and possibly is not capable of growth later on. I think it is essential that the practical side is stressed much more in all our scientific pursuits and education.

I have just mentioned the question of finance. For our spreading education, basic schools have to be established in every village and teachers have to be paid salaries necessary for ensuring efficient and contented service. I am told that the cost of having a sufficient number of such basic schools will take away the whole of our national income. Obviously, one cannot do it, however important education might be. Some way has got to be found therefore whereby one can deal with this subject sufficiently justly and reduce the cost. Then there is another important matter with which you should concern yourselves. In this country there are a number of systems of medicine notably Ayurveda and Unani. There is no doubt that these systems contain things which are worthwhile and it would be foolish to look down on them. Medical science should view everything in an objective manner and base its judgement on practical results.

* *Proceedings of the Medical Education Conference*, Ministry of Health, Government of India, New Delhi, November 19-22, 1955, pp. 12-14.

Finally, I should like to pay tribute to my colleague in the health field, Rajkumari Amrit Kaur and her enthusiasm for the health problems. About your Chairman, Dr. B. C. Roy, I wish to say little lest I say too much, because he is a very old friend of mine to whom I go for advice in many matters inspite of his being a doctor. I cannot think of a better guide and counsel than Dr. Roy as the Chairman of your Conference. The deliberations of this Conference, I am sure, will be helpful and beneficial to the cause of health in our country.

64. COMMENTS ON ATOMIC ENERGY*

(Extract from conversations with Tibor Mende between December 31, 1955 to January 9, 1956 at New Delhi)

T.M.: This, I think, leads us almost automatically to the central problem of our era: to atomic energy. Do you think, Sir, that the large-scale application of atomic energy would— as some people believe—lessen the gap between the economically over-developed and the economically under-developed countries? Or will it rather have the opposite effect?

J.N.: This, I think, is a very vital question.

It would be exceedingly dangerous for atomic energy to be controlled by a few Great Powers. Naturally, this is the tendency. But that will mean increasing the gap between them and the other countries which are less developed. Instead of that equalizing process, it would have the reverse effect.

In a sense atomic energy is more needed by the under-developed countries than by the developed ones, *i.e.* power-resources are more urgently needed by the less developed lands. In the United States, for instance, power-resources are so highly developed that they could do without atomic energy. It does not really make any difference to them.

T.M.: I imagine that the answer to this would be that these economically retarded areas still have abundant quantities of unexploited traditional fuel; like hydro-electric potential.

J.N.: Yes, sometimes that is an answer; but not always. Traditional fuels are cheaper *where* they occur. But it is a very expensive business where they do *not* occur. Take parts of India, thousands and thousands of miles... Yet I could take atomic energy to those areas immediately...

T.M.: I saw an astonishing editorial the other day in which Dr. Bhabha was quoted as saying that "The entire hydroelectric potential of India's rivers, fully har-

* *Conversations with Nehru* by Tibor Mende, WILCO Publishing House, Bombay (1958), pp. 61-64.

nessed, would merely replace one-seventh of the energy now annually derived from burning cattle dung."[1]

J.N.: That is an extraordinary statement. It has been challenged, that is the extent of it. But the basic fact remains. I do not think Dr. Bhabha is correct in his appraisal of the river resources of India. I think they are greater. Of course, he has taken the present estimate. But that can be increased greatly. We have not yet examined this matter thoroughly. Look at the map of India; take the Himalayan chain. It is a tremendous reservoir of power; of rivers, minerals and all that. While it is true that normal fuel would be cheaper than atomic energy—at present, at any rate, I don't know about the future—that normal fuel has to be carted and transported while atomic energy can be taken immediately for use at other places, and far from the fuel areas.

T.M.: And the transport of traditional fuel needs additional organization, human energy, personnel and so forth...

J.N.: Quite so. And we are thinking in terms of the development of atomic energy. Dr. Bhabha said at Geneva that within ten, fifteen or twenty years you may have inexhaustible supplies of fissionable material from sea-water for instance—so that you may really get fairly cheap supplies practically without limits.

T.M.: Evidently, Sir, you have followed developments relating to atomic energy very closely... Do you believe that in the near future the practical application of atomic energy might bring about serious economic—and consequently social—changes in a vast country like India?

J.N.: I should imagine that within twenty years fairly big changes can take place.

T.M.: And your successive economic Plans, for instance, the Second Five-Year Plan, would take actual steps with this optimism in view?[2]

J.N.: Well, considering our various approaches to the development of India and of our resources, we are spending a fair amount on atomic energy development. Of course, it is nothing compared to America, England or even France; but in Asia, we are spending more on it than any country; much more. And we are more developed in this respect than other countries in Asia. In fact, if I may say so, we are more ahead than many of the European countries, leaving out half a dozen or so.

T.M.: In other words, you have plans at the moment to put to practical use your theoretical progress?

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1 Dr. Homi Bhabha is India's foremost atomic scientist. He was President of the Geneva Conference on Atomic Energy in August 1955. The quotation in question is taken from an editorial published in *The Statesman* (Delhi) of December 24, 1955. Cow dung is used in India's villages on a large scale as domestic fuel.

2 India's First Five-Year Plan started in 1952. The second began in the spring of 1956.

J.N.: At the present moment our plans are merely to develop atomic energy. One of our atomic reactors will be ready in a few months. Another in about a year. And the third is in view. All these, of course, are in the domain of experimental research. The immediate need is the production of atomic energy.

T.M.: Do you expect that this new aspect of the cold war, this economic competition aspect which is developing, will actually help the countries of Asia to obtain atomic power stations as a sheer opportunistic by-product of the Great Powers' economic competition?

J.N.: Well, in a purely opportunist sense it would help. But you require a certain development in a country in order to profit by this. After all, atomic energy requires a scientific background, qualified men, some industrialization and so fourth. You cannot just pump it down into the heart of Africa.

On this subject of atomic energy, I might tell you that the thing we do not like at all is that it might encourage and confirm existing colonialism; because of certain colonial areas possessing atomic raw materials.

65. SCIENTIFIC WORKERS AND TRADE UNIONISM*

(Address at the annual general meeting of the Association of Scientific Workers of India at Agra on January 2, 1956)

Prime Minister, Mr. Nehru, called upon scientific workers to devote all their energies to the development of science. Addressing the Association of Scientific Workers of India, he said that "there had been some scientific development in India in recent years in the sense that, with the establishment of the National Laboratories, scientists had better opportunities to work. Unfortunately, the universities were still not in a position to promote the development of research for want of funds." He hoped that this difficulty would be soon overcome.

Referring to the problem of scientific workers, Mr. Nehru, the Association's President in 1948, said that he doubted "if trade unionism, which was unavoidable in industry, would help scientific workers."

66. ROLE OF THE STATE IN MEDICINE**

(Address at the special convocation of the College of Physicians and Surgeons, at Sunderbai Hall, Bombay on June 1, 1956)

This is a somewhat unusual experience for me. I have had the honour of receiving a fairly large number of honorary degrees, doctorates, chiefly from universities, but this is the first

* *The Times of India*, Bombay, January 3, 1956.

** Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

time that a distinguished College of Medicine and Surgery has tried to envelop me in its fold. I feel a little as if I was in somebody's borrowed shoes. And, I feel rather nervous lest ignorant people might come to me for treatment in future *(Laughter)*.

I must say that these doctorates which are of so many kinds and varieties are very confusing. I believe that in Germany they distinguish somehow between a medical doctor, a legal doctor, a doctor of philosophy and so on, even in common speech. A person I knew came back with a degree, a Doctorate from America; he was an American himself, he came back to my home-town of Allahabad. And when I asked him what he got his doctorate in, he said he was a Doctor of Philanthropy! *(Laughter)*. So, it is very confusing to the ordinary layman, in India especially, who has thought of doctors in terms of medical doctors.

I remember, long ago when I was still practising at the Bar in Allahabad, a colleague of mine who later became the Chief Justice of the Allahabad High Court, Dr. Sulaiman. He had a good practice. And another person in Allahabad was rather jealous of his good practice, and he let it be known privately, to all kinds of people, that Dr. Sulaiman was really some kind of a veterinary doctor! *(Laughter)*.

So, there is likely to be a great deal of confusion about this matter. Once you start giving degrees to persons, not for their medical knowledge — medical or surgical knowledge — but for other qualities or reputations that they may possess, these difficulties are likely to arise. I am very thankful to you because in giving me this Honorary Fellowship you have expressed your appreciation, not of course of my medical or surgical knowledge, but apparently of other qualities that I might be supposed to possess.

In the course of your remarks, you have referred to the necessity of providing large numbers of medical men and women to our vast rural areas, especially small towns and rural areas which lack medical services. That, of course, is a very important and vital need. As you know, the difficulty comes in the sense that, if we have or we try to have fully trained doctors — those who have gone through the 5, 6, 7 years' course — we are not likely to have enough of them for a long time. You referred in your remarks to short courses of training. I do not quite know what that means. Whether you refer to people who do not go through the full course, and are therefore not fully qualified, but are half-qualified and they are sent out, or whether you propose to produce qualified men in some compressed course of training — I do not know what it is. But anyhow, that problem has to be faced. Nobody, I take it, certainly not members of your College, would like in the slightest to lower standards, because you cannot have lower standards. But the problem, nevertheless, is how to provide medical care for large numbers of people in our villages, especially in outer district areas, when we have not got, and cannot produce in the near future, an adequate number of fully trained people.

It has been suggested that there might be shorter courses, not to produce qualified doctors — fully qualified doctors — but people who might be called assistant doctors, assistants to doctors or whatever, who would function in an area attached to some qualified doctor and who could refer to him the serious cases etc. However, it is a matter to be considered.

The other question that often arises in India and in our Parliament is the place of what are called our indigenous systems of medicine — the Ayurvedic and the Unani systems. Well, I do not know what many of you think of these systems of medicine. May be, you differ in your opinions and about your approach to them. I can only tell you what I feel about it. I have no doubt that our systems of medicine made very considerable progress — progress on what might be called, broadly speaking, scientific lines. In fact, at one time, rather long ago, schools of medicine and surgery in India were possibly as advanced, if not more advanced than any in the wide world. I remember reading many years ago about Haroun Al Rashid sending for an eminent physician from the University of

Takshasila (Taxila). And Arab medicine was by no means backward. It was advanced even in those days. So, our indigenous systems of medicine were advanced. I think it is equally true that later they became rather rigid in those days and lost the capacity to advance, while the rest of the world by experimental scientific methods of trial and error made progress in the discovery of more knowledge. Not that all the knowledge that surgeons and physicians were experimenting upon their patients was always for the good of the patients! And often they changed their experiments later. Anyhow, there is no doubt that there has been a very great advance in knowledge in medicine, surgery and allied subjects — advance by the scientific methods of experimentation, trial and error.

Now, how do we take advantage of such accumulated experience as the country might possess with regard to indigenous systems of medicine? I have little doubt that there is much in that accumulated experience so far as curative remedies are concerned — herbs and their application and so on. I have little doubt of that. But I have equally little doubt of the fact that if we are to progress at all, we must adhere strictly to scientific method, to scientific training. And in so far as Ayurvedic or Unani systems can be utilised and made to progress, that can only be done if they put themselves in line with scientific method. I am glad that in some places in India, more especially I think in Jamnagar, an attempt has been made to that end. I do not, therefore, see why there should be so much argument about this question if once you acknowledge that we must proceed on scientific lines. Science is not a closed system, it is an open thing, an open method of discovering the truth wherever you may find it and whatever it may be. In the event it may convince you of your previous errors, you have to discard your previous errors, and not stick to them. You must therefore be open-minded and not sit in your ivory tower, thinking that only you have a glimpse of the truth and nobody else has. The only things I think that you should adhere to strictly are the methods and processes of science. Having done that, you can examine everything and profit by it.

Another matter I might suggest. That is this — the spread of medical services in this country which is bound to take place : how is it going to be done? I have little doubt that the only way it can be done effectively is through the State taking it up. Personally, I believe in the State being connected with medical services much more intimately and deeply. Our medical services should be free to every individual who lives in the country — good medical services. At present, there can be no doubt that, in spite of good hospitals — Bombay has many very good hospitals — nevertheless, the poor man does not always get the same treatment which the rich man does. Many of them, if not in Bombay but elsewhere perhaps, hardly get any treatment at all, or cannot afford the very expensive drugs that modern medicine used more and more. That is not right or fair. They must get proper treatment, whether it is in hospitals or otherwise — they must get the drugs they need. Therefore, from this two things follow. First, that the medical service itself should be organised on a State basis, so as to provide this free medical attention. Secondly, that the major drugs, the important and major drugs, should be, by and large, in State manufacture— a State enterprise, because so far as I can see there are few such rackets in the commercial world as the manufacture and sale of drugs at tremendous profit.

I am glad that we, the Government of India, have put up the antibiotics factory for the manufacture of penicillin. Here in Bombay you have had for a long time the Haffkine Institute which has done such good work. I might inform you that we are intending to put up in a big way, on behalf of the State, other concerns for the large-scale manufacture of drugs. I am sure that this will lead to the cheapening of their price and they will be available to almost anybody who requires them.

I thank you, Sir, and your College for the honour you have done me.

67. NUCLEAR EXPLOSIONS AND THEIR EFFECTS*

(Foreword to the book entitled "Nuclear Explosions and their Effects")

About a year ago I suggested to the Defence Science Organisation of the Government of India that an objective study might be made with the material available of the consequences of the use of nuclear, thermo-nuclear and other weapons of mass destruction. Such a study could not, in the circumstances, be complete, as much of the information was considered secret. Nevertheless, I thought that it would enable us and others to form some picture of what modern war was likely to be. There have been frequent references in the newspapers and in periodicals to the result of nuclear explosions and some official publications have also been issued on this subject by various Governments. But I was not aware of any connected account and I thought that such an account, even though incomplete, would be useful.

Dr. D.S. Kothari of our Defence Science Organisation was specially entrusted with this task. With him were associated Dr. Homi Bhabha who is in charge of our atomic energy work, and Dr. V.R. Khanolkar, the Head of the Cancer Research Institute in Bombay. The preparation of this study was delayed because of the Conference on the Peaceful Uses of Atomic Energy held in Geneva last year. That Conference brought out many facts which till then had been unknown to the public.

The chief burden of preparing this study has thus fallen on Dr. Kothari. Dr. Homi Bhabha, in spite of the heavy burden he carries, has given substantial help. A number of our younger scientists connected with the Defence Science Organisation and the Atomic Energy Department have also given valuable help.

I have tried to restrain our scientists from being too technical. I have not succeeded wholly, but I think that this study will be of value even for non-scientific readers and the public generally. It will give some idea of the world we live in and even more so of what the fate of the world is likely to be if we start playing about with nuclear warfare. I suppose that no one, not even the great experts in this new science, know definitely what the full results of Hydrogen Bomb explosions will be. Enough is known, however, to give us some kind of a picture of a war in which these weapons are used. War is associated with death. We have now to face death on a colossal scale and, what is much worse, the genetic effects of these explosions on the present and future generations. Before this prospect, the other problems that face us in this world become relatively unimportant.

But even without war we have what are called nuclear test explosions which, in some measure, spread this evil thing over large parts of the world. These explosions continue in spite of the dangers inherent in them.

I trust that this study, brief and incomplete as it is, will be of some use in directing people's minds to the dreadful prospect of war in the nuclear age and to the dangers of continuing nuclear test explosions.

New Delhi,
June 20, 1956.

Jawaharlal Nehru

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* *Nuclear Explosions and their Effects*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, (1958).

(Foreword to the Second edition of "Nuclear Explosions and their Effects")

A little over two years ago, the first edition of this book was published. It had a friendly reception not only from scientists, but also from the general public. The edition was soon exhausted. It was intended to bring out a second edition early in 1957, but this could not be arranged, chiefly because Dr. D.S. Kothari was engaged in other work. Perhaps it was as well that this delay took place as during the last two years a number of important papers and reports have been issued. These have added considerably to our knowledge about strontium 90 and the way the fallout is distributed over the earth's surface.

This additional knowledge has made us realize more than ever the consequences of nuclear war and also of nuclear test explosions. Less than a month ago, the Scientific Committee appointed by the United Nations General Assembly issued a warning against under-estimating the effects of atomic radiation and said that the cessation of nuclear weapons' tests would act to the benefit of human health. The Committee came to the general conclusion that "even the smallest amounts of radiation are liable to cause deleterious genetic and perhaps also somatic effects". These eminent international experts proceeded to say: "Even a slow rise in the environmental radioactivity in the world, whether from weapon tests or any other sources, might eventually cause appreciable damage to large populations before it could be definitely identified as due to irradiation."

These conclusions, expressed in restrained scientific phraseology, tell us of the fate in store for us if we are not wise enough in time to put an end to this horror. Fortunately there is some indication now that nuclear tests will be suspended. The Soviet Union suspended them some time ago. The United States of America and the United Kingdom have announced that they will also suspend their tests in the near future. Let us hope that this will not be a mere suspension, but a final end of something which threatens the future of humanity.

As I write this, the United Nations Conference on the Peaceful Uses of Atomic Energy is meeting in Geneva. These peaceful uses will only prosper if they are divorced from the idea of war. There can be no doubt that people all over the world passionately desire some agreement among those who control these frightful engines of destruction, to put an end to the fear that haunts humanity.

I trust that this book, which has involved much labour, will be of some help to bring a clearer realization to people of the perils and dangers that humanity has to face and from that full realization may come effective steps to avoid these dangers.

New Delhi,
September 1, 1958

Jawaharlal Nehru

68. STATE OWNERSHIP OF BASIC DRUG MANUFACTURE*

(Speech at the Hindustan Antibiotics, Pimpri, Poona on August 2, 1956)

Coming here this morning, I was reminded of the long arguments we used to have some years ago — six years, five years, seven years, I forget now — six years ago, about the starting of this plant for the making of penicillin. Penicillin, obviously, is an important thing and

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

the question arose whether we should start it as a State concern or get one of the great manufacturing firms of some foreign country to start it here. In these two viewpoints, naturally there were certain immediate advantages on the one side — a certain assurance that the risk was taken by somebody else; and there were also obvious advantages on the other side. Well, if we had probably considered that question later, two or three years later, we would not have had much argument because by that time our thinking, our joint thinking, as well as various other factors had developed much more. Anyhow, we decided then in favour of the State — State-owned adventure in cooperation with UNICEF — and this is the result. I do not think anybody can doubt now that that was a happy and right decision to make. As I said, now we have no doubt about it. If we have any such or any like plants to put up, we will put it up as a State concern. Not because we want to put up big industrial concerns — we want every kind of energy, capacity, to be employed in the development of various types of industrial production — setting up of the public sector and setting up of the private sector. But, I think that it has to be the basis of our policy that what might be called basic things should be State-controlled and where possible State-owned.

Now, in regard to these antibiotics, penicillin etc. — in fact, in regard to any drugs also which are commonly used — there is a tendency, inevitable and I do not blame anybody, but there is and there can be a tendency to exploit the market. The prices go up, prices go down too when there is plenty available and so they shift about like that. We know in India even now that people just cannot get drugs that are necessary for them, because they cannot afford. That is not the right thing. Certain basic things should be available to everybody who needs them. I hope a time will come when there will be in India, as in some other countries, a National Health Service, of which advantage can be taken by everybody. Gradually, we are trying to expand that idea. Apart from that, there are certain things which are for greater public advantage, public use, public benefit and which should not be secret. I do not think it is right that something of wide public use and advantage should be controlled by some secret formula owned by some private firm. I think science does not advance, or has not at least advanced in the past very much, by methods of secrecy. Sometimes it has, no doubt, in war time and in our lives. Broadly speaking, the scientist's approach is that; and even otherwise he seeks the truth and he seeks it with courage. He proclaims it to the world for others to know it and then take the next step. So, when the question arises of remedies for human disease — drugs etc. — and for private firms to have secret processes and their utilising them — no doubt they do some good, producing something which is good; but nevertheless, their main object remains that it should be kept private in their own hands and the profit out of the manufacturing of it should come to them. I do not think it is the right approach these days. Therefore, it becomes necessary for the State to take to the manufacture of these basic drugs and I suppose this process will grow and continue in India. Anyhow, here, this penicillin plant which has now been functioning for about a year has demonstrated its success, and in fact has done better than was anticipated, and thereby falsified the fears of many of the people who thought that it could not prove to be a success.

I am glad, therefore, to come here today, and to meet those who are running this plant — our young scientists, men and women, and to see how keen and eager they are in their work and how they are aiming at even higher standards. After all, it is quality that counts; it is standard that counts in everything we make and in everything that we do, and ultimately in the human beings that we produce in this country. We do not want anything second rate in this country, neither second rate human beings nor second rate anything either, that any plant or factory may produce. It must always be our endeavour to improve the quality of everything, to make it as good as we possibly can, and, then to try to make

it better. It is not good enough to think that because the State is doing it or anybody else is doing it, therefore, we can relax, become complacent and bring out something that may be tolerably good. That is sometimes supposed to be the normal official mentality, the routine official mentality, of sitting in office and doing something as one's forefathers did before them. Well, the forefathers are dead, and their ways are to be dead to us. And we should do things in a more efficient way. What it really comes down to is that inefficiency is a fatal thing for a country that is making progress. Such a thing should be set upon and put aside.

Of course, we have to do many things and learn from what is being done elsewhere. But, the point is that the whole approach should be of improving, of doing better, of taking advantage of the new knowledge and experience available, and thus not only helping ourselves, but helping the world to improve.

So now, this penicillin plant, I take it, is one of our efforts not only to take what is being done by great discoverers and others but trying to improve the plant.

I congratulate those who are running it.

69. SIGNIFICANCE OF THE ATOMIC REVOLUTION*

(Speech at the opening of the Atomic Energy Establishment and naming of the first Swimming Pool Reactor, APSARA, at Trombay, Bombay on January 20, 1957)

Both the Governor and Dr. Bhabha have expressed their thanks to the representatives of various countries and their Atomic Energy Establishments who have come here from far distances. I should like to add my own feelings of gratitude to them for they have come from long distances at relatively short notice. Some of them connected with their own big Atomic Energy Establishments will no doubt find this 'small fry' because they are used to something much bigger. But I have no doubt they will appreciate that in the conditions that exist in India and in Asia the work that has been done here has some significance.

We are told — and I am prepared to believe it on Dr. Bhabha's word — that this is the first Atomic Energy Reactor in Asia, except for possibly the Soviet Union. In that sense, this does represent a certain historic moment in India and, if I may say so, in Asia. Nothing has been happening particularly today or now and this is only a ceremony — a formal ceremony for inauguration of something which really has been happening and going on. Nevertheless, it is a recognition of what has been going on and what is likely to take place in the future. And, therefore, it has a considerable importance.

We in India, and in a greater or lesser degree in other countries in Asia, are involved and have given a great deal of thought to the scientific and industrial development, to raising the standard of living of the people — naturally, that is our major task. And almost everything that we do, our Five Year Plans and the rest, revolve round that single question. Some people may think that this development of atomic energy is not directly related to that, at any rate in the present. Well, perhaps not!

Few things that we do produce results immediately. Dr. Bhabha has given you some figures showing how important it is for India and for most other countries to develop this. In any event, whether we like it or not, it is quite inevitable that we do it, just as it became

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

inevitable when the Industrial Revolution came to the world, that it should go ahead whether people liked it or not. So this Atomic Revolution, if I may call it so, has something in the nature of inevitability about it. Either you go ahead with it or you succumb and others go ahead, and you fall back and gradually drag yourself along in the trail of others. Well, that of course is not good enough and we should like every country to contribute its quota, some more, some less. I said just now that this moment has a certain historic significance. I am rather used sometimes to thinking in terms of historical perspective. I cannot look very far ahead because the change in things and the tempo of events is very rapid nowadays. Indeed, in my life-time, much has happened which few people dreamt of. I am not sure that much that has happened in the name of progress is very admirable. Sometimes doubts arise. And yet whether it is admirable or not it is inevitable, and one should be able to make it admirable by giving it the right turn.

As I stand before you here, with this Swimming Pool Reactor behind me and in front of you, I have in front of me the Island of Elephanta, not far away, which represents something that happened about 1300 years ago. It still exists and people go to see it, even the distinguished scientists who have come here for this function. Because presumably it represented and represents something of lasting value and significance. Well, 1300 years or so lie in between these works in the Island of Elephanta, and this Swimming Pool Reactor which represents this middle of the 20th century. Both, I take it, have their place and any person who ignores either of them misses an important element of life. I do not suppose humanity can live on reactors alone. Presumably, they want something else, too. Certainly, they cannot live on Elephanta alone; something else is wanted. So, in a sense, it is the combination of Elephanta and the Swimming Pool Reactor — odd as it may seem — that might produce a proper balance in life. Not Elephanta as it is but something that it may represent — the artistic values and cultural traditions which have lasted.

I am happy to be here, not because I know very much about atomic energy or reactor in spite of numerous attempts Dr. Bhabha and Dr. Krishnan have made to educate me. But, without understanding the intricacies of these mysteries, at any rate, I hope I have some conception of the broad consequences of these things and of the importance in this world of ours of the release of this great power.

In the old days, the men of religion talked about the mysteries. In Greece, there were the mysteries — in Greece and elsewhere — and the high priests who apparently knew about these mysteries exercised a great amount of influence on the common people who did not understand them. In every country that was so. The high priests in those days possibly dominated the thinking of many countries with their mysterious functions and ceremonials and rituals.

Now we have these mysteries which these high priests of science flourish before us, not only flourish but threaten us with; and at any rate make us either full of wonder or full of fear. Whatever it is, we have got these new mysteries of science, and of the higher mathematics, which are unveiling various aspects of the physical world to us. No one knows where this will go to. Some people may be frightened of this but in the ultimate analysis one should never be frightened of the truth whatever it may be. You cannot suppress truth; you cannot suppress the desire of man to discover, to progress, to find out, to unravel even though it may sometimes land him in very dangerous situations. You cannot stop the progress of the human mind or humanity. If by chance it takes the wrong turn, well, it suffers the consequences. Therefore, it is no good saying, "Stop this business". You cannot stop it. Certainly, it is good saying that this business has to be organised in such a way as to bring good to the world and not evil. That one can understand and one can try for. And I believe people in every country in the world, and more especially those

countries which are advanced in the art and science of atomic energy development, realise this. Even they cannot possess this tremendous power which is ever growing without also realising the tremendous dangers of using it in the wrong way. In fact, I imagine that everybody now realises that things as they are today make a war, in which these atomic weapons are used, out of the question. A global war in which this kind of what is called a strategic use of atomic weapons is made, is out of the question. Some people dally with the idea of what is called the tactical use of these weapons. Well, I do not know much about these matters, but it seems to me a little dangerous to play about in this way when you realise that the bigger use of it must be forbidden because it will bring disaster to everybody. Hence, the importance of the talks that go on from time to time of controlling the use of this great power. You have to think in larger terms of disarmament. It is a very difficult subject, I know, and this is no occasion for me to talk about it. But I believe that in spite of the apparent and real difficulties, people's minds and the minds of those who control the destinies of nations are beginning more and more to take what I may venture to say a 'realistic' view of this situation. And let us hope that they will arrive at some decision which will put an end to this terrible fear that these weapons might be used. Indeed, this itself will be helpful in controlling the use of any weapons of large-scale destruction.

So far as India's development of atomic energy is concerned, we are at the beginning of this journey, although I believe we have done rather well in the last few years. I can say so without hesitation because other people have endorsed it. It is not I or what the Governor might say. And I should like to congratulate those responsible — Dr. Bhabha, Dr. Krishnan of the Atomic Energy Commission and even more than these leaders, all the young men and women in our Atomic Energy Establishment who are working here and doing such good work. It is really when I see them and talk to them and see not only their enthusiasm but their informed enthusiasm, their trained minds, that I realise what very good material we have got. And the future becomes much more assured not because of these buildings we put up of cement and steel but because of the human material that one sees doing this work. So, I should like on this occasion specially to congratulate them on the work they have done, because it is really their work, the result of their work which you see here. We are not of course in the slightest degree reluctant to take advice or help from other countries. We are grateful to them for that help, which they have given and which we hope to get in future because of their longer experience and other facilities. But, it is certainly to be remembered by us that this thing that you see, this Swimming Pool Reactor in front of you, is the work practically entirely of our young Indian scientists and builders. Having said that, I should like, as Dr. Bhabha has done, to express my gratitude to the countries which are advanced in atomic energy work and who have been generously helping us. Indeed, we have received help from any number of them. Presently, you would see what is called the Canada-India Reactor which is being built — an imposing and forbidding sight — which is due to the generous help of the Canadian Government. You have learnt of the continuous help we have had from the Atomic Energy Establishments of the United Kingdom, of the United States, and of the co-operation we had with France. With the Soviet Union also there has been co-operation in this matter which, no doubt, will develop in future. So, I should like to express my gratitude to all these countries.

We have built this Atomic Energy Establishment here not only to help ourselves but as a centre where we can store such knowledge and experience as we possess, and that this establishment might offer these to people of other countries of Asia or round about. And I believe some have expressed their willingness to take advantage of this. But I should welcome the association in these training facilities of people from countries which do not possess them, more especially in Asia and may be in parts of Africa. So, I should

like to express my happiness today. But with that happiness, whenever one thinks of atomic energy, it is quite impossible not to think of the possibility of this development taking a malevolent and evil turn, to which I referred.

No man can prophesy the future. But, I should like to say on behalf of my Government and myself — and I think that I can say with some assurance on behalf of any future Government of India — that whatever might happen, whatever the circumstances, we shall never use this atomic energy for evil purposes. There is no condition attached to circumstances, because once we attach any condition, nobody knows what the conditions might be and the value of such an assurance does not take us very far.

Now, I have had my say and I gladly formally declare this Atomic Energy Establishment open. But one thing more. It has been suggested that we should give a suitable name to the Swimming Pool Reactor. In the course of the afternoon here, while we were having tea, this important subject was discussed. Dr. Krishnan from the fund of his knowledge of Sanskrit lore suggested various names. Dr. Bhabha pondered over it; the Governor who is also a Sanskrit scholar, was consulted, and so we thought this was an appropriate moment to name this particular Swimming Pool Reactor. It may be that when you hear the name we are suggesting it may surprise you a little. But, on further thought, you will see how very appropriate it is. The name really belongs to a beautiful damsel. The name we suggest for it is APSARA which, you know, means a celestial damsel or a water nymph. This is Swimming Pool Reactor and APSARA is specially connected with water. Therefore, it is appropriate. So, I am sure with your approval, I name this Swimming Pool Reactor — APSARA.

70. INTRODUCTION OF DECIMAL COINAGE*

(Message on the occasion of introduction of decimal coinage in India on April 1, 1957)

On the first of April of this year 1957, a silent but far-reaching revolution is going to begin in India. This is the introduction of the decimal and metric system in our coinage. This will no doubt be followed by the extension of this system later to weights and measures. For the present, however, we are introducing this system in the coinage only. Many people will ask why this change should be made in a well-established system and in something which affects the daily life and habits of all sections of the people. The question is relevant and deserves a full answer. No such change should be made unless it is obviously to the advantage of the nation, and the people. I am convinced, however, that the change was not only necessary but essential and any delay in it would have come in the way of our future progress. I have no doubt that sometime or the other this change would have become unavoidable. The later we made it, the more difficult it would have become. Everything old is not necessarily bad just as everything new is not necessarily good; but in a changing world something that was good in the past may not fit in, in present conditions. We have, therefore, to adapt ourselves to this changing world. The world today is one of science, technology and industry in their innumerable aspects. A cumbrous system of coinage and weights and measures is wasteful by time and energy, and delays work. As our social life has become more advanced and complex these petty delays and waste mount up and add to a great deal. Therefore, it has become necessary to make this change now rather than at a later

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

stage. It is well-known, I hope, that in adopting the decimal and metric system, we are not adopting something alien to India. Indeed, we are going back to something which was originally the production of the Indian genius. India gave to the whole world long ago, the great discovery of zero and numerals. Later the beginnings of what subsequently came to be known as the metric system saw light through Indian genius. So, we go back to our own. Some of my colleagues have explained fully in speech and writing the significance of this change, and details of how the change is going to be made. Some inconvenience might well be caused to begin with because of this change-over, as long established habits come in our way. But, every effort is being made to avoid this inconvenience and to have a period of three years when both the old and the new coins will circulate side by side and be considered as legal tender. Thus, any real inconvenience will be avoided, and very soon the great convenience of this new system will, I am sure, be appreciated all over India. I seek the cooperation of our people in making this a success. I am sure this will be forthcoming. It has been explained already that no one will suffer any loss by this change and indeed there may well be some gain apart from the gain in using better and more expeditious methods. I commend, therefore, the new coinage based on the decimal and metric system to our people.

Jai Hind!

March 24, 1957.

71. SCIENTIFIC METHOD AND THE FUNCTIONS OF THE CIVIL SERVANT*

(Presidential address at the third annual meeting of the general body of the Indian Institute of Public Administration, New Delhi on April 6, 1957)

I wonder if any of you have come across an address delivered by an Englishman Mr. E. Blount in October 1956 at Chatham House, London, on "Science as a Factor in International Relations". I think it appeared in *International Affairs*. It is a very interesting address and I should like to draw your attention to it in connection with the forthcoming discussions in your seminar on the question of training. I did not know this before, that in England a person who has gone in for purely technical studies is not allowed to enter the senior administrative services on the ground that he is not cultured enough, and not an all-rounder in his education, which a public administrator ought to be.

I am thrown back to the time when I was at school in England, more than half a century ago. There used to be great argument then in regard to the form in which and the extent to which the subject of science should be introduced in schools, and whether it should be compulsory or an optional subject. I suppose there have been some changes in the last fifty years; but there is always this pulling in opposite directions of what are called "cultural subjects" which, presumably, produce an integrated human being, and "technical and scientific subjects" which, presumably, produce a useful man. It may well be argued that too much stress on technology and other branches – specialist branches or the physical sciences – has led to a certain lop-sided growth of human beings in industrially and technically advanced countries. It has led to too great a power being placed in the hands of human beings without the corresponding moral capacity to use it rightly. But, that is only one

* *Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, (1958), Vol. III, pp. 164-166.

aspect of the problem. The other aspect, and an exceedingly important one, is that a country can only survive today if it has enough of scientific and technical personnel. There is no particular reason why the scientist should be an uncultured person; it may well be that the scientist is more cultured and more integrated than a person who has read, let us say, only literature.

I have already referred to Mr. Blount's address. He brings out some points in a way which strike one's mind. Science itself is very old but scientific methods are only about a hundred and fifty years old. The application of scientific methods, let us say, to industry makes a vast difference today. We all know of the vast changes that science has brought about in every field. Now we belong to the age of nuclear energy, when a tiny bit of mass is converted into enormous energy which can be used for both good and bad purposes. Mr. Blount points out that if a country wants to progress it must have the capacity to get itself changed. Any country which is tradition minded in regard to various matters, including administration, is doomed in a rapidly changing world. Scientific methods, by the collection of data and statistics of all kinds, help one to assess the forces in action, to watch and control them and to stop and remedy what is wrong. In fact, the scientific method means planning. Planning is science in action. Planning has to be flexible; it has to be wide awake and alert. That applies not merely to the industrial process but to the administration as well. Administration has to adapt itself to the changing phases of society.

Another point which Mr. Blount has stressed is that everything apparently depends on the number of technologists and engineers one has in a country. Taking the big countries today, it is now generally agreed that human beings could produce the same results given the same chances. And given the same chance, therefore, the bigger the country and the more the population, the greater the results. And that leads us to the conclusion that China and India, being two countries with vast populations, are likely to forge ahead in technical and scientific fields. Their industrial productivity is gradually increasing. This seems to be all the more true of China. India has to struggle with traditionalism in the shape of some aspects of Hinduism, caste, etc., but India is going along the right road. From the point of view of scientific technique, Western Europe appears to be somewhat on the down-grade and the United States at the peak. The Soviet Union has, in both the width and the intensity of science and technology, gone ahead very fast and is likely to move still faster in the future.

The traditional concept of administration as something apart from the normal life of the community is, I think, completely out of date today. In fact, the administrator who knows nothing of other jobs would not be a good administrator. In the highly complex society of today, the integrating aspect of his role becomes exceedingly important, and he must, therefore, keep himself fully informed not only of the developments in the community he serves, but also those of the world at large. There are many problems but the general impression that I get of the world is an impression of disintegration, not of integration. It may be, of course, that this disintegrating process is connected with the transitional phase and out of this disintegration some bigger and deeper integration will come. Anyhow, we are all living in a disintegrating world, where standards have disappeared, moral values have been bidden goodbye, and people think more and more in terms of power over Nature. It is obvious that all this technological and scientific progress in the world, unless it is balanced by some kind of moral standards and ethical values, is likely to lead to destruction. That is why we are so concerned over the basic question presented by atomic energy. Use it for evil, and it will destroy the world; use it for good, and it will raise the world to unknown standards of progress and happiness.

Pandit Jawaharlal Nehru at the Convocation of the Indian Agricultural Research Institute, New Delhi during the Golden Jubilee Celebrations (April, 1955). Also seen in the picture is Dr. Panjabrao S. Deshmukh (Union Minister of Agriculture).

Pandit Jawaharlal Nehru at the Conference of Directors of CSIR Laboratories at National Physical Laboratory, New Delhi (November, 1957). Also seen in the picture are Prof. M.S. Thacker (Director, CSIR), Dr. K.S. Krishnan (Director, NPL), Dr. S. Husain Zaheer (Director, RRL, Hyderabad) and Dr. A. Lahiri (Director, CFRI).

Shri A.S. Rao, then Director of Electronics Group, BARC explaining to Pt. Jawaharlal Nehru the working of Portable Monitor for radiation survey. (20.1.1957)

72. CRITICAL IMPORTANCE OF TRAINED PERSONNEL FOR DEVELOPMENT*

(Address to the National Council for Training in Vocational Trades at New Delhi on July 30, 1957)

I have gladly accepted the invitation of my colleague Nanda ji to come here today to give you such encouragement as I can in this work that you are undertaking. Frankly, I do not know very much as to what has been done. I have been trying in this respect and I have been trying to understand it by looking through rather rapidly some pamphlets that have been produced and naturally by listening to the Chairman's speech. That is to say that, not that I am not fully seized of the importance of the subject but that I do not know the details of the work that has gone on earlier. Mr. Ananthasayanam Ayyangar, our respected and honoured Speaker, has been associated with this work of the council previously. My first reaction is to wonder how a Council of 54 persons works. Certainly, we can have opening ceremonies and closing ceremonies and speeches. How exactly 54 persons work together, *i.e.*, in considering a problem, is not clear to me. But I have no doubt that you will find a way of doing something, in spite of your numbers. I suppose it was inevitable and desirable at least for this larger Council to be fully representative. But there is always this risk and danger when large bodies get together that the close consideration of a problem becomes more difficult and all that happens are rather formal speeches. I honestly hope that you will avoid that type of procedure or that habit which is, I am afraid rather a habit with us wherever we meet, whatever committee or council or whatever it may be. Because you deal with practical problems, the approach has therefore also to be practical. Now, if we look at the history of civilisation, there are many ways of judging its progress or the reverse. A great man once said that the only way to distinguish — one of the ways to distinguish – a human being from non-human animals was that man was a tool-making animal — I think it was Franklin who said that, but I am not sure. But it is important to remember that it is a fact that man has made tools that has made him what he is. One of the earliest epoch-making discoveries of the human race in the early days was, I suppose, the discovery of fire, most revolutionary! Another epoch-making discovery was that of the wheel, which made immediately an enormous difference, revolutionalised transport, all kinds of things, just in a simple way a very bad wheel to begin, no doubt! These are very many simple illustrations of the very long journey of humanity through tool-making to greater progress.

It is the tool among other things certainly that has made man go ahead, the tool being presumably an extension of his hands and feet. And the tool is now becoming an extension of his brain too, because a modern tool is not merely a physical tool but a brain tool, so that really tools are extensions of man's capacity to do things. And whether you look upon this matter from the point of view of fine craftsmanship or big machines, big industry, it is ultimately the tool that man has got that matters. Whether you look upon it from the point of view of using steam power or electric power or atomic power, we make tools and we use powers of nature. That is an advantage. Now, the measure of the advance of man or a community is, to what extent they have better tools. If it is correct, that the tools are the measure of the advance, then obviously the measure of advance of the communities is, what better tools they use, otherwise to that extent they are backward. Tools, of course, can be of all kinds and tools can be used for

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* i) Nehru Memorial Museum and Library, Teen Murti House, New Delhi ii) *Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi (1958), Vol. III, pp. 106-112.

good purposes as well as bad. Even a very simple and very useful thing like a pocket knife can be used to cut a man's throat, that is not the fault of the pocket knife, that is the fault of the person who uses it for an evil purpose. What I mean is, we must not get mixed up with the idea that a tool is bad because the person who uses that tool has evil intentions, is not properly trained or brought up. The atomic energy may be used — and I hope will be used – for the enormous advantage and benefit of the world. Atomic energy can also be used for the extermination of humanity. Anyhow, the progress of humanity can be well judged by the progress of its tool-making power and the use of tools whether they are in small handicrafts or big machines. That does not, of course, mean that other ways of measuring progress should not be undertaken. They are highly important because, as I said, the tool is a neutral thing; it may be used for good purposes or bad, and it is important that the human being should be so conditioned, developed, trained, as to use the tools for right purposes and not for wrong ones.

Again, if you look at various countries in the world, some that are called 'developed' and some that are at present more or less developed or more underdeveloped, you will find usually that the difference is in the advance which the developed countries have made in the use of tools. Therefore, they are wealthier and they produce wealth. Now, the use of tools, the production of tools, does of course inevitably involve the training of persons who can use those tools or who can evolve or discover new tools and better tools. So apart from the use of tools one has got, almost a basic thing becomes the training of human beings in the understanding, in the use and in the invention of tools. In other words, trained manpower counts. Most probably in a nation more than anything else, it is the trained manpower that counts. It is the human being, his labour and his tools that produce wealth. Naturally, he is helped, if the country has resources, he is hindered if it has not – but the main fact remains that it is the trained individual, trained not only to use his hands and his tools but also to use that magnificent tool that he has — his brain — to advantage. Trained human being ultimately makes a difference to his country and to the world. Again, a test of a country's advance, broadly speaking, in these matters is how many trained persons they have got, how many trained engineers they have got or the like. I am using engineers as a wide term because on them will ultimately depend the advance in the use of techniques and the rest.

Only the other day I was looking through an interesting manpower study which our Statistical Institute and Planning Commission have produced–it is very interesting and I should like to congratulate those who have produced this study, because that makes a scientific approach to a problem — of exactly where we are and how we are advancing in that front of engineers. We are trying to approach this problem more scientifically, because unless we know where we are, where we lack, we shall not make progress. We find a very extraordinary spectacle — many people say that we have not got enough engineers, which is perfectly true. I do not know how many we have — whether we have got 75,000 or 35,000 or 40,000; exact figures are not known, round about that — 30,000 to 40,000 engineers we have got in India. We say it is not enough, and that is true, in view of our Second Plan and the rest. But at the same time, the remarkable fact is that while we have not got enough engineers, there are engineers who are unemployed. That surely shows there is something wrong about the organisational aspect of it, that any competent person should be unemployed in a type of work for which we want competent persons of that type. So that this kind of approach becomes necessary – the planned approach – of not only training people but seeing that they fit in, that they get and they are assured of work, that they fit in. They are assured, the community is assured that you can profit by them; and not see the great wastage of the person or the community spending a lot of money over training a person, then when he is trained there is no work. It is a terrible waste.

Apart from the frustrating experience for him or her, it is a waste for the community or the country, because training costs – costs the community's money.

So I am glad to see, that as far as I have understood through some of these papers and what I have heard, this training which you are going to give is not to end in a dead lane, but lead to creation of profitable work. Am I right? It should not be like the training we give now, literary training, I mean, in our universities which often unfortunately leads to a dead end. And it is a gamble whether a person who has got through does any creative or profitable work or just sits and frets. It is not good enough, and that has to be looked into and remedied also from another point of view.

We all know that we are passing through a very important and a very difficult period in our national development. We are trying to get across the barrier which divides our static economy to a dynamic and progressing economy. Now, it is a difficult thing always to break that barrier or cross that barrier. And we cannot do difficult things without planning things. Now, in this again it is trained people that count. Whatever activity we may undertake, the balance in a country like India is changing from the importance attached to pure administrative ability to technical ability of different types. Administrative ability is essential; I am not trying to lessen its importance. It is essential for any organised society, but pure administrative ability broadly indicates no other ability, it indicates unprogressive society, just keeping things going, may be in an efficient manner. For a progressive society, the balance progressively shifts to other kinds of abilities also and that balance has shifted today in India. We want a highly qualified and trained administrative service – that is of importance necessarily – but we want today even more technical people not of one kind but in all the various kinds of public activity and trying always to use higher techniques.

I say higher techniques and I have no doubt that a higher technique is better than a lower technique. But a higher technique cannot come from the air. It has to grow, and it has to fit in with the social fabric and conditions. Sometimes, I find some Indian students, let us say, going to the United States and becoming very proficient in some branch of engineering. They come back here. Now they have got so used to the high techniques of the United States that they look for them here and they miss them that they are not here, broadly speaking. They feel annoyed, they feel frustrated. I like that higher technique to grow up here. It is no good my putting it up here in the middle of a jungle – just introduce something which would not fit in with the social and physical environment. Therefore, we have to try, we have not to hanker after every high technique to which we have not grown here socially and otherwise. We have to employ sometimes a lower technique which we may have. In a country where there is lack of manpower, it is an urgent need for them to use labour-saving devices. In a country where manpower is abundant more than abundant, that pressure of a labour-saving device is not so great. Although labour-saving device is a good thing and should progressively be employed, but it has to be related to the conditions – special conditions – we live in, otherwise, difficulties arise. Therefore, I am all in favour of higher techniques, and without higher techniques a country is bound to lag behind in every sense – lag behind not only in its wealth-producing capacity, in its standards of life, but lag behind even in that essential quality that makes a country strong enough to maintain its freedom and independence. We cannot maintain freedom and independence by lower techniques in a world which is using higher techniques.

Now, it is the basic function of a country – absolutely basic – to maintain its freedom and independence. Almost everything else comes afterwards because if you lose your freedom and independence, you cannot talk of other things. So, I want to lay stress on this fact – the recognition of this fact – that higher techniques must always be aimed at.

And the moment we give up that idea, then we accept a position of inferiority in the world, and not only that position but a position where our freedom itself might be threatened. Even so, I will again say that in adopting those higher techniques, we shall always have to remember the social milieu, the social problems. It (higher technique) is not something that can be imposed from above, it has to grow. India is being industrialised and there is no doubt it would be more and more industrialised. I welcome this. But industrialisation itself is not just an odd placing of, let us say, a high-grade factory in the middle of a desert. It has to grow in the country, technical personnel, technical training institutes and all that, then it sets in and grows.

Now, there is one other aspect which I should like to touch upon though it may not be directly relevant. But I think it is relevant not only to this activity which you are undertaking but to every activity in the country. We may become able and technically trained and all that as individuals and groups, but how do we pull together? What is the cement that joins us, so that our activities – our individual activities – may not only be advantageous to us as individuals but should be advantageous to the community, to the State, to the whole country. I am for the moment leaving out the whole world, although I should like to include that, because of its being too great, too big a circle. What is the *cement* that binds us? Because if the cement is lacking, those very activities that a highly trained person undertakes are not very advantageous. As civilisation, such as it is, advances and makes the society more and more complex, the element of co-operative endeavour becomes more and more important. Whether it is a factory or any kind of undertaking, it involves co-operation between human beings. Even the primitive man required some co-operation, a highly developed society requires much more of that. Now, if that element of co-operation is basically lacking, then all the training that we have is useless because it is frittered away in some measure of conflict and in pulling in different directions. Of course, the whole concept of a national State, of national freedom, is that of co-operation of the individuals, who live in that State, in the maintenance of the freedom and the prosperity of that State. There may be many differences of view. We accept that. But within that broad acceptance there are so many other ways to build up that major element of co-operation. One takes for granted this major element of co-operation in the State. All of us being citizens or nationals of the State, we take this concept for granted, and forget it more or less; and sometimes we pursue a way which naturally weakens that major concept, apart from otherwise weakening the processes that are being undertaken for the advance of the State or the people in general. Now, that is a very vital matter because it is that concept which is the life giving concept in a society. Once that goes, the social fabric disintegrates. The social fabric may consist of wonderful people, geniuses in every line, but they, all the geniuses, may go in different directions. They, individually may make good individuals, but certainly the social fabric will go down.

Nobody says that social conditions in any country, bar none, in the world are perfect. All kinds of problems are there, and the moment you solve one problem, number of more difficult problems arise. That indeed is a sign of growth. So, we are not afraid of problems and we recognise that a social structure is full of imbalances. One thinks that this social structure requires to change and sometimes a very great change if a country seeks to do that. We in this country, whether in the political field or in the social or economic, have tried to follow a policy of doing things by peaceful means, through peaceful methods. I do not mean to say that as individuals we are more peaceful or better or more moral. I definitely think we are not and I am quite honest about it because most people imagine that we are somehow superior. Most Indians imagine that we are superior because we recite ancient *mantras* about peace and *shanti* – therefore, obviously we are better. But when the test comes, there is no peace in our behaviour, with the pettiest conflict

we forget every item of unity and every conception of peace. In presuming that we are better than others – that is a failing which every country and the people of every country have – thinking themselves better than others. I suppose we are also subject to that failing, but at least let us keep our eyes open, not to be swept away by it. But while we may not be better than others, it has been to our great advantage to be channelled in particular directions of thinking and action, not only recently but to some extent through the past – through the long past even. We have been channelled in that direction, to some extent, and certainly in the recent past, for the last generation or two. What was perhaps thought to be only a theory was tested in practice and found to pay rich dividends – that is, a method of peaceful approach, the method of resolution of conflict through peaceful methods. And peaceful method does not mean a method that would just avoid active violence in the sense of hitting you on the head. Peace is not merely the absence of active violence, it is something much more important and innately positive. It is not a negative thing, or the absence of violence.

Now, we had experience in experimenting of that in our political sphere. In spite of our many failings and follies, we made that experiment through the genius of our leaders and other great people in this country, a success. Having made it a success, we seem to forget the very basis of our thinking or our action and drift in wrong directions. Whether it is a question of language or any other, people start breaking heads. Whether it is a question of what type of schools or education, whether it is a question of having a refinery in Assam or somewhere else, the same thing happens. It is amazing how this kind of thing – this kind of disruptive thinking on problems which should be decided calmly and dispassionately, this disruptive thinking and action, or rather disruptive lack of thinking is increasing. It is a very serious matter.

Then look at another aspect of it : strikes and the like. We hear a great deal about strikes now. As everyone knows, I am what might be called a middle class person. I am not an industrial worker, or in that sense of the word, a peasant. And I often wonder if, because I am not – because of that – whether I can fully grasp, fully enter into the mind of the peasant or the industrial worker. I do not think you can understand anybody unless you can place yourself in his position. Obviously, it is very difficult for one to do that. I try to at least. I keep my mind receptive and open, and I am prepared to recognise that I may fail in understanding them. So, I am not prepared to condemn anybody, but nevertheless one has to think about these matters. And it seems to me that this tendency to industrial conflict – whoever may be at fault in it, whether the employer or the employee – it is harmful for our growth. I think – and I have thought – that one of the essential rights of a worker is the right to strike. That is how trade unions have grown and how industrial growth has been established for the last 100 years, 150 years or more, not only in this country but other countries as well. It is a very painful story how the workers were crushed and penalised and how they gradually tried unity of effort to build up something for themselves. I can very well understand therefore their passionate desire to hold to those privileges or rights, that have stood them in good stead in the past. So, I do not deny them that right. But, it is one thing to have an abstract right and another to exercise it on all sorts of occasions, in all environments – whatever the consequences of that exercise might be. I think that normally speaking, we have considered to evolve, and we have evolved proper methods of dealing with industrial disputes dispassionately and deciding them. But it is for everybody, whether he is an employer or employee, to realise that it is to nobody's advantage to get into conflict.

Now, that applies to industrial matters. Today, we have to consider strikes of public servants, employees of Government, employees in public utility services and the like, which is a much more serious matter. Because in an industrial enterprise the strike affects

the employees or the employers, and only distantly and belatedly it has a slight effect on the community – *i.e.* production may be less. But a strike in a public utility concern or public service concerning the community affects the community immediately and it cannot therefore be judged from the same point of view as an industrial strike.

Now, I recognise fully that a Government, by the mere fact that it is a Government does not become the fountainhead of wisdom. And even a Government, if it thinks that it can decide every thing without consultation, because it is the Government, has a wrong approach to the problem. In the democratic society, the Government is a reflection, and ought to be a reflection of the will of the people — and it should continue to be a reflection all the time. It can, otherwise, become isolated.

We recognise that we are going through a difficult period. Prices have gone up somewhat though fortunately much less than in many other countries, but they have. And when prices go up, specially of the primary materials, people suffer and it is — it should be – our duty to give the most earnest consideration to these problems and try to remove burdens, – the increasing burdens or even the existing burdens – on our people or employees and others – that, I admit. And I admit that people are in difficulty. We have been considering these matters, but let us also realise that there is no magic remedy for these. We are paying the cost of trying to go ahead, paying the price of that. In spite of that, it may be that here and there we make mistakes. And if we make a mistake, we are not afraid of acknowledging it and trying to remedy it. But the major fact remains that you do not remedy mistakes by doing something utterly wrong, by some greater error. And therefore, it has surprised me and pained me distressfully to see that many of our fellow countrymen talk loosely of strikes in these services essential to the community. Even if they feel that they are in the right in many of their demands, that is a wrong procedure, a thoughtless procedure, a careless procedure, and in the final analysis, an anti-social and an anti-national procedure.

If there are these difficulties, which others face, let us consider them – but not this business of the big club, whether it is a big club wielded by the Government or the strikers. Government has big clubs too, but I do not like the Government wielding the big club. I think it would be the failure of the Government in that respect. Sometimes it may be forced to do that, but it is a difficult matter. But it does no credit to a Government to have to use a big club. It does no credit to the people who might use the big club. These questions cannot be settled or dealt with by threats or counter-threats. The matter is much too important, much too serious, affecting the whole country, not only the particular people involved but the entire community. And affecting in the final analysis our Five Year Plan and the rest at the moment when we are facing considerable difficulties in the economic sphere, in the financial sphere.

Even apart from that, people should know if they have their eyes open and if they at all see what is happening in the world, that India is facing dangers – not only internal difficulties – but external dangers too. And at this moment for some of our countrymen to talk light-heartedly of embarking on great strikes is a matter which is most distressing to me, and it shows that somehow perhaps we have not grown mature enough to shoulder the heavy tasks that this great country offers to us. If we are not mature enough, if we are not united enough, if we do not know what things come first and what things come next then all your planning and your technical training yields little fruit. It can only yield fruit if it is a united endeavour pointing in one direction. If at every stage it (this endeavour) is splitting up, then we suffer from a fault, from a disease, which has often affected India in the past – that of separation and fissiparous tendencies.

I ventured to talk to you about many matters which appear not directly concerned, but that is not so. They are directly concerned with your work, with my work and with

the Parliament's work. We are not isolated beings living in ivory towers. We are all related in this society of India, and if the foundation shakes, what happens to the super-structure? Therefore, I wanted to talk to you about this matter anyhow. In this work which you are doing, I wish you all success.

73. SCIENTIFIC WORKERS' ROLE IN ADVANCEMENT OF SCIENCE*

(The tenth council meeting of the Association of Scientific Workers of India was held at Madras on January 2, 1958. Major-General S.S. Sokhey, the President of the Association, gave the background address. This was followed by the following speech of Jawaharlal Nehru)

This Association was founded about nine years ago and you had honoured me by electing me its first President. Of course, I was in favour of establishing an organisation, since similar Associations were founded in other countries and had contributed to their welfare.

You have just heard a report of the work done by the Association. I do not know it in detail, but I suppose you have done useful work. There are two aspects of your work: firstly, as a trade union, you should protect your rights, and secondly — and this I consider more important — you should get together and discuss the problems of advancing science in India. Trade union means advancing your own interests, and that is very good provided it is not at the cost of others. Interest may be advanced by use of force. There are tensions in our society; I am not speaking of science but of industry. And often the interests of one group are contrary to those of the other. There is struggle and as a result one loses and the other gains. This struggle is there and no one can deny it. But the question is how to face this problem: by violence or by negotiation? Violence sometimes is forced on one even if does not seem to be an intelligent way of solving the problem. In industry, in the beginning this way was the only one available to remove injustice and hardships. It became a recognised way. But now a time has come when such questions should be tackled differently, and I believe gradually we shall have to tackle them in a different way.

In any case, the example of industry does not fully apply to scientific workers. It may apply to those in the industry. In universities and laboratories there has to be a different approach. The climate of struggle in private industry sometimes prevails in the universities. Teachers and students get organized in two blocks to fight each other, whereas they are there to help each other. However, these wrong trends, I hope, will gradually disappear.

But the other thing concerns the scientific workers more deeply. They should advance science and thus only they can advance themselves. When scientific expansion takes place in India, there will be more opportunities for work and more jobs. This is obvious and it emphasises the necessity of advancing science. In the last few years, we have advanced in science; we have more laboratories and more opportunities of work. I am not so sure about the universities; perhaps due to lack of funds and other reasons they are a little backward. And I want to emphasize the necessity of advancing science there, because ultimately the nation will gain only in so far as there is progress in education.

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* *Bulletin of the Association of Scientific Workers of India*, BASWI, Vol. XV, No. 9, September 1958, pp. 133-34.

All these questions arise and you experience them daily. I only hear or read or know a few things. I have other preoccupations. But that science should go forward and your Association should give a hand in this, I fully endorse. There are other sides to the question. We want scientific experience and method utilized in other spheres of life. The biggest thing is planning. It is not just making lists of requirements – so many roads, railways and factories. It means surveying the needs of the country and suggesting ways to fulfilling them speedily and without wastage. Science has a great part to play in this. Statistics, for example, should help us to know the exact position of the various requirements of the country. It should help us to keep a check on our progress. Therefore, a simple academic or intellectual approach will not be so helpful, scientists have to recognise the practical utility of science. When science progresses, it will help industry; it will be an essential part of planning and scientists themselves will gain from the process.

All these aspects should be before you. The country as well as scientists should benefit by your work. In response to the call of the President I have said a few words, and now it is for you to act.

74. SEARCH FOR NEW TECHNIQUES THROUGH LEATHER RESEARCH*

(Address at the Central Leather Research Institute, Madras on January 6, 1958)

This is the second time I have come here. Some years ago, I came here and saw the work that is being done. I may tell you I did not believe that you have extended and expanded your activities since then. My chief means of knowing of what you are doing is Prof. Thacker who keeps me up to the mark and he tells me you are doing well. I am glad to learn this. In a sense, we have been talking that the country should look more and more to scientific processes and techniques. We talk a great deal of our national laboratories and institutes. Well, they have to justify themselves from day to day, not one justification for ever. The moment they lose grip or fall into routine, their thinking and action dries up and they are lost. Therefore, such an institute or any scientific laboratory can only be kept by active and vital men, all the time thinking and acting, trying to do something better today than yesterday and evolving new techniques. It is not enough to copy from some other countries. I have no doubt you are thinking on these lines. I wish you all success.

* *Bulletin of the Central Leather Research Institute*, Vol. IV, No. 6, January 1958.

JAWAHARLAL NEHRU
ON
SCIENCE AND SOCIETY

POST SCIENTIFIC POLICY RESOLUTION

75. NATION'S DECLARATION OF FAITH IN SCIENCE : THE SCIENTIFIC POLICY RESOLUTION*

(Statement in Lok Sabha on March 13, 1958)

Sir, I beg to lay on the Table a copy of the Government of India Scientific Policy Resolution No. 131/CF/57 dated the 4th March, 1958.

I shall read it out because we consider this Resolution as an important one, defining our attitude to science and technology generally :

"The key to national prosperity, apart from the spirit of the people, lies in the modern age, in the effective combination of three factors, technology, raw materials and capital, of which the first is perhaps the most important, since the creation and adoption of new scientific techniques can, in fact, make up for a deficiency in natural resources, and reduce the demands on capital. But technology can only grow out of the study of science and its applications.

2. The dominating feature of the contemporary world is the intense cultivation of science on a large scale, and its application to meet a country's requirements. It is this, which, for the first time in man's history, has given to the common man in countries advanced in science, a standard of living and social and cultural amenities, which were once confined to a very small privileged minority of the population. Science has led to the growth and diffusion of culture to an extent never possible before. It has not only radically altered man's material environment, but, what is of still deeper significance, it has provided new tools of thought and has extended man's mental horizon. It has thus influenced even the basic values of life, and given to civilization a new vitality and a new dynamism.

3. It is only through the scientific approach and method and the use of scientific knowledge that reasonable material and cultural amenities and services can be provided for every member of the community, and it is out of a recognition of this possibility that the idea of a welfare state has grown. It is characteristic of the present world that the progress towards the practical realisation of a welfare state differs widely from country to country in direct relation to the extent of industrialisation and the effort and resources applied to the pursuit of science.

4. The wealth and prosperity of a nation depend on the effective utilisation of its human and material resources through industrialisation. The use of human material for industrialisation demands its education in science and training in technical skills. Industry opens up possibilities of great fulfilment for the individual. India's enormous resources of manpower can only become an asset in the modern world when trained and educated.

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* *Lok Sabha Debates*, Second Series, Vol. XIII, cc. 4736-39. Papers laid on the Table on March 13, 1958.

5. Science and technology can make up for deficiencies in raw materials by providing substitutes or indeed by providing skills which can be exported in return for raw materials. In industrialising a country, a heavy price has to be paid in importing science and technology in the form of plant and machinery, highly paid personnel and technical consultants. An early and large scale development of science and technology in the country could therefore greatly reduce the drain on capital during the early and critical stages of industrialisation.

6. Science has developed at an ever-increasing pace since the beginning of the century, so that the gap between the advanced and backward countries has widened more and more. It is only by adopting the most vigorous measures and by putting forward our utmost effort into the development of science that we can bridge the gap. It is an inherent obligation of a great country like India with its traditions of scholarship and original thinking and its great cultural heritage, to participate fully in the march of science, which is probably mankind's greatest enterprise today.

7. The Government of India have accordingly decided that the aims of their scientific policy will be:

(i) to foster, promote and sustain, by all appropriate means, the cultivation of science, and scientific research in all its aspects – pure, applied and educational;

(ii) to ensure an adequate supply, within the country, of research scientists of the highest quality, and to recognise their work as an important component of the strength of the nation;

(iii) to encourage and initiate, with all possible speed, programmes for the training of scientific and technical personnel, on a scale adequate to fulfil the country's needs in science and education, agriculture and industry, and defence;

(iv) to ensure that the creative talent of men and women is encouraged and finds full scope in scientific activity;

(v) to encourage individual initiative for the acquisition and dissemination of knowledge, and for the discovery of new knowledge, in an atmosphere of academic freedom; and

(vi) in general, to secure for the people of the country all the benefits that can accrue from the acquisition and application of scientific knowledge.

The Government of India have decided to pursue and accomplish these aims by offering good conditions of service to scientists and according them an honoured position, by associating scientists with the formulation of policies, and by taking such other measures as may be deemed necessary from time to time."

76. FACTORS BESIDES SCIENCE FOR REAL DEFENCE*

(Speech at the Defence Science Conference at New Delhi on April 3, 1958)

A Defence Science Conference, I take it, deals with defence and science and tries to join the two together. All of us are interested in defence, and many of us, in an increasing number I hope, are interested in science. At the same time, we find that science which plays such a tremendously important part in our world today has a tendency to, well, play tricks with humanity. It gives us a great deal of power and it amuses itself by seeing how we misuse it. It gives us defence and then gives us something more powerful which will overcome that defence and so this race between the two aspects goes on, till it has reached a stage when any attempt to experiment again in the field of war might well lead to the end of all experimentation. Therefore, the whole question of defence has become something new, something different from what it was. I am not going into that matter, but I just mentioned it.

On one side we recoil with horror at the prospect of war, not only because it destroys–that is the least of the things that war does–something more important: it does not merely destroy the body but destroys the mind and heart and everything that is worthwhile for the human beings. Even without war, we see how it has filled human beings and nations with hatred and their minds are full of violence. And yet, how do you meet this contingency? Not, I say with all respect, by praying for peace–though prayer may be good, because it means a good frame of mind at least–not in a sense of helplessness, because helplessness breeds fear. And I don't think that there is anything worse for an individual or for a group or for a nation than to suffer from fear. Almost every evil arises from fear. How to get rid of this fear?

Another odd thing is that people and countries that happen to be rather advanced in the art of war and in defence science, with an enormous capacity to use this science for defence or for attack, still suffer from a tremendous deal of fear. The possession of all these weapons does not rob them of fear. They fear each other. It is an extraordinary phenomenon. And so I wonder–I have often wondered–how we can build up our defence science on this lack of fear or on fearlessness, which of course is probably a subject which is not considered by Dr. Kothari[1] and his colleagues because that enters into a different range–may be psychological or whatever it may be. I have no doubt that all the defence science in the world and all the weapons in the world are worth nothing if there is not fearlessness behind them, nor is a nation worth anything.

Sometimes, another danger follows – that we get rather complacent. A phrase has grown up since the last world war, about the 'Maginot Line mentality'. We build up some kind of a wall and we think we are protected, although there is no protection except in your own capacity to protect and the strength of your heart and mind–or whatever other capacity you may have. I talked about fearlessness. One is always afraid of some-

* i) Nehru Memorial Museum and Library, Teen Murti House, New Delhi. ii) *Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi (1964), Vol. IV, pp. 420-423.

1 Dr. D.S. Kothari, Scientific Adviser to the Ministry of Defence and Head of the Defence Science Organisation, Government of India, New Delhi

thing one does not know. A person who has never handled an ordinary rifle is afraid of the rifle as a dangerous weapon. Today, the rifle may be an ordinary weapon for anybody, but those who have not handled the rifle think it a frightfully dangerous weapon. It is, of course, dangerous, but not for persons used to any kind of danger. If you are used to it, you take it more or less for granted, and do not get frightened of the man who possesses it. Now, that is the chief value of our people learning rifle shooting. It is not that I want them to shoot but because I want them to get used to this rifle and not be afraid of it because they have never touched it. Many people in this country are afraid of the rifle because they have never touched it, but if they get to know it, they will like to throw it away more or less because they cease to be frightened of it. Now, that should apply to bigger weapons. We should not be ignorant of them, and therefore afraid of them. That should apply indeed to all advances, whether in defence science or in any other field. Those advances that are constructive and beneficial, we should of course adopt. Those that are purely destructive, we should know so far as we can, so as partly to deal with the situation that might arise, in case somebody else uses them. Secondly, just not be afraid because knowledge sometimes – not always – gives one a little more confidence than ignorance. What I am driving at is this, that whatever be our line of approach to these problems of defence, we cannot afford to be complacent. Indeed, we have to base our future on the growth of scientific knowledge in every field. Science has unfortunately – technology and science – under the stress of war have perhaps advanced more than under the stress of peace. That, at any rate, appears so. But, today no country can advance in peace or in war except with a full knowledge of modern science and technology, not only knowledge but the capacity to add to that knowledge. In India, in our own way, considering everything, we are doing good work in the field of science and I am very grateful to the men of science in this country who are doing this work. Many of you may remember or may recollect that about a month or six weeks ago, the Government of India passed a resolution on science, its chief value being that not only it shows the Government's mind, but I hope the nation's mind, and their approach to science. I do not say that the resolution was something revolutionary, but it was a definite change-over from the old way of thinking. That change has come about gradually and not suddenly, but it has come and it will come more and more. Also, it was an indication to the country at large how things were moving, how people were thinking. So that there can be no doubt that we have to advance by the application of scientific methods and techniques in all fields, and more especially in a field like defence.

I welcome this conference and I am very glad that our Defence Science Department has been doing such good work under Dr. Kothari. Having said so, again I would like to remind you of a fact which is entirely a separate fact, but it is well to keep in mind, *i.e.* the defence of a country today, or at any time, even more than anything else depends on the morale of the country, even more than on your weapons on the economy of the country, on the state of the country in the sense that whether the country is well fed; whether the country is more or less contented or discontented. That is more important ultimately than any weapon. And we cannot allow that aspect of the country to suffer merely by thinking of a trained army, trained navy and trained air force equipped with the latest arms. I would rather have no army and no navy and no air force but a man who will refuse to bow his head even before the biggest bomb or anything, than a fine army and a fine navy and a fine air force with the people behind them supine, ill-fed and all that – that is no good. The army and the navy and the air force are meant for the people, not just to display their powers for themselves. So, we come back to the position that the best defence is the quality of the people, perhaps the contentment of the people. The best defence internationally is the friendship of other nations instead of being hostile

to other nations. One gets friendship by being friendly. One does not get friendship – anybody's friendship – by being hostile to that person. That is obvious enough. But one gets friendship also by being respected. If we are weak and supine, we get nobody's friendship. People do not care very much for the weak and the timid. But those who are in their own way strong, who are not overwhelmed by fear, who try to do to the best of their ability what they think is right, and do not allow themselves to be pushed hither and thither by other forces and other countries – they are respected. And then, out of that respect, friendship grows. But, always remember that, as a law of science, for every action some kind of some other action or reaction follows. I have not a shadow of doubt that whether it is individual relations or group relations or national relations, if you give goodwill and friendship to another country, that goodwill and friendship some time or other will come back to you. Or at any rate, it will tone down the hostility of the other country. I have no doubt that if you give hostility and threats to another country, you get both of them back in return. But, you can never get peace on a basis of threats and on hostile approaches. You can never get a civilized way of living if you continually behave in an uncivilized and crude way. The two are contrary.

While we must necessarily progress and try to progress in science and in defence science, you must always keep this in your minds that the mind and the heart of man are more powerful than anything that has been invented even by science. In fact, what has been invented by science has come out of the mind of man. And a man of courage real courage, of courage and integrity, is a greater strength to a nation than just the weapon he may have in his hand. The weapon is useful and inevitable, no doubt, because the weapon itself is the symbol of something and symbols count in this world. I hope earnestly that there will be no recourse to these weapons of mass slaughter that have been produced by science. I hope even more earnestly that so far as we in India are concerned, we shall not be dragged or pushed into war with anybody. I hope that our policies will always promote friendship and convey no threats and thus we shall gradually overcome the hostility of others, if there is that. That is the best defence and the best way of living. But, at the same time, I think it is essential that we should not wait for events but strengthen ourselves in every way–in the economic way, in the scientific way and in other ways – so that we may respect ourselves and others may respect us also. And so, having referred to all manner of irrelevant things, I invite you to begin your deliberations. *(Cheers.)*

77. ROLE OF DEFENCE SCIENCE AND TECHNOLOGY IN PEACEFUL DEVELOPMENT*

(Speech at the opening of the Defence Exhibition at Janpath, New Delhi on September 6, 1958)

For the last many days, I have been told that this Exhibition is the first ever to be held in India. Even this catalogue says so in big type. And now I am told that it is the second time that I have come to the Exhibition. So, I do not know which is correct. I take it, both are correct to some extent, *i.e.* a previous one that was a small affair – for more or less internal consumption – and this one is a more public view on a bigger scale.

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

Well, I am deeply interested in this and I am quite sure all of you will be interested, because it shows us the potential and the capacity of our present defence, industrial and the like establishments. Whether you think in terms of defence or you think in terms of peaceful development of industry, there is an overlap in these matters. Obviously defence apparatus cannot, and should not, confine itself just for military or naval or air purposes. You cannot put life in compartments like that, and for my part I would not like to think of our defence forces only thinking in terms of military, or naval or air effort. In fact, there has been an incursion by our defence establishments, more and more, into the field of production for civil uses and help in times of civil emergencies. Only recently we have seen in Delhi how the army came to our help when there was some difficulty about the water supply. It would be a good thing if we began to think of our defence forces not only in terms of defence, but in terms of more peaceful uses. Some years ago, I remember I visited a place in Madhya Pradesh — I forget the name of it — there was a very fine statuary there, relief in stone, about thousands years old representing some incidents or representing rather the ruler of that time who had driven out the Huns from India. And he was depicted as a victorious monarch who had driven out the Huns. But what interested me was that there was a reference to him and to his Minister. The Minister was described in that stone carving as the Minister for war and peace — both. It was a very good description, I thought, instead of merely being a Minister for purposes of war. And I hope the time will come when our Defence Minister will be described as Minister for Peace. Essentially, defence will come into the picture when it is needed, but our activities really should be directed towards creating the conditions and the atmosphere for peace. The world today is a world governed by science and technology: both. We have made great progress at ever-increasing pace during the last 100 years or more. But I suppose it is true to say that technology had a tendency to advance faster during periods of war than periods of peace, simply because pressure is great. It is a fight for survival and all efforts are thrown into it. But the only virtue, *i.e.* about the only virtue that one can attach to war is that it makes the people's minds and bodies work hard. Anyhow, the fact is that technology is supreme today and enters in every department of human endeavour and life. The countries that are advanced and are advancing on the scientific and technological plane — not only are they fulfilling their duty to their people in giving them worthwhile conditions of living, but also freedom and the atmosphere of freedom to progress. If you look upon it from the point of view of war-like devices, they all depend on technology. Of course, pursuit of peaceful progress remains the most important issue for technology in the world. And it will remain so, so long as the human beings are human beings and have not become some kind of robots without soul, spirit, mind, thought or anything else. Therefore, we in India, whether on the military, naval or air side or the civil side, have to catch up this modern science and modern technology; there is no other hope for us.

How we apply that technology is for us to decide, taking into consideration the conditions that prevail in the country. That is to say, technology does not mean an imitation of how it has been used elsewhere in other countries, where conditions are different. But, technology does mean the use of the latest technique applied to the conditions that prevail in a certain country, so that the problems of that country could be faced. Technology also means the use of all the latest power sources. Steam made a vast difference to the world; electricity made a greater difference and now we have atomic energy. I don't know what other new forces of nature will be used by man in the future. Anyhow, it is obvious that we stand on the threshold of even more rapid development of technology than ever before. Whether that is used for good purposes or bad, no one can prophesy, we can only hope. So, if you take your defence forces, they can be at all up-to-date, efficient and effective only if they use modern techniques and take advantage of modern scientific know-

ledge. Modern scientific knowledge is not the monopoly possession of any particular country, or any particular continent. Sometimes people seem to think that it is the monopoly of some western nations, because Europe started it and went ahead pretty fast for 100 years or more. Science is essentially a world-wide development; it belongs to the world, every part of the world has contributed and goes on contributing to it. It is true that our contribution in India is not so significant as the contribution of other countries that have been long at it. But if we are to progress in science and technology, it will not be merely by having imitative minds, copying what other countries have done. If we are to progress in industry, it will not be by importing machines from abroad. In fact, if we are to progress in anything at all, it will not be by copying others, but by having the capacity to produce them and to invent new things—in other words, to be in the forefront of scientific discovery as well as the implementation in practical application of what the discovery has. Therefore, one of the significant things that has happened in India during the last 10-11 years has been the impetus given to science – both basic science and practical science – the application of basic science to the practical things of life. It has borne some fruit already. And I am quite sure it will bear considerably more because nobody can doubt the capacity of our people in scientific and technical matters, given the chance. It is the chance that has been lacking in the past. Where the chance has come, they have shown themselves to be as good as any. Our services, I am glad to say, are increasing in numbers and in quality also. And nothing pleases me so much as to meet many of the young scientists – both young men and women – to see their enthusiasm for their work, the keenness of their minds and to delight in what they are doing. It is not that they do an odd job, work in the office for a number of hours, do it honestly, no doubt, but without any spirit and enthusiasm. But, it is that spirit and enthusiasm that has gladdened me. And it is that spirit and enthusiasm in our defence forces that pleases me.

The other day I visited the Oil Commission in Dehradun—the Oil and Natural Gas Commission. Quite a new adventure for us, this oily business! *(Laughter)*. We had to start from scratch and train people up. We got a few young men and young women, may be some in technical jobs and others straight from the university – good M.Scs. and others – and gave them a few years' training. And there they were, searching for oil, testing oil and all that. Well, I was more anxious and more interested in these young people than in their machinery and equipment, interesting as that was. And I was delighted to find their ardour, their eagerness in the work they were doing and searching for oil, and their vigorous assurance that they were bound to succeed. Now, that is the spirit one wants – a young man's spirit of adventure, of self-confidence and all that. Now, we have had for some time a Defence Science Organization, started some 10-12 years ago or more perhaps. It started in a small way, perhaps in the war times. But the real progress had begun later, after we became independent. It is now progressing faster and faster, under the very able guidance of Dr. Kothari and his colleagues who are also keen and enthusiastic in that work. And, of course, there are so many others in the army who are engaged in this work. I expect great things from this Defence Science Organization, and from all those connected with it in various ways. Already, it has shown good results. But these results, which perhaps you will see here, – results from our ordnance factories, from our engineers, from our technicians, from our Defence Science Organization – this is just a first beginning. And I am assured that there is almost nothing in the shape of machinery that they cannot make. Naturally, it is not enough to make a machine; we have to make it cheaply and economically. All this has to be tested. But nevertheless, it is something to know that we can make most things – almost everything – leaving out very few big things; that we will make in the course of future, no doubt. So, here, we have a considerable potential, which is rapidly being turned into actual. And here, we have to think not merely in terms of military ma-

chines being made, although that is necessary so long as we have defence forces. It is necessary that whatever we require we make ourselves--if not everything, almost everything. But, apart from that, when we have this great potential and ability and competence, there is no reason why it should not be used for civil purposes also. There was an idea – I do not think it exists much now – that the defence forces or any governmental organization should not encroach on what is called the private field or the private enterprise. We propose to encourage it (private enterprise) because we propose to push ahead on all fronts. There is really no question of any conflict between public enterprise and private enterprise in India, where there is such a vast field for development. But, at the same time, it should be realised that there is no question of our not doing something on the plea that it might affect private enterprise. That would be an absurd proposition. The test is: what is good for the country, and not what is good for this sector or that sector. Therefore, I welcome this development of the industrial front in our defence establishments, and I should like to encourage it. Obviously, that development should not be merely for show at an exhibition, because it is easy to make this kind of model to show. But it should be more broad-based, that is, it should be economic.

78. PROGRESS IN COMMUNICATIONS AND RADAR : UNDERSTANDING AND ADAPTING HUMAN MIND TO THE SCIENTIFIC AGE*

(Speech at the inauguration of weather radar station at New Delhi on September 13, 1958)

I was wondering how far any of you assembled here, apart from the few experts sitting on the table or elsewhere, could write a little essay on "radar" or indeed could write even a page about it in an understanding illuminating way. My colleague, Mr. S.K. Patil[1], has confessed that he does not know much about it and I associate myself with him in that confession.

It is extraordinary how today we utilise the scientific advances and take them almost for granted without understanding them in the least. It shows that scientific advance is going far ahead of normal human understanding--some experts apart. After all, scientific advance comes from the human mind. It does not drop down from the heaven but comes from human mind and it spreads to others who take advantage of that. But the fact is that the great mass of humanity which lives in this scientific age and takes advantage of it has no real grasp of these achievements of science. Hence, I suppose the difficulties that have arisen – the difficulties of our adapting ourselves mentally to this scientific age – physically we try to do so, not mentally. Hence, the difficulties of scientific advances being used or the threat of their being used for human destruction on a wide scale. After all, a scientific advance means a peep into nature's ways and understanding of nature, a utilisation of nature's forces or nature's great resources of power. We do not produce something out of nothing; it is only that we discover more and more some aspects of this tremendous and manifold variety of nature.

What is radar? It is a means of communication. Suppose you have to write a history of

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* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

1. Mr. S.K. Patil, Union Minister of Transport and Communication, Government of India, New Delhi.

the growth of communication in the world from the very beginning, probably it will be not only a fascinating story but it will give us a little greater insight into history. What we normally read in history – a long succession of kings, the generals and the battles–I hope that history now largely ignores the kings and the generals and the battles, and thinks of the achievements of the human race, the great achievements through which man has gradually advanced, gradually gained some understanding of nature and utilised that understanding for his own advancement. The story of communications– I do not know where to begin. But I suppose one of the earliest things was the discovery by that great genius who invented the wheel. A wheel may appear a very common thing, but just imagine the time when there had been no wheel. These are basic and tremendous discoveries which have really affected human history like the discovery of fire and so many other things which everyone takes for granted. It is easier now to make advances in science, step by step, on the basis of what we have got. These are far easier than the discovery of the wheel, than the discovery of fire and how to use fire, than the discovery of agriculture, how to grow these things from mother earth. Let us come to another field–the tremendous field of mathematics, which is so closely associated with scientific advance and with any understanding of the physical world today. How did mathematics find its way – can you imagine mathematics advancing if we have to deal always with what are called Roman numerals! Terrible, if you deal with Roman numerals: you could never even do a big sum of addition, much less some other sum easily. Then some genius arose, who invented what are now known as the international form of numerals, which you perhaps know arose in India. Take the other great genius who first had the conception of zero. It is a tremendous conception which changed the whole face of human numerical and mathematical things. We do not know what he was, except that the conception arose in India. Some Indian genius of old time also invented the basis of the decimal system, out of which it grew.

I have said that so far as communications go, one might for the moment call the inventor of the wheel the great scientist who gave a push to communications. Then there was a tremendous lag; the wheel remained a wheel and nothing more happened. The only power that the wheel had was either human power, pushing or pulling it, or later trained animals, domesticated animals, pushing or pulling it. And probably, for thousands of years the fastest means of communication was a fast horse. You could ride it or it could pull some kind of a carriage; riding was the fastest, and that was the fastest way of sending a message. Now, look at this long period of history – thousands of years – when essentially human beings depended on the wheel on one side or on the horse — horse power in the real sense of the word – on the other. And no other progress was made in that direction. Then, long afterwards, came steam and then came electricity, and then various other developments which we know so well. Through electricity came the telegraph and the telephone, followed by the wireless and the radio and so on, and ultimately – at least ultimately up till now – the radar. So, this is a series of developments in communications.

We think today of the radar as a very useful thing. It found its origin in war, under the stresses and strains of war, and it was immediately adapted to the uses of peace. I have no doubt that this will develop even more and other ways of utilising nature's forces and energy will be found because the pace of change and the pace of advance today is very very fast. We do not have to wait for 2000 years for man-power or horse-power to give place to some other power – steam power or electric power and various atomic powers. We are advancing at this terrific pace, advancing so fast and advancing through the human mind, but advancing so fast that the vast multitude of human minds are left behind. We cannot grasp the significance of these things. We use these of course–we may get into a railway train or aircraft or use the radar or use so many other things without really understanding the rationale of it or the basis of it. And yet, if we are to progress, we cannot progress

without knowing the reason behind – not merely just reading some kind of a simple explanation in a pamphlet or a book and getting hold of some broad generalizations; but understanding the real reason behind that particular scientific development. So that we might carry ourselves a stage further and gradually adopt our life to this changing scene in science. These are big questions and I merely mentioned them to you because even in the brief period I sat here, thinking of what to say to you, these ideas occurred to me. Here we are, anyway, at the installation of this radar set which is going to be of great use no doubt to our pilots, aircraft and our meteorological department, which fulfils such a useful function both in leading and misleading people. Fortunately, people do not rely on it too much; therefore they cannot be misled too much. However, with the help of this radar, the element of misleading will grow less and less, and the lead given, or the information given, will be much more accurate and helpful–certainly for our pilots. It does not matter if we get rain or not, but it does matter a great deal whether a pilot and his aircraft get tied up or get into trouble because of storms and clouds.

So, we welcome this, and I am thankful to the Technical Co-operation Mission who have kindly presented this to us. I hope that our engineers and others will not only use it, not only understand it, but understand the inner significance of such things, so that further steps, advances, in the progress of radar, or other scientific achievements, will be done by them in common with other scientists in the world. And now I presume I shall press a button and something will happen. *(Laughter)*

79. TASKS BEFORE THE ADMINISTRATORS IN THE ERA OF SCIENCE AND TECHNOLOGY*

(Speech at the Administrative Staff College of India, Hyderabad on October 23, 1958)

I am very glad to be here. I have been hearing about the Administrative College for some time – in fact, even before it started – and General Shrinagesh[1] has on more than one occasion spoken to me about it. I need not tell you how much, how important I feel this Institution is, not because it is the first in Asia or third in the world, but because obviously it performs a task which is of high importance in the present stage of our country – perhaps of other countries too.

Now, in the few minutes that I speak to you, there is not much point in my discussing the type, the normal type, of problems that you deal with and in which you have greater experience and knowledge than I have. I am glad to note that the principal idea behind your discussions and your efforts here is to view a problem from various sides so that you may get a wider outlook and thus be able to understand it in all its aspects. In the modern world, life, society – not society in the narrow sense – get more and more complicated, technology and all that, with the result that we produce highly competent individuals in a specialised field. But there is a tendency for those highly competent individuals to know nothing about other fields, or not enough. We may possibly have a very fine engineer, who does not know much about other things. In other words, it is possible that he may not

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

1. General S.M. Shrinagesh, Principal, Administrative Staff College of India, Hyderabad-Deccan.

even be a good citizen, although he is a very good engineer, or a good doctor, or a good lawyer, or a good administrator and tends to specialise, which is inevitable. But too much specialisation and not enough of a wider outlook, is apt not only to limit the individual but limit his work. I take it that one of your objectives here is that while you specialise you try to get that wider outlook, in so far as you can. That of course is good.

Now, in regard to any special field, probably the approach is the same even though you might differ in your economic theories. Let us again take an engineer who has to build a bridge. It does not very much matter if he comes from a capitalist or communist country or a socialist country. He has got to build a bridge. Presumably the laws that apply — the engineering laws that apply to the making of a bridge are the same, whether it is a communist country or a capitalist country. Or take science: by and large, the scientist, presumably, more or less works on the same lines. If they have to send a rocket to the moon, well, they study the laws of science, not the laws of Marx or the laws of some economist of a different type. I say this because, in the present day, there is in the world, as you know, great tension between what is called the 'West' and what is called, wrongly, the 'East' – between the communist world and the anti-communist world or a non-communist world. The tension is political, is military, is—if you like—to some extent economic. But essentially, if you see, the broad objectives of even the major countries that are in conflict are the same. They are the development of science and technology and the use of science and technology – well, you may put it – for the betterment of their people, to raise higher their standards. Or you may put it in another way, to increase their power potential, become great powers. It is only through science and technology that a country today can become rich and powerful and great even in the military sphere. Therefore, while they may have different economic theories, while they may have a cold war, they really and largely work along the same lines, that is, exploit science and technology, exploit the power resources of the world which science has released to gain their objectives. One of them is, of course, to increase their potential and actual power, to raise the standard of living and so on and so forth.

You may describe the growth of a modern civilization, if you like to call it, or industrialism, if you like to call it, as the ever greater use of power, power derived from nature's resources which man uses. A tremendous revolution took place in the world, bigger than any, and that was the industrial revolution which began with the use of steam power, and that developed in many ways; later came electric power and other things. Now we have atomic energy, atomic power, which is just beginning to be used. So, all these various types of power increased the capacity of the individual or the group or the State enormously and therefore the course of civilisation has been the increasing use of ordered power. The average administrator generally does not think of these things. He takes the world as it is —not quite as it is, but still he does not see the revolutionary tendencies that have been at work, that have made the countries of Western Europe and America very rich and powerful, later made a communist country like Russia very powerful and increasingly rich. In other words, as I said the other day at the Bank meeting in Delhi, in spite of your cold wars, the communist countries and the capitalist countries worshipped the same Gods – the Gods of machine, the God of technology, from which other countries like ours tend to do the same or go in the same direction. Because, there is no hope, I am quite sure, for any country to better itself, its standards, without the use of nature's power as brought out by scientific and technological devices. We can never raise our wealth potential without, in other words, utilising science and technology, without industrialisation in some form or the other.

And remember also that at the present moment, we in the world, in different parts of the world, in different degrees are passing through an intensely revolutionary period —using the word "revolution" in the sense of how it affects the structure of the society, human

relations, human productive apparatus and so on. Has it ever struck you that not long ago, say, two hundred years ago, what was the world like, more or less? Take communications two hundred years ago or less. Communications were about the same all over the world as they were two thousand years ago. There was no great difference. If a man wanted to go somewhere, the fastest way for him to go was perhaps a fast horse. If he wanted to send a message somewhere, probably that was also done the same way. See the enormous difference that has been brought about in these two hundred years by the development of science, technology etc. And all these things you take for granted today, apart from the railway train, or the steamship or the aeroplane or the telephone and ultimately radar and all kinds of things — electronics comes in, which in communications is increasing its progress at a tremendous pace. That is one example. Other examples are in the rest of the productive apparatus, which of course again has been advancing at a terrific pace.

Now if the productive apparatus advances at this pace and communications and everything, obviously human life is affected. The structure of society is affected, because society is conditioned — when I say 'society' I mean the human beings in a group living together. This type of social group is affected by the way things are produced, by the way things are distributed, by the wealth — producing capacity, wealth being goods, not of course money — money is only a matter of commerce and exchange. Now if you look back, as I said over these thousands of years of human history, you see it was gradually changing from the earliest days — let us say when the first wheel was introduced : tremendous discovery — the wheel. A month ago I was in Bhutan, a country where there is no wheel, no wheeled carriage, no roads. The people are by no means primitive. Do not imagine that. They are cultured people, intelligent people, and if you bring them and put them in your college, they may get first class. It is only that the human beings are backward due to lack of opportunities etc. And so they yet live in an age where there is no wheel, no wheeled carriage, or locomotion. And suddenly suppose I have to go. If I have to go just a hundred miles somewhere, I have to go on horse-back through high mountains and take about a week over it. So, you see this tremendous revolution that has been taking place all over the world — principally, to begin with, in Western Europe and America — and it has spread. And that revolution is bringing about inevitably enormous changes in human life — our life.

Even though we are not industrialised in any high degree, we live with the implements and the products of science and technology all the time. Now we are on the threshold of what is called the 'Atomic Age', which, ultimately, apart from its tremendous destructive power, is a power which can be used for the advancement of humanity. And more and more we get into a power age, and that is the point I wish to stress — that as the productive apparatus changes, greater power comes in, human beings change with it, social relations change with it. People do not quite appreciate that, they seem to think that you superimpose something. The children of today who are going to school even in India — and since the boys and girls go to school — I find they know much more, their interest is much more towards science and technology than of children of my day. So, the context of thinking is changing, the context of life is changing.

If that happens, obviously, the problems before the administrator change too. They change because of technology. The problems before the administrator change because the human being that he administers changes. It makes all the difference in the world whether you are dealing with a peasant in the field or the artisan or the skilled worker or the semi-skilled worker. The peasant is changing. If you go to the Soviet Union, you will find the amazing change that has occurred there. With the old Russian *Mujick* — the peasant has disappeared. He is a technical worker — even in the field — because they have

got tractors and they have got this and that. The whole population in Russia during the last thirty years has completely changed because of the introduction of new techniques, new machinery — certainly of course in the plants and factories — but even in the fields. Now that is also happening in India today — somewhere rapidly, in some places more slowly. That is bound to. It is an inevitable thing. It is well to remember that, because it colours all our outlook on the problems that we have to face. Therefore, our outlook has to be a dynamic outlook. The scientist's outlook is normally a dynamic outlook; a technician's is normally dynamic; the administrator's is normally static. It is very difficult for him to get out of that and therefore an administrator is often left behind by changes, technological changes and social changes that are taking place. And it is well to remember in this Administrative College how the administrator has to deal with a changing society, technologically and in regard to social groupings and the rest.

We talk, General Shrinagesh talked about a mixed economy, and we talked about the private sector and the public sector and so on and so forth, as if they are two branches of the same tree. They are not. There is a different philosophy underlying both. I do not mean to say that they are completely separate or in conflict. I do not mean that. But the public sector, of course, can only come in at a certain stage in the development of a social group. Public or private, you cannot suddenly go into Central Africa and start a private sector or a public sector, because conditions have not gone that far: people have not developed. Human beings have not yet developed, to a stage to bring about these things. You might perhaps start a factory in Central Africa with a few trained men. You cannot possibly start, broadly speaking, a big public enterprise in a very backward human environment; that is, it relates to a new stage of growth.

There is one fact that I should like you to remember, because you know, broadly speaking — why broadly speaking we have definitely said — that we are aiming at a socialist pattern of society in India. Now, what does that mean? We have said, of course, that we shall have the public sector and the private sector, and we have also said that we are not following any doctrinaire or dogmatic form of socialist theory, but we are rather pragmatic about it. And may be, we take such steps as we think proper from time to time, but always keeping in view that nothing should be done which comes in the way of that movement and that direction, or diverts us from that. That is, if we are clear about that.

Take the so-called conflict between big industry, medium industry and cottage industry. Now, economists and others sometimes talk with a measure of contempt, "Oh! In this world of advanced technology, you talk about cottage industries; that is an absurdity." Well, not only do I not consider it an absurdity, but I consider it an essential thing in India. And I do not see the slightest conflict between big industry and cottage industry. There may be some overlapping here and there. I do not say that for ever and ever these things should continue as they are. I am merely dealing with India of the present day and of the foreseeable future. As I just said, I am convinced that without industrialisation, that is, without development of our industries with the highest techniques, we are not going to advance; we are not going to make India a prosperous country. Europe and America became prosperous only because they utilized science and technology. We must do the same and I want to push that process as fast as I can. But in doing so, I have always to keep in view the human factor. Suppose industry advances fast — very fast here: well, how many people do you think it will employ, say, in the next ten years, fifteen years? Ten million, 20 million, if you like 25 million or 30 million — it is a large number, specially in these days when more and more automatic processes come in, and we want the latest type; I do not believe in having a second-rate type. We may have automation or something later on. But whatever you may do, vast numbers of human beings are not employed in India in that process,

in that big industry process. You can absorb much more in small industries: by small I mean up-to-date small industries.

Small industry is very important and I think it is doing pretty well. Even so, vast numbers remain who live on agriculture although they are not wanted there. They are a bit of a burden on the land. Fewer people can do the job better. Now, you cannot leave them, and give them a dole. It is neither good for them nor for the country. Therefore, they have to be employed, given work. Work is essential for the human being and I personally believe that some kind of manual work is normally necessary for every human being. I do not think even the intellect functions quite clearly unless the body functions properly and hands and feet can function. However, apart from that, the necessity for cottage industry comes in because of the problem in India as it is. It does not come, for me, into conflict with big industry or small industry. And even the cottage industry should apply, should use, as far as it can, the latest techniques of cottage industry. It is no good comparing it to some tremendous plant which can produce the same goods cheaper. If we can employ all the people in India in high techniques, well and good. If we do not employ them, it means we are wasting one of the most precious assets of a country, that is, manpower. Therefore, in a way, the problem in India is how to utilise our surplus manpower — I use the word "surplus" in the present day sense, and it should not be surplus if it is properly used in productive activity and in capital formation. We want capital formation. A person may, by his older or shall I say even primitive methods produce, let us say, Rs.5/- per month: a very small sum. But then if you think of a hundred million people producing Rs.5/- a month, it becomes a large sum. They are consumers anyhow, even though their consumption may be very low. They have to consume to live. They have to produce something. So, all these problems come up before us and in the economic domain the administrator, whether he administers a plan or anything else, has to keep them in view and fit them in the changing social environment.

Remember that India is changing fast. Take even our colleges. Much is said about indiscipline. It is true, the fact of the matter is that the growth of education has not kept pace with quality. It seldom does. People go to colleges, and rightly. They go there whose fathers or grand-fathers never went to a school. They go to a college without that background, some kind of educational background in the family or elsewhere. And unfortunately, our methods of education are, well, more examination and mugging up for examination, which do not bring that background giving them quality. Of course, it will come. So you get a type of person. And this is not a problem of India alone, in the extreme form it is. Even in England today large numbers of people have gone to universities there, usually what are called red-brick universities, that is not Oxford and Cambridge, and they are called angry young men. They do not accept the social fabric of others. They are clever. They have gone to the colleges. They have learnt something. But they resist bowing down to other standards. So, these problems come in a changing world everywhere.

An administrator, apart from the technological job that he has to do, has to deal with human beings – whether they are workers in the plant or factory – whether they are others, clerks, whatever they may be. And when the human factor is rapidly changing, he has to have a fertile and adaptive mind, not a fixed mind, to adapt himself to that change, to understand them, because ultimately the biggest job of an administrator apart from his technical training is to understand the human beings because he has to deal with them. When you deal with large numbers of human beings, you cannot in the ultimate analysis coerce them. You have to win their goodwill, their cooperation. Only then can you succeed. More so, because in countries like India today, there is a great deal of political consciousness, demands, urges etc. They are the right urges; they are the right demands – why should they live in a miserable condition? If I were placed there, I would rebel all the time. But at

the same time when the demands are there and the urges are there, the capacity to fulfil those demands immediately is not with us.

Because while in Western Europe and America the economic revolution came first and the political revolution came later and thereby the demands of the political revolution could be fulfilled by the resources that had been produced by the economic revolution. In India the political revolution has come producing the demands and the economic revolution is rather backward. And that is a big problem and you cannot fulfil them. We try to fulfil them, as much as possible, gradually and we hope to do so eventually. Therefore, when one understands this, then one understands the mentality of the people we deal with. And I have found — because at least in one thing I am a bit of an expert, *i.e.* in crowd psychology — how do you deal with crowds? You can only deal with them in a friendly way. There is no other way. Of course, if a crowd rebels, you may have to deal with it firmly; you have to, that is a different matter. You may even unfortunately have to call, or have recourse to the police or the army to deal with the crowd. That is your failure if you do it. You should win the crowd; and you could, because a crowd is a curious thing. The intellectual level of the crowd is low, lower than the individuals in the crowd. A crowd changes its temper very rapidly. It may be angry; if you make it laugh, it changes its temper immediately. Just you have to know therefore that only the friendly approach tells. Firm approach, certainly. Friendly approach does not mean that you should do the wrong thing. But always a friendly approach, an approach to the mind, and even the heart of the crowd. And always trying to explain and treating them so that they feel that you do not consider them lower than yourself. You consider them on level. Even if he does not understand your explanation, you attempt to explain and please him, because you have treated him as an intelligent person and not as a fool who cannot understand. You tell him that. Just like a child — it is irritating to treat a child as child who cannot understand. Always try to treat the child as an intelligent person. He responds to that. So, all these problems come up, and you have to be wide awake to them and feel your way, feel the pulse of the situation, of the group, of the worker.

Then again you know that we are trying to introduce progressively workers' participation in industry. It has been done to some extent here and there in the private sector and to some extent in the public sector. Now, that is bound to grow. Again, because you cannot have his co-operation except as a partner, you cannot boss over him; the days of bossing have gone. Because you are cleverer, you are more experienced, you have a more responsible position, but that does not mean that you go about bossing over people. You have to treat them as human beings and get the best out of them. In the early days of the industrial revolution in England, you will find that most of the inventions were made not by bosses at the top but by workers in the factory: foremen and others. They made most of the inventions and not the big men at the top usually. They got a chance. Your people should be given every chance to do that. There are plenty who will come up — some at least will take advantage of it.

And that leads me to the fact that nothing is worse than introducing — as we have introduced; and we believe in — the class system in our industry or in our administration. I do not like this business of class I officer, class II, class III and class IV. I can understand a person abler, more competent, occupying a more responsible position. But let him not think that he belongs to a superior class. Apart from everything else, he will not get work from others, and more and more it will become difficult.

So, I have been going on talking for a long time and have really got to go now. I am very glad to have come here and I am sure this College could be helpful in dealing with many of these problems that we face.

80. SOCIAL ASPECTS OF SMALL AND BIG PROJECTS*

(Inaugural address at the twenty-ninth annual meeting of the Central Board of Irrigation and Power held at New Delhi on November 17, 1958)

I have great pleasure in joining you on this occasion because I think that the problems that your Board tackles, namely, irrigation and power, are of basic importance. I wonder if one could find better two words that express what we want in India. These two words cover agriculture and industry both. For an agricultural country, irrigation obviously is of high importance.

But for both agriculture and industry, indeed for everything that goes to build up the material civilisation power is the most important. It may even be said that the history of material civilisation in the world is the history of the growth of power development. In fact, the Industrial Revolution again centred around the growth and use of power. The importance of power is thus obvious and it is for sources of power that the engineers and others search for, so as to be able to use it for the manifold purposes of modern civilisation and growing society. You may, without knowing anything about a country, blindfold state its advancement, by finding out how much power it produces.

So it is right that we should realise the importance of these two subjects — irrigation and power — as we have indeed done. The progress during the last ten or eleven years has shown our great desire to increase irrigation and power in this country. Some of our major river valley projects have become famous not only in India but outside India also. They have become symbols of big things that we want to do.

For some time past, however, I have been beginning to think that we are suffering from what we may call "disease of gigantiism". We want to show that we can build big dams and do big things. This is a dangerous outlook developing in India. I want our engineers to undertake big schemes in the country, but the idea of having big undertakings and doing big tasks for the sake of showing that we can do big things is not a good outlook at all.

I think that while, inevitably, we shall have to undertake big schemes or tasks in this country, we should always remember that it is the ten thousand small tasks that count ultimately much more than a few big ones. It is, as you also referred to it, Mr. President, the small irrigation projects, the small industries and the small plants for electric power, which will change the face of the country, far more than half a dozen big projects in half a dozen places.

You have said just now in your address that the cost of production of power in a small project is great. I am not at all sure if that is so, because the cost of a small project has to be judged after taking into account all the social upsets connected with the enormous concentration of national energy, all the national upsets, upsets of the people moving out and their rehabilitation and many other things, associated with a big project. Also it takes a long time to build a big project. The small project, however, does not bring about these upsets nor does it involve such a large endeavour.

However, we are not so much interested in the economics of it as in the fact that we would like to develop the resources all over India rather than in one place. While concentrated progress at any one place, no doubt, produces a fine show-piece and does enormous good in that place, it fails to deliver the good effects beyond a certain distance. Therefore, statistically you can show that what is happening in India, in human terms, does not reach the great majority of our people. Therefore, real value of a development lies in spreading out its influence all over India so that more and more of people can benefit by it. Thus the

* *Irrigation and Power*, Central Board of Irrigation and Power, Vol. XVI, No. 1, January 1959, pp. 4-8.

Pandit Jawaharlal Nehru at the National Metallurgical Laboratory, Jamshedpur (March, 1958). Also seen in the picture are Sardar Swaran Singh (Union Minister of Steel, Mines and Fuel), Dr. B.R. Nijhawan (Director, NML) and Dr. Zahir Hussain (Governor of Bihar).

Pandit Jawaharlal Nehru at the Laboratory of the Oil and Natural Gas Commission, Dehradun (August, 1958). Also seen in the picture is Shri Keshava Dev Malviya (Union Minister of Mines and Oil).

Pandit Jawaharlal Nehru watching a model of the parachute jump in the Defence Production Exhibition at New Delhi (September, 1958). Also seen in the picture are Shri V.K. Krishna Menon (Union Minister of Defence), Dr. D.S. Kothari and Smt. Indira Gandhi.

Pandit Jawaharlal Nehru at the inauguration of 4th Indian Standards Convention at New Delhi (November, 1958). Also seen in the picture are Prof. M.S. Thacker (Director, CSIR), Dr. K.L. Mowdgill (Dy. Director, ISI) Shri Lal Bahadur Shastri (Union Minister of Commerce and Industry and President, ISI), Lala Bharat Ram (Chairman, Reception Committee), Mr. E.A. Nadishan and Dr. Lal C. Verman (Director, ISI).

social value of a vast number of small projects is much greater than that of one, two, three, four or five big projects.

Again, I am not, for instance, saying that we should not have big projects. I think they are important from a variety of points of view and they are sometimes essential. I merely wish, if I can, to replace the balance in our thinking, which has shifted too much towards gigantic schemes. State Governments are constantly pressing our Government, our Planning Commission, for various schemes—all huge schemes—and they have a right to do so. But this is all the relic of gigantician to which we have fallen a prey. We have to realise that we can also meet our problems much more rapidly and efficiently by taking up a large number of small schemes, especially when the time involved in a small scheme is much less and the results obtained are rapid. Further, in these small schemes you can get a good deal of what is called public co-operation, and therefore, there is much social value in associating people with such small schemes.

I remember that when I went, four or five years ago, to the Damodar Valley Corporation, an enthusiastic young engineer explained to me what they were doing. I was happy to see their interest excited and I looked around. There were a few hundred men and women carrying baskets of earth on them. I asked the engineer, "Did you explain to them the reasons for what they were doing here?" He said "No" I said, "Then you have not understood your work at all. Your work is to explain to the ordinary worker what he is doing in the scheme, to get the public associated, to get their understanding and goodwill." Every worker will work harder and better if he understands his work, especially when his work becomes a part of the vast undertaking. In this manner, a sense of partnership can be brought about. Later I called the hundreds of people who were carrying earth from one place to the other. I said, "What are you doing?" They said, "We are taking this basket of earth from here to there." They did not know even the immediate use of their work as a part of the big scheme. This, to me, shows an amazing lack of understanding in those clever and enthusiastic engineers, a lack of feeling that those people who were working for the project have to be interested in it. Those are the people who are going to profit ultimately when the scheme is ready. It is up to the personnel who are working in the Damodar Valley Corporation to see that the people of the whole area, the village and other places, know what they are doing. Merely producing beautiful pamphlets in English and putting them in the exhibition here or there is not much good. It is the people who are round about there that count. They labour hard and therefore the approach to them is highly important. I mentioned this particular instance as an example because you have always to get the response of the people. This makes the quality of work entirely different.

It is not good enough just to see that we succeed by getting some big contractors to do the job. The contractor is not interested in knowing the man who is actually working, nor in his progress. That does not fit in with the modern thinking and it creates trouble. Therefore, I should like you, apart from whether you are doing a big scheme or a small scheme, always to think of human beings involved. How they would be profited and to get their sympathy and understanding in the job. By such an approach you will not only get a wider understanding of that particular area but also of other areas in India. From this point of view also I would urge you to take up the small schemes which are easier for a person to understand and comprehend, and also to help in working it out.

There is a tremendous amount of manpower available in India. We talk about our big power resources, but it is a folly not to use the small power sources we have, waiting at the same time for the production of bigger power. Even a small power can become big when multiplied by millions. In not utilising this tremendous manpower that we have, we are wasting some thing of value apart from a certain psychological and human aspect. So one should think in terms of bringing in the people around about for doing the work. This, apart

from being cheaper, may be better. I do not personally approve of intermediaries, the contractors and the like. I think that the cost of each undertaking can be reduced if the contractors are cut of it. It is about time that we thought about it much more seriously than we have done so far.

Your President just referred to the problems of silting, water-logging, etc. These are serious problems especially in Delhi, Punjab, etc. On the one side, we carry out irrigation works and put more and more water for fresh areas, while on the other side, land goes out of cultivation due to water-logging. This is a curious state of affairs and it is far better to stop every irrigation work than allow water-logging. It seems to me the height of folly that while we advance on one side we retreat from another side. I do not know, of course, whether we retreat more than we advance. However, it is bad engineering if you cannot hold what you have already got in the process of acquiring more. It is for you to find out why this is happening. It is a bad show all together if as a result of these big schemes water is supplied at one place while at the same time something has gone wrong elsewhere. Therefore, my submission is that the engineer's work should not be just to construct a building or a canal or a dam, but in addition he has to look at the scheme in an integrated way, visualising all future consequences of it, both social and economic.

Some reference to afforestation was made today by your President. Many people do not attach much importance to things like trees. Once a year people march out when they plant trees and forget about it the next day. I do not know how many of the trees thus planted survive till the next year. It is very good to plant trees, but it is a deplorable outlook and a cheap show if the trees planted are left uncared for. We want millions of trees in India. I think cutting of trees should be considered as a serious offence. A tree takes several years to grow and cutting it should not be resorted to unless it is absolutely necessary. There is no organised approach to afforestation or any such scheme. I do not know how far you think of afforestation when you prepare a scheme and also its consequences. All this indicates the need for a wider integrated approach to problems, especially in the big jobs that the engineers have to do.

So I would beg of you to consider these other aspects of the schemes and not to ignore them thinking that some other Board or Department or Ministry of the Government in charge of it would look into it. Unless we have this integrated approach to our problems, we shall constantly be making errors with the result that a project or a scheme which is good in itself will lead to certain other consequences that are not good.

You know that we have to go ahead fast to achieve improved conditions of living. The face of India is changing and will change more and more rapidly. It can be achieved by planned integrated development. Any lopsided development will only put a stop to it. In the early days, our engineers and others were saying that if we produce huge bulk power, how will it be utilised? That is not the question today. You can put a power plant in the middle of the Rajasthan desert or in any other place and the power can be utilised. More power you produce more will be the demand for it, indicating the changing conditions in India.

You referred to another problem which brings out an aspect of things which is not good, *i.e.* the resources are created and they are not utilised. Now again, the engineer may say, "I have done my job by creating these resources; it is up to somebody else to utilise them". This is partly true, but not wholly true. There also, the integrated approach must see to the utilisation as well as to the construction or creation of the resources. After all, it is for utilisation that the resources are created. And no plan should proceed, as it did in the old days, without the utilisation part being worked out.

I have been hearing of the difficulties as to the utilisation part. For instance, you dig a canal but the channels to take it to the village areas where they are needed are not ready. It is happening all over the place in India. It surprises me that there is such lack of co-

ordination. It is not the fault of the engineers; it may be the fault of other departments, of State Governments. But, I think engineers also should not keep aloof from them. It should be a part of their work to see that the resources created are utilised.

I have ventured to put some ideas before you. I have some virtues in the sense that I am used to looking at things in perspective e.g. historical, international and other perspectives. It sometimes helps me perhaps to see a thing in its right proportion. I see today rapid changes coming over the world and in our own country. And I see that unless we work hard, we shall not make good in the manner we want to. It is becoming of the highest importance to work fast and hard. Naturally, what we do depends upon our resources, and it is we who create resources.

I have not a shadow of doubt that India is a country of enormous potential resources and considerable skills. We have to combine these skills to the resources and utilise such power as we have. And that again is a deeper question than mere money resources. Human resources are far more important in the final analysis and I include financial resources and the rest.

And in the process of building up India, the engineers of various types and varieties have inevitably to play a most important part. And you must feel that you are playing that important part in building up not only a magnificent scheme but a New India. And it is that sense of partnership in great undertakings that makes an individual or a group grow.

81. ROLE OF STANDARDS IN PLANNING, PRODUCTION AND EXPORTS*

(Extracts from the inaugural address at the Indian Standards Convention at New Delhi on November 24, 1958)

The Prime Minister said that he was impressed by the ISI building and also by the mural done by Satish Gujral. Pointing out the importance of providing murals to public buildings, he said, "I have been telling people to let the murals form a part of the building and that they should be planned from the beginning so as to fit in it. I hope that both our public institutions as well as private people will profit by this and encourage this type of public art, murals, paintings and the like."

Recalling the remarks of Shastriji[1], the Prime Minister said that he was surprised that Indian industries were not getting full benefit from the standards formulated by ISI, so much so that even the Union Ministries were not taking full advantage of it. Emphasising the role of standards in national economy he stressed, "without standardization, we cannot progress in industry. If we wish to create confidence about an industry and the sale of our goods, then they should be of high standard."

Correlating planning with formulation of standards, Shri Nehru continued, "we talk today about increasing our production; it has become a vital matter. In fact, that is a sign of our growth, that is a sign of our fighting many evils that we suffer from. How can we do this? After all, the whole conception of planning is not to do things in an odd spasmodic way, but in a planned way. It is an essential element of planning to have standards."

* *I.S.I. Bulletin*, January-February 1959, pp. 4-7.

1. Mr. Lal Bahadur Shastri, Union Minister for Commerce and Industry, Government of India, New Delhi.

Pointing out that export had become a matter of the most vital concern to us to gain foreign exchange for goods we import from other countries, the Prime Minister stated that no nation could really export successfully unless she had standards in which people of other nations had faith. Expressing regret over the attitude of some people he added, "Even though we deal with science and technology of high order, minds of some have not quite grasped all these basic facts. Some industrialists may say that their goods are quite good and may argue as to why they should get their goods inspected by this Institution when they can sell them wihtout any inspection. They must understand that standards to them are as essential and vital as examinations are to students. People producing goods make themselves judges when somebody else should be the judge." Their goods must conform to certain standards and patterns. This is the first basic principle which all of us have to appreciate in the context of our present acute shortage of foreign exchange.

Arguing for maintenance of values, Shri Nehru pleaded for striking a proper balance between standards and variety. "Conformity does not mean absolute conformity, although there is much to be said for a good deal of uniformity. Variety is pleasing, and I like variety, but if one uniform thing can go further and reach more people and bring them benefits, it is better to have that."

Shri Nehru expressed pleasure in finding that the ISI was not concerned merely with judging standards of other people or of goods produced by them, but that the ISI took the initiative itself to lay down certain standard designs; the model granary (IS:600 to IS:609) designed by the ISI is a very important thing for our villages and other places for storing grain. Seeing these small foodgrain storage structures amidst gigantic schemes in their proper perspective, he said, "We are getting too much in the habit of thinking of gigantic schemes, buildings and the like. They are good, but more and more I have begun to think, it is the millions of small schemes that will bring benefits and welfare to our millions of people than the few big schemes here and there. So, a good model granary which may be used at ten thousand places in India is more useful than a huge granary." Their importance lay in arresting the seven to eight per cent of food-loss suffered in storage by pests, by animals and by all kinds of food destroying agencies. Referring to it, he added, "It is a tremendous amount, and it would cover entirely all our deficit in food and much more if we can change all that. Proper storage, therefore, is the obvious way of saving, and thus solving the food problem facing the country"

Concluding, the Prime Minister said, "It really has become quite essentil for the purpose we are working today, for planning, exports etc. that we should fix standards, adhere to them and in fact raise them continually. Further, the ISI should not merely test the goods produced by other people but should try to take the initiative to create designs, such as the little granary and other things which may be adopted in various parts of the country".

Wishing the Institution greater prosperity, the Prime Minister ended by saying, "I hope that more and more advantage would be taken of the work of the ISI by our public sector, private sector, Government and all those who may need it, because that is the right thing to do."

82. BRIDGING INDIAN PHILOSOPHY AND MODERN SCIENCE*

(Inaugural address on the occasion of Jagadish Chandra Bose Birth Centenary Celebrations at the Bose Institute, Calcutta on November 30, 1958)

You have done me great honour in giving me this opportunity today of associating myself with this celebration of the centenary of a very great Indian, and I feel I am privileged to be here, present on this occasion. I remember when I was rather a small boy — 13 or 14 years old — I heard people, grown-ups, discussing in our house a book that had appeared *"Response to the Living and the Non-living"* — I think that was the title of Acharya Jagadish Chandra Bose's book, and they discussed learnedly and they were excited about what the book contained. So, I thought I would try and find out what it contained. The book was in the library. So I got hold of it and tried to read it. I do not remember if I understood much of it — I had no idea, but I was impressed, as most people are, without understanding all great men of the world. So, this was my first introduction, if I may say so, to the name and work of Acharya Bose. After that his name came before us in various ways and naturally we were proud of this great man of science who was our country man.

When I went to Cambridge and studied in a rather mediocre way some of the subjects which Acharya Jagdish Chandra had studied there—some scientific subjects and there too sometimes I heard not only of his work but also of controversies with some English scientists who apparently did not like his work or did not approve of it — for whatever reason might be. I do not remember having met him till then. It was afterwards when I came back to India that I had the privilege of meeting him on a number of occasions. But one personal note, if I may give it, is that the present Director of the Institute Dr. Bose and myself were more or less contemporaries at Cambridge, and if I may say so, Dr. Bose grew in my eyes greatly there in Cambridge when I heard that he was the nephew of the great Jagadish Chandra Bose.

It is not much good my speaking in laudatory terms of Jagadish Chandra Bose. He was a great man and we in India are apt — what shall I say — to eulogise so much everybody that the eulogy of the great becomes nothing at all, because we eulogise the second rate, the third rate and the fourth rate also and little distinction remains. It is an odd thing — I speak subject to correction — that in India there are very few good biographies in any language. Again I say I speak subject to correction, because a biography in India means fulsome praise or sometimes denunciation. There is not a friendly approach, friendly critical approach, objective approach; we are so overwhelmed by personality that we praise it so much that we can get no picture of human being but of some demi-god who had come on earth. And we say not only about the very great but every one, as I said, about the second rate. Perhaps because we are generous, because we think that saying something that may perhaps be considered as lessening the greatness of the man, would be improper. Far from lessening the greatness of a man the greatness comes out when we realise that he was a human being, and not some semi-divine person who has no human characteristics. So, when one uses the superlatives in the case of the second rate, then we are left with but words and phrases when we describe the great. That is my difficulty, because Acharya Jagadish Chandra was undoubtedly one of the great men of India. Great he was, of course, but the particular line in which he showed his greatness was, if I may say so, rather typical in one way of the modern age and in another, of India. It was a kind of marriage in his mind of ancient Indian tradition or philosophy with modern scientific knowledge. It is his reaction to life and knowledge that impresses one. We have had and we will have great scientists, and science is becoming more

* *Jagadish Chandra Birth Celebration Addresses*, November 30, 1958, Bose Institute, Calcutta, pp. 7-12.

and more important in the world today governing our lives. And science has become a greater revolutionary force than any other in the world — that is true. Now, science having become such a revolutionary force and having practically changed the whole conception of the physical universe, has arrived at a stage when it offers us a choice of tremendous progress and tremendous disaster, and, in fact, probably this is the great problem of the age not only for the scientist but for every sensitive person — how to choose rightly in this age of crisis. Now, it is not enough when this happens, such choices are given to us, to imagine piously that we are on the good side or on the right side and criticise others who do not happen to agree with us. This, shall I say, attitude (I cannot remember a more appropriate word for it) produces a sense of complacency in one's righteous and then it does not help us to face the problem either intellectually or, of course, on the physical plane of action.

In India we have been, with all our virtues, far too passive — not pacifists but passive — and we imagine that by the enunciation of some truth or some *mantra* we have done our duty to our country, to the world and to humanity. Now, the *mantras* are words of power and those who first recited them were men of power out of whose mighty brains they came, but even words of power cease to have their power in degenerated brains. They merely mumble words without the strength to understand them or act up to them. There is always that danger of people mumbling big things without understanding, without realising that there is spirit and life in those words, and if you lack that spirit and life and do not put that content in them, they become empty words, however great they might be. So we have always faced this grave danger which may perhaps be almost inevitably an accompaniment of high philosophy. The Indian people have been distinguished for philosophy, for metaphysics apart from other things, and rightly so. But there is always a danger that we adopt the philosopher's jargon without the philosopher's mind. It is a dangerous thing, and we are apt in India far too much to adopt this jargon and the *mantra* and repeat great things and imagine that we have done our duty to the world; that is to say, philosophy and metaphysics, great and good as they are, require some kind of backing of life, of energy in your minds to clothe them with action. The science which developed in the western world brought that capacity for search for truth in a somewhat different way, just as in philosophy and metaphysics the search for truth is in a somewhat different way, and brought heavy rewards in its train. It had not only the search for truth there but life and energy — not mere mumbling of something that had been done before, but experimentation and progress by succession of failures and successes. So science was a good thing and it showed tremendous results and, as everybody knows, it changed the whole concept of our own manner of living in the world. After all, much, if not everything almost, if I may say, that Europe or America is, is due to science — application of science.

Then came in the earlier years of this century a sudden blow to science. Of course, I know, it would not perhaps be wrong to imagine that in science cataclysmic and other things occur step by step—the last step may appear to be very great. Nevertheless, one may say that the whole concept of the physical world was changed by a series of discoveries of great scientists from Einstein onwards. And today we are in a fluid state of mind. When I studied science in the laboratory at Cambridge we had the old concept, a fixed notion of what the physical world was. All that fixity has gone; it has disappeared, and ultimately we land ourselves in the atomic and hydrogen bombs, with vast energy which forces people and the scientists more than ever to imagine, to try to grasp where they are going, where their scientific discoveries are leading them. On the one hand, science, if it is to live, must advance and you cannot put a barrier to science or to enquiries or to search for truth in that way by trying to prevent that. That cannot happen and that should not happen even though science may lead you to the brink of hell. The human beings desire to know. It is a good thing. On the other hand, we have arrived really at the brink of hell and the scientist has to think—

am I right in doing a work which drives the world in this terrible direction? In the twenties, not so much in the thirties, in the forties the brilliant band of scientists were working on these various theories which ultimately led to atomic energy and the atom was split and all that. This problem came before us repeatedly; it frightened us. Where are we going to? It, the atom bomb, had not come, it was bound to come. The public did not know. In Germany, in England, in Italy, in France, in America, in Japan, in various degrees the scientists were working and the scientists were frightened of the politicians — how they will use the power that may come to them. They were even more frightened of course of the soldiers—how they will use it. However, these scientific discoveries led ultimately to what we have today.

Not only the hydrogen bomb and all its progeny; but this thing is controlled not by the scientists but by the politicians and even more so by the military apparatus of the State. Just think what the scientists were afraid of has happened and the scientists are tied up hand and foot to the chariot of the State, to make more bombs, to do this and that and then they do not know how to escape.

I have given you this brief account, which you no doubt know, of the problem of the age, to indicate that the solution of the problem can only be made, I think, on the line of thinking of Acharya Jagadish Chandra Bose. Even before the atom bomb, he thought of the divorce between science and philosophy. In his thinking and in his action, he attempted to bridge over the breach between philosophy and modern science, which is an attempt to bridge Indian thought with what I would call modern thought. I do not say that all aspects of Indian thought or Indian custom, are capable of being bridged, because all kinds of cobwebs grow up and the dust of ages settles down on something that was very shining and brilliant, and dulls it. So it has happened with Indian thought. Many of our customs are not only out of date but rather almost unbearable to a sensitive mind. Yet in spite of all that the fact remains that the basis of Indian thought is something magnificent and something which makes you feel, because it is difficult to prove these things, the essential verity and truth in the core of that thought. Now, if that is so then how to bring that thought in line with modern science? Mind you, the basis of Indian thought, not of the cobwebs that had accumulated, was, I believe, essentially scientific — whether it was some of the *darsanas*, philosophy of the Vedanta or whether it was philosophy that developed under Buddhism—it was essentially considered absolutely scientific. It is we, the descendants of the old Indians who have lost that science and only mumble words. So, therefore, it is not difficult really. You remember the words—whether you go through the Upanishads or whether you go through Buddha's words, as reported, always it is a scientific approach, never unscientific. Buddha never asked anyone to accept a single word, if I may say so, just without understanding it, without experimenting and feeling it. Do not take my words or accept what I say, but experiment and if you have that experience, believe it. The whole basis of the Vedanta is an experiment, a mental scientific approach. Of course experiment in a somewhat different field — from what modern science has experimented upon. It is true in the other sphere of human existence, human feeling. That is true — whether that other sphere or some sphere of life is cut off by an impenetrable barrier from the sphere with which science has dealt, I do not know. It is a different type — it may be — I do not know — I am again using words which I do not completely understand. It may be in the fourth dimension, you get out of third dimensional world and enter the fourth dimension and then see all kinds of things which are hidden to the third dimensional eye. Whatever that may be, the point I am stressing is that the approach of old Indian thought, the Vedanta or the Buddhist philosophy, was experimental and scientific in the realm of the spirit. Now, if that was so, that is the essential quality of modern science, the experimental search for truth, by experiment, by trial and error, not taking for granted anything however

ing the man who said it. If that is so, there is a common bridge between the two — at least a bridge can be constructed between the two.

Now, as I just said, Acharya Jagadish Chandra Bose was himself in his life and work a bridge between the two, and that is the thing which strikes me most, apart from his high attainments in science and his experiments in various forms — first of all of electrical radiation and then in these responses from non-living substances and his trying to break down the wall between the living and the non-living. All that as he himself had written and said had certain spiritual quality. His science had obviously a spiritual quality. I found in an entirely different context, if I may say it, a certain spiritual quality in the work of Einstein. Poor Einstein said in his later days — he wished that he had not been a scientist but a carpenter. He was so frightened at the result of his own work which led to atom bomb that he said, "I would not have been in any way responsible for this, if I had been a carpenter and led a peaceful life; the world might have been a little more peaceful too." That statement itself shows a sensitiveness, a spiritual quality in Einstein which he had in abundant measure and which really every real scientist ought to possess in some measure, otherwise he is not called a true scientist.

So that, now when we have come up against this great question of the age which may be represented by the atomic energy — how it is to be used — for the purpose of destruction or construction, you really in a sense have come at the end of the tether in the approach and you have to find some other avenue to lead you away from that blank wall where science has landed itself, or if you like, where politicians exploiting science have landed themselves.

We read about these conferences going on in various parts of the world where high and mighty persons meet to discuss questions of disarmament, stoppage of atomic tests and the like, knowing full well that if they do not succeed they go towards disaster, world disaster possibly, irretrievable disaster. Nobody wants war — how can they, except a mad man! And yet by certain compulsions, by fear, by the outcome of fear-hatred for each other, they just cannot bring themselves round to deal with this problem in a logical way, because fear comes in the way.

Now, I have great respect for these people because they are fine people wishing for peace and I am not criticising, but I am venturing to suggest that their approach will have to be on somewhat different lines, apart, of course, from the practical lines they are pursuing. Something else has to come in order to disentangle this knot and that something else can only be described as a spiritual approach — I use the word in a big way, not in a narrow way. I am not a mumbler of *mantras*, I tell you quite clearly, and I dislike anything being thrown at me to paralyse my mind by mumbling of words, however great the words may be. But I do believe that the world has, mentally speaking, arrived at a turning point, at the end of the tether in that sense and has to add something to its thinking, to its approach to problems, in order to get out of this big tangle or else to perish. It may be that the scientific-spiritual approach — again I am using the words in the broadest sense, not in any narrow sense, and laying stress on the scientific part of that approach — this approach, scientific and yet spiritual, which has been the characteristic of the highest Indian thought, not your thought nor mine but I repeat the highest Indian thought in the past ages, may help. I do not know whether Acharya Jagadish Bose definitely, deliberately and consciously did that, but nevertheless he did that. He tried to bring about the marriage of the two — the efficient scientist with his scientific methods complete but also, at the same time, joined on to it a man with a spiritual outlook and feeling, but that spiritual outlook is curbed and is determined by the scientific method of approach. The two are essential. The moment you leave out one, if you have science only, you stop at the atom bomb or something more horrible. If you have the other thing only without science, you will only be a mumbler of things

without understanding. I speak with respect and I do not, of course, think that anybody can criticize great people who have achieved greatness in any way, but I am talking about the general masses of people who imagine that by certain ceremonial practices they perform their duty in life. Well, in India — perhaps because we are, however unworthy we may be, inheritors of this ancient thought which, may I again say, is not limited to India, others in other countries also had it, but nevertheless I am talking about the Indian thought because we are inheritors of that thought and because today we are struggling in the realm of science and making progress and we are bound to make progress — we may be able to succeed to some extent in bringing about that marriage between the two which would have happy results for both.

I ventured almost unconsciously, if I may say so, to give expression to some ideas that I have and, whether you believe it or not, I may tell you that a little before I got up to speak, I had no particular idea that I have to speak on this particular aspect, but as soon as that particular window of my mind was opened, certain thoughts came out which I have ventured to place before you.

So, Acharya Jagadish Bose was not only a great scientist, not only a great man, not only a pioneer of science in India but a pioneer in a much bigger way—in trying to bring about marriage between two mighty urges and forces, something which, I believe, has become essential in the world of today.

83. ROLE OF AERO-CLUBS IN IMPARTING AIR-SENSE TO THE COMMON MAN*

(Inaugural speech at the Aero-club, New Delhi on December 4, 1958)

I thank you for inviting me on this occasion to inaugurate this meeting. Not that I can be of a very great help to you, as I see from the agenda that most of the matters you are going to discuss might be in terms rather technical, about which I can say very little. But, I have gladly come here because I do think that flying clubs in India should be encouraged in every way. Why? There are many reasons for that, but above all, if this country is going to go ahead, we have to get to the people, not only the advance guard of modern scientific and technological progress, but also a large number of people who may not be the advance guard, but who nevertheless form the reservoir from which others can come. One of the very big changes that have taken place and are taking place is in the field of communications. It is really extraordinary: what has happened even in the last few years. We are in the jet age and the jet age before it is established leads to some other space age, or something else. We are going on advancing, *i.e.* the pioneers go on advancing while there is no road for others to follow even for a long time. Well, if any advance is to be made, or any kind of scientific progress, the big men, the big geniuses – they make the advance and go ahead, of course. You cannot produce geniuses to order but you can produce highly competent trained, skilful people who can follow up a genius, or out of whom geniuses may come. If India is to advance – as of course it is going to – we must get into tune with this scientific and technological age. Many people talk about it, many people write about it, but I often feel that speaking and writing though they do, they really have little conception of what has happened and what is happening to the world today. We talk glibly of the atom bomb,

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

of the hydrogen bomb. Now, the hydrogen bomb came into existence with that tremendous intellectual labour of chiefly the mathematicians; whose mind worked in the most rarefied atmosphere of pure intellect. Those who write about this rather loosely have really no idea of all this. My point is that we cannot afford, in the modern world, to be left far behind in this scientific and technological advance.

Now, coming to aviation, that is obviously one of the most vital things of today. And again, if you divide that up, there is the air force – a very good air force; small of course compared to the big countries but a good one. There is our civil aviation and these various lines that are run by them and then there are your aero-clubs, which ought to be closely connected with our civil aviation and even in some ways with our air force. There ought to be close links if the aero-clubs are to advance. Now, the aero-clubs can do some work which neither our air force nor our civil aviation department can do, that is, they can be the link with the general public in regard to training — not with the specialised person who is trained by the air force, who has to undergo a high course of training, or a civil aviation pilot, *i.e.* whose profession becomes that. But they touch the wider field of amateurs and also professionals. That is, your field is a wider one, though perhaps normally you naturally do not aim at a very high degree of skill – what the others have to aim at. Therefore, aero-clubs perform a very important function, to give, in a sense, a broad amateur civilian base to flying, which the professionals normally cannot easily give. Of course, the job of a professional is a basic and a very important one. So, I attach great importance to aero-clubs, and I am rather sorry that these aero-clubs are not advancing and progressing as they should. Usually, they are carrying on because of the enthusiasm of a few persons in each club. But, so far as I know, – and I shall be glad if I am wrong – they are not going ahead with that speed and in that widespread way that they should.

Personally, I have always attached a great deal of importance to gliding. In fact, I think gliding should be a kind of thing which almost everybody does — every school boy, every school girl does. That should be the first introduction to flying, gliding — some kind of air-sense coming in, I imagine, though I have no proof for it, that a boy or a girl who glides gets much more self-assurance in life than a person who always sticks to the ground. *(Laughter)* Therefore, from a psychological and educational point of view, apart from many others, I would like to encourage gliding tremendously. Our civil aviation department — in fact, our education department — should interest itself in helping in this. It is relatively cheap; it is not expensive. I do not know what the economics of it are, but I imagine it cannot be very expensive, more especially now when I believe gliders are being made in India, though not at as fast a pace or rate as they ought to be. I was just enquiring: I was told that they will not make them faster because they do not get orders for them; they cannot make them in the air. Well, surely, there should be enough orders to keep them busy at the present rate for a hundred years. They have to increase their rate; it is quite absurd making them a few at a time. Therefore, I would impress upon you the very great importance of gliding.

And gliding, as soon as a person knows that, immediately it becomes a first step to flying in other ways, in heavy air machines. And as I said, I attach a value to gliding from this psychological point of view, educational point of view, giving a person a certain self-assurance and air-sense. You know all about it, but there is such a thing as emotionally getting into tune with the new air travel world that is coming. I would think that a passenger in a plane does not get that. He sits in a lounge or something and he is taken from one place

to the other. He does not get that air-sense at all. A glider will get the air-sense — a pilot will of course get it in an aircraft — hence, the importance of gliding for our young folk. And looking at it from another point of view, as far as I can, to bring myself to think what I felt when I was 15, 16, 17 or 18 years of age, it is a tremendously exciting sport for the boys and girls. Therefore, I would impress upon you as well as those who run our civil aviation and education departments to think of this and encourage this as much as they can and make it almost a necessary adjunct to a high school, or of course a university if you like, but I will begin with a high school.

Secondly, as you know, we are rather slowly and painfully beginning to manufacture aircraft in India — *i.e.* HJ, HJ3, HJ-3, HTP-2, which were rather expensive. Now, Hindustan Aircraft has produced a smaller and cheaper version — "Pushpak" it is called — which would perhaps be much more suitable for aero-clubs because of its relative cheapness. I hope that gradually we shall be able to manufacture good, stout, relatively cheap types of aircraft in India. Because so long as we depend on outside — at present we are very dependent — we cannot go ahead in anything depending too much on outside products. I wish you success in your labours and in the work you are doing for the country.

That work I would judge by the widespread interest that you create. Certainly, have your competitions and have your prizes and all that. They are good and they interest people. But, it is the widespread interest of large number that counts. Now, I see whenever you have some kind of a show on, large crowds collect to see it. They are interested, but somehow it is beyond their reach. Unfortunately, we still have too much of class division and the greater number of people cannot even afford to be inside of your enclosure. They have to be somewhere outside and kept far apart and they are too poor for this kind of thing. It would be a good thing if you could organise, and give some opportunity by scholarships and other means, probably through a school; I do not know how else you can do it. Young boys who normally would not be able to afford it, may get an opportunity to come and learn. I would suggest to the civil aviation department to organise some scholarships for this purpose. I am talking specially of scholarships for the people of very little resources. Other scholarships may go to anybody, but this is to be an opening for the real poor. I do not like the word 'poor', but I am compelled to use it. I would give you an example from a completely different topic. I do not particularly think that public schools in the normal sense of the word are wholly desirable. They are partly desirable in the present circumstances, at the present moment. What I mean is that I do not like the idea of the difference between the public school and the ordinary school to which an average person goes. And yet, there is no help for it because the ordinary school unfortunately does not get necessary equipment. Recently, a public school has been opened in Bihar. I think admission is by merit alone and not by family connections. And the person who has come by merit, if he cannot afford to pay the fee, the State Government has agreed to pay his fee in this public school. Anyhow, it is a good idea in a small way. The average public school today attracts only boys who come from relatively prosperous families and who can pay heavy fees. Therefore, it encourages a certain class distinction which is bad. In that sense, I thought that if opportunity by some scholarships or other means could be given to boys or girls of merit who cannot afford it, it will be a good thing.

Again, I wish you well and I hope you will make good progress.

84. TRIBUTE TO DR. KRISHNAN*

Prime Minister Jawaharlal Nehru offered felicitations to the eminent scientist, Dr. K.S. Krishnan on his 60th birthday today (December 9,1958) as "a great scientist, a great scholar and a man with the least lopsided personality."

Mr. Nehru was speaking at a function held at the National Physical Laboratory, New Delhi, this evening to celebrate the occasion.

The Prime Minister said that apart from being a scientist of repute, Dr. Krishnan was a man endowed with rich human qualities that made him more valuable to society. Continuing, he said that one could feel young and active all one's life by developing a sense of fun – "not in the trivial sense of the term but deeper sense" – and the reason why Dr. Krishnan continued to be youthful and active, in his opinion, was that he had a lot of fun and good humour in him. "Every time Dr. Krishnan meets me, he has an interesting story to tell", he added.

85. HAFFKINE INSTITUTE**

(Message of good wishes to the Haffkine Institute, Bombay, on the occasion of its Diamond Jubilee Celebrations on January 9, 1959)

"Sixty years in the life of an institute is a long enough period to judge of its work. I think that during these sixty years, the Haffkine Institute has fully justified itself in its service to medical research. It has gone beyond research and actually produced many articles of great importance for public use. On the occasion of the Diamond Jubilee Celebrations of the Haffkine Institute, I send it all my good wishes and trust that its future will be even greater than its past."

86. SCIENCE, TECHNOLOGY AND HUMANITY***

(Address at the anniversary meeting of the National Institute of Sciences of India, New Delhi on January 20, 1959)

Prime Minister Nehru today (January 20, 1959) asked scientists to think in terms of humanity and develop a balanced mental approach towards material and moral advances instead of merely striving for physical conquests.

Addressing the anniversary meeting of the National Institute of Sciences of India at Vigyan Bhavan, he said that it was not enough for scientists to conquer the moon. They must "promote a temper of science which should be free from fear and hatered." Pandit

* *The Hindu*, Madras, December 10, 1958.

** *The Hindu*, Madras, January 11, 1959.

*** *The National Herald*, Lucknow, January 21, 1959.

Pandit Jawaharlal Nehru at the Bose Institute, Calcutta on the occasion of the Birth Centenary Celebrations of Sir J.C. Bose (November, 1958). Also seen in the picture are Dr. D.M. Bose (Director), Prof. Sisir Kumar Mitra and Dr. B.C. Roy (Chief Minister, West Bengal).

Pandit Jawaharlal Nehru with Sir C.V. Raman at the Raman Research Institute, Bangalore (February, 1959).

Pandit Jawaharlal Nehru at the National Physical Laboratory, New Delhi on the occasion of celebrations of 60th Birth anniversary of Dr. K.S. Krishnan (December, 1958). Others present (from left) are Dr. K.S. Krishnan, Shri Lal Bahadur Shastri, Prof. M.S. Thacker, Dr. D.S. Kothari and Dr. Homi J. Bhabha.

Nehru deplored that in spite of so many advances in science and technology "we are still producing not very desirable human beings." He also deplored that in spite of considerable scientific advances made by big nations, the cold war still continued. "Whether nationally or internationally, it is not a civilised temper, as it promotes fear and hatered," he added.

Referring to the address of Prof. P.C. Mahalanobis[1], retiring President of the Institute, who dealt with a wide range of subjects, including planning, scientific developments, education and health, Pandit Nehru said that one of the many things which remained unsaid in the address was the vital need to produce good citizens. To become a good citizen, Pandit Nehru said, science alone could not solve the problem. There was need for philosophy, a logical approach of temper. He said that when he looked to the highly developed nations, he wondered whether something wrong was not taking place at the bottom, in complete disregard to human mind and spirit.

Referring to Prof. Mahalanobis's observation that scientists should be on top and not at the bottom, Pandit Nehru said that he found scientists were actually taking command of military equipment, but humanity was not deriving any benefit from this. Pandit Nehru hoped that in spite of advances in science and technology, "we shall try to become a little more civilised." Pandit Nehru also referred to Prof. Mahalanobis's plea for radical reforms in education, and reiterated his idea of instituting a considerable number of scholarships for poor students for higer education. These scholarships should cover not only the tuition fee but all other expenses such as books and hostel charges, he said. Pandit Nehru said that to improve the standard of education, the greatest problem was to produce competent teachers rather than finances. It would be dangerous to embark on any educational plans without good teachers and professors, he added.

87. NEED FOR A SCIENTIFIC APPROACH BY SCIENTIFIC WORKERS*

(Remarks at the annual general meeting of the Association of Scientific Workers of India at New Delhi on January 24, 1959)

Prime Minister Nehru today warned scientific workers in India against adopting "unscientific contradictory approaches" to their problems.

Mr. Nehru asked them to lay stress on quality and to maintain it, at least on the top. "Even in these days of democracy, it is quality that tells; whether that is quality in a nation or group or organisation."

Mr. Nehru, who was inaugurating the annual meeting of the Association of Scientific Workers of India, of which he was the first President in 1947, deplored the habit of statistically comparing what has been done in India with things done in countries like the United States, United Kingdom or the Soviet Union. "It is always good to keep the progress made by these countries in mind, but it does rather surprise me that in all these statistics, the history of a hundred or two hundred years is forgotten," he said.

"In the realm of science", said Mr. Nehru "India has progressed and laid stronger and better foundations than in other countries, leaving out the advanced countries which have

1 Prof. P.C. Mahalanobis, Member, Planning Commission, Government of India, New Delhi.

* *The Hindu*, Madras, January 25, 1959.

had long careers in the last two hundred years or so. It is not quite fair to compare ourselves with them. No doubt, we like to catch up with them, not in any spirit of competition or rivalry but simply because we want to do well." "Experts from foreign countries who had seen the progress made by India in the scientific field after a period of time had expressed surprise at the considerable progress made and being made", he said. That, of course, did not mean that India should not have done more. But the type of problems and difficulties which an under-developed country had to face initially to pull itself out of the roots of poverty were forgotten, while assessing the progress made by it in the various fields.

Mr. Nehru chided the Association for its "contradictory approaches" in some of its draft resolutions and said, "I am not tremendously impressed by them. In fact, I am distressed by some of them. It seems to me that you are forgetting your science."

(The draft resolution expressed regret that the Third Plan was being drawn up without reference or help from scientific personnel, accused the Government of 'importing' technical experts 'rather indiscriminately' and criticised the Government for 'ignoring' the Soviet offer of assistance in enlarging the capacity of a penicillin plant in the country. Another draft resolution authorised the Council of the Association to take up with Government the question of appointment of administrators without scientific knowledge or training in scientific and technological departments.)

Mr. Nehru commented that the resolutions did not show any scientific approach. On the contrary, "It is an expression of your various contradictory approaches, an angry approach. At any rate, it is not a scientific approach, that is what I am trying to point out."

Mr. Nehru in the course of his speech said that he entirely agreed that scientists should be consulted more and more by the Planning Commission. But on reading the draft resolutions, he said he felt that "if this is the approach of scientists, then the Planning Commission is not likely to be helped much by the unscientific approach of this body."

Mr. Nehru said that the Association's reference to a chemical plant that was being built up was a "condemnation" of the Government. "That decision may be right or wrong, but for this organisation to sit down solemnly and pass a resolution of this type is, to put it mildly, amazing", he said.

Mr. Nehru said: "If you deal with matters of serious concern and condemn the Government of India in regard to steps it has taken, I do not challenge your right to do so. Of course, you have every right to do so, but I do challenge the way you do serious business. For months and months, the Government considers a problem; the Planning Commission considers it and all manner of people consider it in all its aspects and reach a decision. You cannot by meeting for an hour, dispose of it by a resolution and condemn everybody. That is an odd approach".

Mr. Nehru said that there was a real danger if scientific workers were to lose the very great respect that they commanded in India. "In India, apart from the great world developments, science will become more and more important and scientific workers are increasing in number and competence. For my part, I think the younger generation of our scientists is a very fine lot, men and women. I have seen quite a number of them and I think they hold promise for science in the future". He said that they should not allow this quality to be watered down or overwhelmed. They should see that it was maintained and not allowed to be smothered in their effort to increase the number of scientists in the country.

Mr. Nehru said that he welcomed the criticism but they should see to it that it was not allowed to go to the extent of "depressing us". A very eminent American expert who had come to India repeatedly to examine what was happening in the various departments of the administration had said in his report that one of the most surprising things about India, one of the major activities in India, was criticism of Government by everybody including Government supporters and to paint a woeful picture of what was happening. The expert

had expressed his amazement at this because he had the opposite impression of the work done and being done in India and the speed at which it was being done.

88. SCIENCE AS A UNIFYING FORCE*

(Speech at the Golden Jubilee Celebrations of the Indian Institute of Science, Bangalore on February 4, 1959)

I have been reading in the newspapers of the prolonged celebrations that have been taking place here and I am glad of that, in a sense. But still, I wonder why they should be prolonged so much. Anyhow, since it has offered me an opportunity of coming here, I am glad of them, because it is always good to come to Bangalore for one thing and secondly to the Institute of Science. Again, I have been reading in the newspapers about what some of your very distinguished visitors have said. The President[1], who is your Visitor, the Vice-President[2] and Prince Philip[3] – they have all naturally praised your activities and laid flowers at the feet of science, occasionally giving you a warning – especially our respected Vice-President – that you should not forget the spiritual aspect of things in your devotion to science. So, I find it a little difficult to say anything new apart from the fact that in the recent weeks there has been a good deal of speech-making in Delhi also on like subjects. It is obvious that the appreciation of science has come in a big way to India. It has taken various forms as you know very well – laboratories, research institutes and all that – and I have no doubt that this will spread more and more, because that is the urge of the times. But it does seem a significant fact that long ago the founder of this Institute thought of the importance of science and built up this Institute – Jamshedji Tata. And that is a true sign of greatness, to see ahead, to have vision and to help in the realisation of that vision. When your Institute was started, I don't quite know what else was happening in India in regard to science – probably not very much; something in the universities no doubt. Now, we have a large number of national laboratories, institutes and they are ever growing, because probably it became obvious that we could not go ahead even in other departments of life, unless we had the help of science and technology. So, I suppose science will grow – is bound to grow in India – the scientific research, the application of science and all that, and the question now is rather to see that it grows in the right direction. In two ways, that is, that our efforts and our resources are not wasted and are put to use in the right way and secondly that scientists themselves give it the right direction apart from Government and the like. Because in the ultimate analysis it will be the scientists that make science, not the governments. Governments will encourage them; governments may put resources at their disposal and that is a matter for scientists of India to think.

We have eminent scientists here and we have an ever-growing number of young men coming into the scientific field. So far as I know, many of your younger people who are working for research in the departments of science are a very bright lot and who give us hope for the future of science in India. Now, when something grows rather rapidly, as scien-

* i) Nehru Memorial Museum and Library, Teen Murti House, New Delhi. ii) *The Deccan Herald*, Bangalore, February 6, 1959.

1 Dr. Rajendra Prasad, President, Union of India, New Delhi.

2 Dr. S. Radhakrishnan, Vice-President, Union of India, New Delhi.

3 Prince Philip, Prince Consort, United Kingdom, London.

ce is rising and is likely to do, there is a slight risk of its growing in not too shapely a form. I may put it then that way, and when it becomes like that, it might become slightly difficult to give it proper shape and direction – it spreads out in all directions. So, I am putting this idea before you. It is not much good my paying tribute to science, because I am always doing that. I think that there is no real hope of material advance in India without science and technology. Certainly, other things also, but without this we do not advance; of that I am utterly convinced. And if that is so, naturally we have to pay attention to the development of science – scientific research and technology. Even people who did not perhaps attach much importance to science are realising today that that is inevitable, whether they like it or not. So, in that sense the future of science is assured and it becomes important. Now, as I said, it is for the scientists themselves to give a proper shape and direction to that.

Everyone who speaks nowadays, including myself, on an occasion like this, draws attention to the curious state of affairs in the world: they call it a 'crisis'. With the advance of science, many things that humanity had dreamt of in the past came within its grasp. And at the same time the dangers that science has evoked and the possibilities of utter disaster and annihilation, the tremendous conflict, rather as I said at Delhi (address at the Annual Session of the Indian Science Congress, January, 1959) this two-faced look of science. Well, there it is; and it is no good our repeating that, like an incantation, but what exactly are we to do about it? Well, that goes beyond science too! What are scientists to do? It is rather difficult to suggest anything, because there are two views of a scientific society or the science of society rather. One is the prevalent one that a scientist observes facts, shuts his eyes to everything else and observes facts and draws conclusions, inferences etc. – wherever they drive him to – and that has been the essence of science. The other view, not so prevalent, although perhaps it was in the ancient days, that having observed something you arrive at a certain conclusion about your aim in life that you are going to; call it what you like – the good society – and then try to work to that end. From one point of view, science and the scientist are completely neutral, passionless, just observing, recording, drawing conclusions from those records. In the other, he is a man of passion, wanting something, aiming at something, at social improvement – or call it what you like – and trying to, of course, remain true to the facts and data that science may give him, but nevertheless aiming at that and going in that direction. Now, I wonder if the second aspect is not becoming a little more important than it has been considered.

The first aspect is there, of course, that is, the essence of science, observations, conclusions – certainly they are there in that way. But in view of the curious crisis that has arisen in the world because of scientific discoveries, the second aspect also assumes importance. And therefore I suppose scientists nowadays go about issuing manifestos against the continuation of nuclear tests. If the scientist was a completely neutral and passionless animal, it is no business of his whether there was a nuclear test or not. But today, he is not quite so passionless and therefore he issues manifestos – rightly I think. But, apart from the issuing of manifestos, he takes other steps too, which lead him further in that direction. Now, I do not see how scientists can escape their duty and can remain just aloof from what is happening, because what is happening or what might happen will powerfully affect them. Obviously, it affects the rest of the world. So, that is the problem.

Then, another aspect of this problem arises. I think Dr. Radhakrishnan probably referred to that point in the sense that, while it is admitted all round that science – the approach of science and technology – is inevitable and desirable, is that incompatible with what Dr. Radhakrishnan called a 'spiritual approach'? I do not know much about spiritual matters and fate, and so I cannot speak with the authority of a philosopher as Dr. Radhakrishnan can. But naturally, in a sense, every sensitive person is a bit of a philosopher and might even dabble or think on some things which might be called spiritual. Call them what you like –

call them the higher things of life – 'spiritual' has a special connotation attached to it. There is something in life, let us say, like goodness, like truth, something like beauty – some things which for the moment cannot be easily measured in that way and yet which presumably are very important in life. And when we put it this way, how far can science be allied, without destroying its basis, to certain fundamental values in life? If it is not concerned with life as such, – if it is independent of these values – then it may make the greatest advance there divorced from those values, but presumably the ultimate result will not be good.

On the other hand, we cannot merely talk of these values in life without science coming into the picture. These are difficult problems and certainly a little beyond my depth. But, I do not myself see any essential incompatibility between the temper of science, the spirit of science, the approach of science, and these higher values – provided that even in the search for those higher values the temper of science is maintained, which I think it can be. I do not know if it will be possible for scientists in India to be able to keep that kind of association or try to develop it. If they do it I am sure that will be good from many points of view – larger points of view. And in our national point of view, each country has some kind of a national genius and progress is easiest made if you are in tune with that national genius. If you discard it, you may go ahead as a group, as an individual or a small group, but you might be isolated from the mass of humanity in that country. It should be our endeavour to carry that mass of humanity with us, to be with them step by step and not reach somewhere at some desirable heaven by ourselves. Therefore, it would be worth considering how far this, whatever the national genius of India might be, and I dare not define it, but I am quite sure it is something which I may express here and there – these are feelings, which in my belief, is not at all opposed to science. In fact, in another plane, it is essentially scientific. So, there seems to be no reason why the two should not influence each other.

Now we have arrived at this age of science and we see the application of it throwing up powerful challenges – Bhakra Nangal or the steel plants – the President has been performing the opening functions of some of them. These will grow in India. There is not a doubt, in spite of the pitfalls and difficulties, India will get industrialised and industrialised in the biggest way. It has been the habit of India in the past to do things in a big way. We have seen, even when it fails it fails in a big way. *(Applause)* Now that obviously there is a certain widespread determination for us to go ahead, and we have our Five Year Plans and all that, we have great difficulties. But I do not think there are many people who doubt – certainly I do not doubt – that we will succeed not only in the Five Year Plans but in the ultimate objective. And there will be industrialisation, and there will be all that follows from that.

Again, another problem comes up before my mind, which really is not a problem of the peasants in India, but looking at highly industrialised and highly developed societies, the problem is there. And to a slight extent it is rather a frightening problem. The problem is, we talk about having a welfare state in India and I have no doubt we will achieve it in some measure. In the welfare state in other parts of the world things are not quite as good as one would expect – new difficulties, new problems on a different plane – arise. Having achieved material prosperity, life suddenly becomes something frightfully dull without any spirit of adventure, without any risk, leading the younger generation into completely wrong channels. Of course, they want some excitement. Not getting it in the more desirable ways they choose the undesirable ways of getting at the excitement. So, the extraordinary question arises that as industrialisation and automation and all that goes on and gives a high standard of life and leisure, people do not know what to do with that leisure and they misbehave in that leisure period. Which again brings you back to the question that obviously, if that happens, then they are not properly trained or educated. There may be high class technicians, but there is something lacking. As such, we come back to the problem of education which, after all, is always basic, whatever you may do with the training and education of the indivi-

dual. And I am venturing to throw out some ideas which are not new – many of you may have thought about it – but they are interesting problems and it depends upon how you are constituted as to how you react to them – with optimism or pessimism.

For my part, looking at the long perspective of history and the tremendous ups and downs, I cannot easily convince myself that in spite of the hydrogen bomb, humanity will perish: it might of course, certainly it can; but I imagine that humanity will survive even that anyhow. There is one big consolation, if it does not survive nobody will grieve about it; the matter ends.

Now to consider some aspects of scientific advance in India. Science should be a unifying factor not only in India, but in the world. Science, normally speaking, should have no secrets, and scientists from each other. And therefore, the ideal for the scientists should be human advance, apart from the help they may give for the national advance. Now, difficulties have arisen which I suppose the scientists have to face: that the advance of science and technology is so tremendous from day to day that it is frightfully difficult to keep pace with it. Keeping pace with it apart from research work done by the scientists, means reading from books and periodicals and literature or what they have: so tremendous, how are you to do it? I believe in some countries – or in most countries – effort is made somehow to keep pace with it by translations, abstracts, summaries and all that: it becomes essential. I imagine – I do not know, but I imagine – that the biggest effort of this kind of translations, abstracts etc. is probably only in the Soviet Union where there is a vast department, so that every scientific literature in the world is translated within a few months in their own language. Now, what are we in India to do about this? Because one has to keep pace with the lot. I do not know what is being done. Of course, our Institute, – or your Institute – Dr. Bhagavantam [4] perhaps gets a large number of scientific periodicals and books in various languages. How many languages are represented here, how many people can take advantage of them, I do not know. Ultimately, the only way to do it is to get some kind of translations or abstracts of important books, I think, and then follow it up. Then again, I wonder if that kind of work could not be arranged jointly. If each institute or laboratory here does it separately, they cannot go very far and much of their labour is wasted. Others do not take advantage of it. So, I was wondering if we could not do something more jointly all over India and these abstracts and other things could be circulated to scientific institutes, laboratories, universities etc. Otherwise, it is quite inconceivable for one institution to take this work up. I do not know the exact percentage, but certainly a very great percentage of this work is done in the English language. At least half – may be more than half – and Russian is coming up, the German and French are of course important. But I still think that now the position we have taken is that a larger number of people know English in this country.

There is a great deal of argument on the language issue in India. It has become hardly a unifying subject, but rather a disruptive subject now. I was thinking how far science, apart from its other work, can be a unifying influence in India. It can be; it must be; otherwise, it will not progress. If science goes on separately in every part of India, science will not progress in India. Scientists must speak the same language — scientific language, I mean — and understand it. Now, there is a conflict because I want science, that is, elementary science to spread to the hundreds of millions of our people; not only to the people who become scientists but I want to see it down all over, gradually to make them think – they will not know much of science – but I want them to develop a certain scientific way of thinking. Now, I cannot do that in a foreign language; I just cannot. It has to be done in the language of the country, and that will no doubt be done. But there is this conflict, that you must approach the masses of people in regard to science in their language in the elementary schools, primary schools, secondary schools etc. On the other hand, it would be fatal for science to be

4 Dr. Bhagvantam, Director, Indian Institute of Science, Bangalore.

split up linguistically in India; it will never grow. *(Applause)* Now, there are two ways open – two ways of approach. Perhaps one is that there must be some common language which every scientist knows. And the common language can only be English obviously *(Applause)* for scientific purposes. *(Laughter)*

Secondly, – and this is really very important – scientific and technical terms should be common in all our languages and also should anyhow approximate to the international usage. I think this is very important. It will again be impossible to progress in different sets of terms if one has to deal with two sets of terms: one in his own language and one in English. It will come in the way. Apart from the common words which are well known in the language that it is bound to use, you know that thousands of new words, new scientific and technical words are added to every language every year. I think at a rough estimate, about five to ten thousand words every year. In fact, the balance of every world language is changing towards the majority of scientific and technical words. Now, if we in India decide, as far as possible, apart from common words, to adopt these words which may be called international scientific and technical words and adopt them in every language in India, may be with minor variations to fit in with the temper of the language, that would immediately bring about a certain unity in scientific and technical approach in India itself and also between India and the rest of the scientific world. And it will be quite easy, or relatively easy, for a person to read the books in other languages after learning the language a little when he has got knowledge of the common fund of technical and scientific words; only he has to learn a little grammar and all that. I put this to you for consideration. I believe it is generally recognised that there should be this common technical and scientific terminology in India, and that should approximate to the international terminology. But, having recognised the principle broadly, one does not know in what way, in what form, to what extent, it will be given effect to.

Talking about science and the language of science, a good deal of the language of science is symbolic. I have not heard anybody discussing these symbols merely from the linguistic point of view. Whether or not they want different symbols in different languages – what it may be – alpha, beta or pi or whatever it is – has to be different in every language or the same! But anyhow, obviously the symbols have to be the same. But these common algebraic symbols are simple. Nowadays, the subject which I do not understand is the higher mathematics – it has become a language of symbols entirely; it has nothing to do with the normal language of human beings *(Laughter)*. I see Dr. Krishnan accepting this fact by laughing – that is interesting. With this growth of science and this close inter-relation of mathematics with physics – and it has always been inter-related, of course – but to get so more and more, it is producing what might be called a very difficult language of mathematics; which is supposed to be, I believe is, common between the mathematician and the scientist. That again is a unifying feature in the world. Nobody could say – at least I hope they do not say – that a special equation in mathematics is capitalist or communist, or whether chemistry or physics is ideologically communist or not. You see, one advantage of science and mathematics is that it takes you out of the ideological conflicts, important as they might be in some respect. As good, as important, as people think them to be, they are presumably becoming less important again by the advance of science and technology. A new physical world is created, or rather a new understanding of the physical world is created, and the physical world itself changes and problems have to be put now in a different context. The old context continues, the old problems continue today to some extent, but are changing. Sometimes they do not fit in at all today; sometimes they only partially fit in this new world that is developing out of science. So, all this leads one inevitably to the conclusion that science is becoming more and more formidable. Naturally as we all do, we have praised it and all that, but watch out carefully lest it misbehaves. But, everything that is formidable

can be formidable for good and formidable for bad.

Anyhow, I hope that this Institute of Science will, in future, continue to give the lead that it has given and give it in the new context of things, because the context changes. Fifty years ago, when Jamshedji Tata started it, India was different; the context was different and life was rather easy-going. I suppose now life is not easy-going. Today we are hit by problems all the time and there are demands for solution from the scientists, practical problems of industry, industrial problems, all kinds of human problems. And behind all that is the fact of something approaching 400 million people in India. That is an inescapable fact, and what are we to do then? We cannot — even the brightest scientist cannot — live entirely in the ivory tower today. He has to come down to that level and deal with these problems; deal with his research also: I do not want him to give that up. But we have to see this picture before us – of this vast number of people in India groping, searching for the way of going forward, going stumbling, picking themselves up, some falling on the way and yet all of them inevitably, ultimately marching forward. It is a tremendous and exciting thought, and it is not merely a thought: it is something in actuality happening. We do not see those people marching in a procession, but it is there – all these millions of people working in various ways. How do all these scientific institutions and others fit in into the scheme of things, how do they encourage and help in this tremendous march forward of a large section of the humanity which happens to be in our country? We have made everybody in the world interested in this, not because of the mere numbers; we are interested, of course, but because we are part of it.

89. A SCIENTIFIC APPROACH TO MEDICINE*

(Inaugural address at the Silver Jubilee celebrations of the Medical Council of India at New Delhi on February 13, 1959)

I am very glad to be here to associate myself with these celebrations of yours. When I was first invited, I was a little surprised to learn that this body, the Medical Council of India, was only 25 years old. I thought it was a much more venerable institution.

Now, we have heard an account of its inception, how it began and its early troubles — Dr. Roy has told us that. Perhaps it was fitting that on this occasion we should have some such account. But myself not being a doctor except an honorary one occasionally *(Laughter)*, I cannot feel vastly excited about this subject from the professional doctor's point of view. My approach necessarily must be that of the layman: that is to say, the layman's approach as to how far, how best, medicine can fulfil its function in regard to public health and public well-being. The other aspect is important no doubt, to which Dr. Roy has referred, *i.e.* the attitude of the trade union of doctors. Trade unions are necessary in the modern world in various fields, and probably the closest trade unions are the professional ones, which call themselves by other names but are as close in their restrictions and everything, closer than any other trade union can be. It may be that this aspect of looking at the question may surprise some people and they may think that professional organisations are something apart, but essentially they are not. It is right that doctors and physicians should have, if I may use the word, such associations and trade unions to regulate their own conduct, as

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi

well as maintain standards of the profession and standards of teaching etc. Because, although there will always be a tendency, as in all trade unions, to have a close shop and not allow others to come in, however eminent they might be even on the national level, sometimes for other reasons. After all, the main purpose for the whole medical profession is to look after the community and secure their well-being. And it is that aspect which concerns you all, but which concerns the layman and a person connected with the Government, especially. It is with this aspect that I am particularly concerned.

Now, in spite of 25 years of the All India Medical Council, India is still very poor in the quality of its doctors. In reality and in effect there are vast areas of India where there is practically no medical help available. That is a very distressing thought; and an even more distressing thought is that doctors, young and old, just do not like going to the villages, or to some remote areas and the hills. They like living in the cities as far as possible, or the towns, while the real need for them is in those rather remote areas. I do not quite know if you have given thought to this matter. It should be the function of the Medical Council to make suggestions or lay down some rules and regulations even, that it should be incumbent on every new practitioner before he can even practise anywhere to spend a couple of years in a village or in some rural area. I will go further: I should like not only medical graduates but other graduates too to spend a year or more, doing social service before they are considered fully qualified for their profession, but more particularly I would say this for the medical practitioners. It should be an essential part of their training that they should serve in this or in some way in rather remote areas which are not properly attended to. It would be a good thing if the Medical Council itself went into this question and laid down some kind of a rule or regulation rather than for Government and Parliament to come in and do something of the kind.

Apart from serving that particular area where they go, they will be serving themselves tremendously, understanding the conditions in India more than they would by living in cities only, and widening their outlook for basic research. Research is not something isolated from human beings: medical research is obviously not. And if you have this wider aspect of research, knowing the country and knowing the people, their difficulties etc. you can tag on your higher research more to the practical conditions in India. Research can be, rather might sometimes be called pure research, but even pure research leads somewhere, to some objective. And if it does that, then it fits in and is likely to yield results far sooner than if it is pure research without any application to any daily problem. As a matter of fact, I suppose most of the research work done by doctors does relate to daily problems which they meet and there is an enormous field for it. During the last few years or more, tremendous progress has been made in the fields of medicine, and surgery. I have often wondered how far it can be said that India has contributed to that progress. Because the real test of the medical profession in a country lies in its quality, not in its quantity. Quantity is necessary, but it is quality that sets the tone. A measure of the test of quality is the research work that has been done that counts. I should like you to think about it, but I have a vague suspicion that real research, which is counted, has not been done very much in India during the last generation or so. There has been some – I do not deny that – but I am talking in relation to the size of the country, its bigness, and comparatively what one would expect from such a country and all the eminent doctors in India. In the universities also, that applies not only to the medical colleges but to arts and science and other courses, the amount of real high-class research that one would expect is seldom found. Perhaps, the burden of teaching is too great and large numbers of students have to be taught. Whatever the reason might be, the research suffers, and I suppose the quality of the people, the teachers, also suffers because they do not do any research. Research is good in itself, but it is even more important from the point of view of improving the quality of the teacher even as regards his students – getting out of

the rut. I am rather concerned with this fact, not only in medicine but other subjects too. We are not getting what we should in the way of research because possibly we have too great a burden to carry.

There is, I think, fairly good research being done in our science laboratories today. Perhaps because they have not got the burden of teaching and all that. And in fact their chief business is doing research work there and, practically speaking, nothing else. Then, I would like our scientists in the science laboratories to be associated in some form or the other with teaching. They should be associated I think in an honorary capacity with the nearest universities. They are usually eminent men. They need not displace anybody. They should not come in the way of other teachers and professors, but they can always be made honorary professors of a nearby university. They are people of note and prominence and it will be good for the students to hear them occasionally, let us say twice a month or so. It will be good for them also to come into contact with the student body instead of always remaining in their laboratories. So, I am all in favour of encouraging research and the men that take up research. The mere fact of doing so rises an individual out of his daily routine – and that puts him on a higher level. Psychologically, that is a good thing for everybody to do some research work whatever kind of research it may be. Otherwise, he becomes too narrow in his outlook, more particularly when engaged in specialised activities such as yours.

Now, I suppose our desire – and yours too – is that we should offer and make available good medical advice to every person in India in need of it; make it available cheaply and ultimately freely. And on the other hand, in the field of public health, there should be a great improvement. In fact, public health should really have precedence over other forms of treatment etc. because that goes to the root of it. We have had very considerable success in the campaign to eradicate malaria. Now, there is talk of big campaigns against small-pox and cholera. I believe, in most western countries these diseases have been liquidated or almost completely eradicated. It is well known that it can be done, just like malaria can be eradicated. It is a question of effort and availability of resources. I think it will be a good thing if you could first of all carry out the campaign against malaria effectively, in a big way; and then take up cholera and small-pox also. I suppose the most effective approach to this question of dealing with cholera is providing good water; not medicines and doctors so much, but a pure water supply. And I do feel that a pure water supply is one of the biggest needs of our villages and small towns: that we have not got yet. So the question of medicine overlaps with public health.

The actual day-to-day work of a doctor should become more and more preventive than actual treatment, although the latter is of importance. We put up big hospitals and that is inevitable. You must have some big hospitals where there is a concentration of work, but one cannot put up these big hospitals all over India, or even smaller hospitals but rather on a large scale. We should evolve some way of giving medical services to the villagers, because I am constantly thinking as to how to deal with them. And we have got into the habit, not only in this matter but in so many other matters, of trying to follow certain standards which are utterly beyond our financial reach. It is curious – there is a gap in India between various standards, the standard of Delhi city and especially New Delhi and the standard of a village that is to say 10 miles out of Delhi. There is a world of difference between the two. And so we function with such varying standards here.

We have the highest type of research institute or laboratory which would do credit to any highly developed country, and we also have, not too far from it, some very primitive exhibition of how people lived a thousand or two thousand years ago. Therefore, on the one hand one wants to maintain high standards, to use the latest techniques and facilities for research – and you cannot if you offer third grade facilities for research; otherwise, the work would be third rate. On the other hand, you have to somehow connect that with the condi-

tions in India, conditions in the village-India and to take progress to them. It is a difficult problem, but we have to do it. And we have to evolve either auxiliary medical services or some very simple type of hospitals, which are cheap, which can be located in villages and which can be connected with some central hospitals in a city. In putting up these small hospitals or whatever you might like to call them, I do not see why you should duplicate the big hospitals in regard to the equipment. Naturally, the better the equipment you have the more useful it would be, but it is better to do without the expensive equipment, and have the simple equipment. If a person really requires that other equipment, he can be sent on to any big hospital. I say this because you have to evolve the cheaper type of hospital with the essential equipment, because if you set higher standards, it simply would mean that you do not have that hospital or you have fewer. Secondly, such hospitals obviously cannot afford recurring expenses of a high order. We have to think of the village hospitals, how to run them. May be your new graduates and others ought to be sent there, and do some work there. You can train up people for that purpose also. I should like you to think of these problems which are really vital problems for us, in a sense more vital than the individual big problems of big hospitals and all that you have to deal with. Ultimately, I hope that there would be free medical services for anyone who requires it in India, and high standards of public health.

Then again, I said high standards of public health. Now, Indians generally are a clean people. They bathe and all that quite a lot. At the same time, that cleanliness is not due to the conception of, shall I say, medical cleanliness but may be for religious reasons or other reasons. Whatever the reasons might be, it is good. But it is important that our people should learn some basic things, the obvious lessons of public health etc. Again, how is that to be done? I think that if we have this system of village doctors etc., it should be their function to teach people in the village. Probably, the most effective way of teaching grown-ups is through their children who go to school. If the children learn something about these matters in school in the proper way, their interest is excited, they go and tell their parents. And the parents probably listen to their children more than they would to an outsider who comes in and teaches them. You see how my mind is trying to understand this problem and how to deal with it, so far as the masses of people are concerned. And you will forgive me for talking about this, because I greatly fear that most of your deliberations – most of you are successful doctors, surgeons and all that – are concerned with the problems of big cities. Therefore, I was laying this stress on this other aspect.

Then, the problem which is being increasingly appreciated in India is that of population growth. And oddly enough, the problem becomes worse and worse the more we succeed in giving better health to the people. Yet, we have arrived at a stage when any kind of quiet logical consideration of this problem leads us to amazing results – that is, amazing in the sense of growth of the population in the future. But anyhow, you know that our Government is perhaps the only government in the world which has officially sponsored the programmes of family limitation, birth-control, planned parenthood, call it what you like. Tomorrow you might know that there is an International Conference on what is called "Planned Parenthood" or something in Delhi. But it is extraordinary how people go about searching for imposing names and being slightly afraid of using the simple words that have been introduced previously – more and more complicated words. However, this concerns obviously the medical profession very greatly, because it should be the business of the medical profession to give this information to the people, about birth-control methods etc. Also to carry on research work, *i.e.* how best to do it. I do not know exactly what the position is now, but for years past, I had been told that this kind of work had been done in Calcutta and Bombay. I think Dr. Sanyal of Calcutta has been doing this work. He has met with a great deal of success in producing some kind of pill, an oral pill, which appears to be better

than something that had been tried in earlier work. Our people should carry on this research work. So far as Government is concerned, we should do all in our power to help in that research.

Apart from that, it is the duty now of every medical practitioner to be a source of information not only to his patients, but to his neighbourhood. Apart from contraceptive devices, sterilisation facilities should be offered wherever they can be in every hospital – free facilities. In fact, I believe in some States – in Bombay probably – may be in Madras, they give a bonus for it too. But it is important that an organisation like the Medical Council should give a lead in this matter and provide and indicate what each member of it can and should do. Because, while I took some credit for saying just now that India was probably the only country where this family planning has been officially adopted by the Government, that does not take us very far. Though we have officially adopted it, but in fact, we have not done very much.

There is some Committee, or a very enthusiastic Board, which has done very good work. I am not criticising it, but only when I think of that work in relation to the problem of India, it becomes insignificant. Almost we could hardly see it. How can it be increased? And that is intimately allied with the economic conditions. Obviously, birth-control devices have to be easily avilable – simple and cheap – otherwise, there is no good talking about them so far as the mass of people are concerned. I would particularly draw your attention to this matter – not only to you as individuals, but to your Council. They should take it up, encourage both research and the application of their research or other methods already known to the people.

I have no particular idea what you deliberate on when you meet in your Council meetings. I suppose previously you were much concerned about legislation and now that the legislation has been passed, and presumably with your approval, that subject need not be considered afresh. But whatever your other deliberations may be, they will include this problem of how to relieve the mass of people from disease and suffering. One problem always comes up, or sometimes comes up, whether it is in the Parliament or in other places – that is, the place of the so-called indigenous systems of medicine as also of other methods – homoeopathy and the like – and a good deal of heat is created. It seems to me that we can only proceed on the basis of a scientific approach. *(Cheers)* We should not rule out any method, any consideration but before accepting it, we should test it by scientific methods, and then apply it. I do not like this word 'allopathy'. I do not know who invented allopathy, but once you admit that the approach must be scientific and by the methods of science, whether it is the 'Unani' system or 'Ayurvedic' system or any other system, they are welcome provided they allow themselves to be tested by that. There is perhaps a tendency among qualified doctors to consider all those who are not qualified in their own way as outside the pale and quacks. You should always be receptive to any kind of knowledge that you can get from any source. And therefore, instead of carrying on this argument in rather heated language about indigenous systems and modern systems and all that, we should welcome the indigenous systems, subject always to the qualifications of science. Once you put that to them, they have to abide by that, or acknowledge that they do not accept science and the scientific methods. That I think is the proper approach to this problem. Because I do not think many of us know, at least one has heard of remarkable cure sometimes effected by totally unorthodox methods. It may be so, but no great progress can be made by a remarkable unorthodox cure. People also get cured sometimes, more than people imagine, without having recourse to any doctor or any physician. And so, that would be an argument for abolishing doctors. *(Laughter)* And the famous Chinese traveller who came to India in the 7th century, Hiouen Thsang, however he is pronounced, writes that in India when a person falls ill, he fasts for a week. If he does not get well within a week, then he sends for a doctor.

I think it is an excellent approach to this question. Most of them undoubtedly must get well or perhaps die. But, as I just said, I am all for the scientific method. Let us have it and let us apply it to anything else, instead of carrying on this argument which mostly consists of running down each other. That does not help. But once you lay down that this is the method you appreciate, then leave out names, keep out those methods which do not accept science as a basic approach.

Well, you are yet very young with 25 years and therefore I take it for a long life to come and I wish you success in your future work and labours. *(Cheers).*

90. ENGINEERS' RESPONSIBILITY IN NATIONAL RECONSTRUCTION*

(Message to the Centenary Number of the Indian and Eastern Engineer, Bombay, March 22, 1959)

"I am pleased and rather surprised to learn that the *Indian and Eastern Engineer* is entering into its 100th year of publication. The occasion certainly deserves to be honoured and I send my good wishes.

The world of today becomes more and more the world of scientists, engineers and technicians. In India, we are facing problems of reconstruction. In fact, the major part of our Five Year Plan depends upon the engineers of some kind or other. Thus engineers in India today have a major responsibility. I am sure they will discharge it with credit to themselves and to their country."

91. THE PROMISE OF AERONAUTICS**

(Message to the Aeronautical Society of India on the occasion of its Tenth Anniversary celebrations on March 29, 1959)

"I send my good wishes to the Aeronautical Society of India on the occasion of their celebrating their Tenth Anniversary. During these ten years, it has made much progress. The development of the science of aeronautics promises to take men into new regions. We in India should try to keep abreast of it and more and more people should take interest in it."

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* *The Hindu*, Madras, March 23, 1959.

** *The Hindustan Standard*, New Delhi, March 30, 1959.

92. SCIENTIFIC RESEARCH AND SENSE OF FULFILMENT*

(Address to the staff and scientists of the Central Electro-Chemical Research Institute, Karaikudi, during his second visit to the Institute on April 15, 1959)

It is inevitable that when I come here today (April 15, 1959), I am reminded of my last visit nearly eleven years ago, when I came to lay the foundation-stone of this Institute. I remember that this place as practically without any buildings, only open space, not very inviting to look about it and a very large crowd gathered. I have still a big picture of the thousands of people that gathered on that occasion. Then I am reminded that I said something to the effect that I hoped that this will be a centre of scientific and educational activities that would grow round it. Well, today, I have come nearly eleven years later to find what I had hoped for, largely realised — more than realised — Mr. Subramaniam[1] says. *(Cheers).*

Well, I congratulate you and all those who helped in this realisation, and I should like to pay my tribute to Dr. Alagappa Chettiar[2] who, with his enthusiasm and spirit of adventure started this tremendous undertaking which has grown and which will no doubt continue to grow.

So, it is really not only a pleasure but heartening experience to see these visible symbols of fairly rapid growth in a direction which I think is of vital significance to our country — scientific research and the like. Possibly, historians in later years when they try to find what has been achieved in India during these early years after independence, there will be many things of course, but possibly, the development of science and technology will find a very high place, education generally and more especially science and technology. The great laboratories, institutes etc. we have built continue to grow where thousands of young scientists, men and women, I am glad to say, are working. I can say with confidence that the calibre of these young scientists of ours is high and recognised as such and whenever they have gone abroad, they have created a considerable amount of impression.

Now this kind of thing may not produce spectacular results suddenly. But this is a stone of foundation for national progress and national well-being, more than almost anything else that we might do. Therefore, I feel heartened and happy to have come here and seen this growth during these ten years or more since I came here last.

To our younger scientists more particularly, I would say that it should be their high pride and privilege to be working in these institutions and working not merely as kind of profession but working in these domains where they join together two very important aspects — one is the probing into the secrets of nature, joy of discovery, joy of finding out new things, search for truth, and the other, the effect of catering that all to the service of our motherland.

Surely, there can be no greater joy than these two when they join together inseparably. It is a great thing. It should bring that sense of fulfilment to a person, which is often lacking among people even though they may succeed in various ventures.

So I congratulate you on what has been achieved and more so I look forward to bigger achievements in the future.

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* Director, Central Electro-Chemical Research Institute, Karaikudi (T.N.).

1. Mr. C. Subramaniam, State Minister for Finance, Education, Information and Law, Madras State.
2. Dr. Alagappa Chettiar, Industrialist, Madras State.

93. DEVELOPING TEAM SPIRIT BETWEEN YOUNGER AND EMINENT SENIOR PHYSICISTS*

(Message on the occasion of the inauguration of India's First Summer School on Advanced Physics at Mussoorie on May 22, 1959)

"I am glad to learn that a Summer School of Theoretical Physics is going to be held in Mussoorie under the general direction of Prof. Satyen Bose. I think it is a very good idea and I send it my good wishes.

Physics is one of the fields of scientific knowledge in which Indians have distinguished themselves in recent years. We have today some very distinguished physicists and I am glad to find that there are among the younger generation men who have already shown great promise.

Science today demands more team work and planned coordination in research than it did previously. Therefore, this attempt to bring together some of our eminent physicists as well as some from the younger generation to discuss the matter and develop a team spirit and planned approach is to be welcomed."

94. UTILISING TECHNOLOGY FOR SOLUTION OF FOOD PROBLEMS OF THE DEVELOPING COUNTRIES**

(Message to the FAO Seminar on Food Technology for Asia and the Far East held at Mysore on August 1, 1959)

"The Seminar on Food Technology for Asia and the Far East which is being held in Mysore deals with a subject of high importance for this vast area. Among all the problems that face the developing countries of Asia, the most urgent is that of food production. This can only be tackled by a scientific approach taking advantage of the technological processes and techniques. I hope that the Mysore Seminar will yield results which will help countries of Asia and the Far East in not only adding to their food production but also in food conservation and better utilisation of available food.

I send the Seminar my good wishes."

95. INDIGENOUS DEFENCE EQUIPMENT FOR THE ARMY***

(Address at the Defence Production Conference at New Delhi on August 31, 1959)

"India cannot go ahead in any direction without taking advantage of science and technology," said the Prime Minister, Mr. Nehru, addressing the Defence Production Conference here this morning.

* *The Hindu*, Madras, May 23, 1959.

** *The Hindu*, Madras, August 1, 1959.

*** *The Hindu*, Madras, September 2, 1959.

The countries which were well-off today, he said, were those which had advanced on the scientific and technological plane. He was glad that, since Independence, greater attention was being paid to scientific research and its application in India in the various laboratories and institutions that had been set up. Though India was still far behind other countries leading in scientific and technological developments, still, an atmosphere of science and technology was being created in the country and more and more young men were going in for it.

Mr. Nehru emphasised that the Indian Army, Navy and Air Force could be first-rate services only if they kept pace with modern technology. It was no good at all if they completely relied on arms, ammunition and other equipment purchased from abroad. It should be an axiom for them that a second-rate or even a third-rate defence equipment manufactured in the country itself was much better than a first-rate weapon imported from a foreign country, which it might be difficult to obtain when it was most needed in an emergency.

The Prime Minister said that he regarded a country dependent on imported weapons as a second-rate country. In British times, India had to buy weapons from foreign countries, but now she was "gradually coming out of this buying spree" partly due to financial reasons and partly due to the difficulty of foreign exchange. It had now become essential for India to produce her own arms and weapons, though it was true that, circumstanced as she was, she could not manufacture everything indigenously. But every effort should be made to produce items which were of general and common use, as he had no doubt the country had technical skill of a high order. They could no longer afford to keep on sending large sums of money to other countries for arms purchase.

The Prime Minister expressed satisfaction that, in recent years, a great push had been given by the Defence Ministry to the indigenous manufacture of arms and ammunition, as also items of civilian consumption in the ordnance factories.

Referring to the use of modern weapons in a war, the Prime Minister said that, in the ultimate analysis, a country had to depend invariably on the human factor in the shape of courage and endurance. A country whose people had the determination to go down fighting, rather than give up, could not be conquered, whatever the weapons used against it. No weapon had yet been devised that could conquer the spirit of man, he said.

While praising the strict discipline in the armed forces, Mr. Nehru said that while the rules and regulations in the services, which aimed at achieving perfection, had necessarily to be observed, but they must not be allowed to stand in the way of the creative and inventive faculties of the individual, which must be encouraged by all means. They must strike a kind of balance and see that merit always prevailed and was given due credit, men of outstanding ability being given ample opportunities to grow.

96. SCIENCE FOR PEACE, PROGRESS AND COOPERATION*

(Message of congratulations to Mr. Nikita Krushchev on the success of the Soviet Rocket Lunik II, on September 16, 1959)

"May I convey to you my congratulations on the success of the Soviet Rocket Lunik reaching the moon. This is indeed a magnificent achievement for humanity and in particular for Soviet scientists. May it be the prelude to even greater achievements in the establishment of peace and goodwill on earth so that science and human genius may succeed in ending the era

* *The Statesman*, New Delhi, September 17, 1959.

of wars and human conflicts and bringing in a new age of human cooperation for the advance of humanity not only in the conquest of space and nature's mysteries but also in raising the spirit of man to even higher levels."

97. SYNTHESIS OF TRADITIONAL AND MODERN CULTURES*

(Address while inaugurating the Rajasthan University Library, Jaipur on October 2, 1959)

On such occasions the first problem I have to face is the language I should use. We are living in a transitional period in many ways and this is also so in the use of languages. Normally, in any country — in a university more especially and elsewhere too — one would presume that the language used is the language of the country. Not that the university should approach the question of language in a narrow-minded way. But, as I said, we are passing through this transitional stage and we shall have to put up for some time with the use of more than one language on such occasions. There is no harm in that, provided we know what we are aiming at, provided we know that this is a transitional stage with regard to language as well as others.

I am happy to be here today because Rajasthan and Jaipur particularly attract me and mould me somewhat emotionally whenever I come here. My object in coming to Rajasthan on this occasion has been principally, as you perhaps know, in connection with the grant of considerable powers to village panchayats and this afternoon I shall go to Nagore for this purpose. This is a very definite and praiseworthy advance that this State had made, because if you look at our multifarious activities there are many things that are being done. In a sense the most important are, on the one side education, and on the other raising the living standards of our villages — not only in the material things, but making them share the burden of the Government. Rajasthan has passed through many changes and vicissitudes from the days of the purely personal rule of a Maharaja. In that personal rule, there were changes, gradually somewhat, till there came democratic institutions. Now we are going through another stage of taking democracy, in reality and not in some kind of constitutional theory, to the village. This is an important development which I have no doubt will spread throughout India. So, I came principally for that and we chose an auspicious day for this great step forward — this day is the 2nd of October, which for every Indian will be connected with Gandhiji's birth anniversary. This morning before I left Delhi from Palam Air Station, I paid a visit to Rajghat and spent some time there so that I might begin the day well. But it is not by paying a visit to Rajghat or occasionally participating in some prayerful function that we honour the memory of Gandhiji, but by trying to imbibe something of the essence of the spirit of that mighty person. I feel sure that he would be happy at these changes in the villages that we are trying to bring about, because his mind was always with the humblest and with the kisan in the village.

Now coming to this particular function, perhaps the most important and vital thing happening in India apart from this real rural development, is education — the spread of education at various levels. Perhaps the most important of all is education at the lowest level — primary education (where millions and millions of boys and girls — I do not quite know the number; there is a big number anyhow—), secondary education, college education, univer-

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

sity education. We discuss and we argue about the systems of education and there are many people who criticise our present methods. I have also criticised them and no doubt we will all go on criticising them and perhaps gradually changing them. But the main thing is that, in spite of all this criticism, this mighty change is coming over India, the widespread education going down to village after village on the one side; on the other, secondary and university education also spreading and more and more looking towards science and technology. Because what we have got to bring about in India, as in many other countries of the East, is the change and a very big change from traditional ways of thinking to what might be called the modern scientific and technological ways. I do not mean to say that traditional ways of thinking were bad or that we should discard them entirely: certainly not. It is one thing to hear, or to profit by our heritage of the past; it is another thing to be made a prisoner by the past. Because the moment we allow ourselves to be imprisoned by the past, we shall cease to grow. It is the past that conditioned us and our forefathers in our country. So, let us respect that past, honour it and profit by it. Nevertheless, we have to live in the present and we have to live here for the future. We have to do this at a time of the most tremendous changes in the world. We are trying to catch up in India with the changes that came in the world 100 and 150 years ago. That is, the Industrial Revolution that came to Western Europe to begin with, that began in the 18th century and carried on in the 19th. Remember that this Industrial Revolution made a tremendous change. Before this Industrial Revolution came, *i.e.* say 150 years ago, there was not much difference in terms of material conditions between the countries of Western Europe and the countries of Asia. In some ways, even materially the countries of Asia were supposed to be a little better off. Then suddenly something happened: that is called the Industrial Revolution. What does it mean? It does not mean work with a little machine here and there. It means exploiting the mighty powers that lie hidden in nature. You begin with the steam and steam engine; you come to electricity; you come to so many other things; and then you come to atomic energy today. These are mighty forces of nature which come into the grasp of man and they change the whole face of things. As a result of that, Western nations became powerful, became rich and the gap between them and the non-industrialised nations became tremendous — ever-growing gap. Now we are trying to bridge that gap. We are trying to utilise these forces of nature, understand them through science, through technology. We use them and thereby create wealth for our people and allow them opportunities, ever more and more, of leading what might be called the "good life". We do not imagine for an instant that I consider that the "good life" consists only of material well-being; I do not. I think that purely material well-being without any moral, ethical or spiritual basis is a shallow thing and likely to lead to social evils and even disaster for a nation. And, do not imagine that the growth of Western Europe or America to material well-being was devoid of moral or ethical content. They did not prosper that way. There was a moral, ethical content in Europe which kept it to a large extent balanced.

Now anyway, we are doing that, and we are doing it at a moment when another mighty revolution is constantly coming over the world and setting the stage for additional changes all the time. We get into the jet-age of travel; we get into the space travel. For the first time in world's history, someone from earth sends something which reaches the moon. This is an extraordinary thing and it hits at the head of so many superstitions which many of our people adhere to. They talk about *grahans* and eclipses and go and stand on one leg in a river to bathe to save the moon. It would be far better if they try to save themselves before they tended to save the moon. So, you see, we have to get out of that kind of traditional mode of thinking. Although it is important, but even more so it is with the traditional framework, the economic and social framework. Unless we do so, we cannot progress. We have to put an end to the power of the rulers in the Maharaja's dress, because we cannot

progress in the modern world with people like that hanging on and doing, performing, no useful function in society. In future, only those should count who perform useful functions in society and it does not matter who their fathers, grand-fathers and great grand-fathers were.

So, you see, the thinking changes and we have to go through not only one revolution but two. We have to cover the track of the 19th century and having reached the middle of the 20th, we have to function in this jet age, atomic energy age and the like. We see the world changing rapidly before our eyes, and we have to keep pace with it. How can we do it? Ultimately through education. Firstly, the vast reservoir of education which begins from primary stage, out of which comes the secondary stage and then more specialised education in the universities. Now, there is a problem everywhere, even in the West, of certain conflicting tendencies between the types of education — what is called the literary type and the scientific and technological type. And each type develops a certain kind of culture, which is slightly different from the other. Much thought is being given in Western countries to these two cultures, developing separately without knowing anything. We have the classics and cultural, literary traditions on the one side — a very important thing in the building up of a nation — and the culture derived from modern scientific, mathematical and technological thinking which is something rather different — and both not only not understanding each other but rather looking down upon the other. We create a curious dichotomy — a curious state of affairs.

That is so, as I said, in England. It is going to be much more so in a country like India which is much more tradition-minded and which is now going forth on this voyage of discovery of this world of science and technology. Because we are bound to go forward, we have to find some kind of synthesis, some *samanvaya*, of these to a certain extent. The Indian outlook has always made it easier, this approach to *samanvaya*, to a synthesis. We do not deny that the other person has the truth, as some religious systems do; which think that they have the monopoly of truth and all others are in darkness. That is not the Indian way. The Indian way is more tolerant. It has the advantage of tolerance and it has also the disadvantages of a vague amorphousness which leads people to complacency and doing nothing, nothing much. So, we take both advantages and disadvantages.

Well, these thoughts came to me because I have come here to open a library and a library is a kind of a university, where people can go and learn about this world and many other worlds too. So, a library has always fascinated me and one of my misfortunes has been that I do not find time to read much now, when there is so much to read in this changing world. There is much to read in this newly developing knowledge and learning and wisdom of the moderns and one wants to keep pace and understand it. One does not have time for all this, and it is rather distressing. Unfortunately, I have become a prisoner of events and I cannot satisfy my own wishes and likings to read as much as I would like to. Even so, while I cannot read, I like to be in a library to look at books and some time to browse into them. I hope that your university library would not be merely a show-piece but something vital and living and you will get many sparks of life from it because you have specially to bear heavy burdens in the future and would have to solve many problems pertaining to India, pertaining to Rajasthan, pertaining to yourselves and you can only solve them by preparing your minds and bodies further. You have to face a much stiffer examination than all university examinations are likely to be — the examination of life, the examination of the nation.

It is a real quality of a nation that tells — neither the numbers, you are 400 million inhabitants, nor all your past heritage — not unless you possess some of the heritage yourself, a habit in you. It is the quality of the human being today and tomorrow, of the human being in India, of its men and women, that will count in the world. If that quality is good,

it is well for India; if it is not, then you will slide down in the scale of nations in spite of your shoutings and slogans and the resolutions that you may pass. And I hope that the young men and young women of Rajasthan will remember this. Rajasthan is a peculiar example of many things which the nation values sentimentally. The stories of the country and unsurpassed bravery come to our minds and fill our minds with excitement. Also, the stories of unsurpassed follies come to our minds, when we think of Rajasthan. There are petty quarrels over petty things, over stupid things. There are lack of unity, their feudal structure and all that. The result was that all that unsurpassed courage failed because it was often associated with folly. No country can progress without courage, courage to face everything. We must have intelligence. We must have a little bit of wisdom. We must see the larger picture and not get lost in some little corner of ours where we live and think that is the world. We have to have an integrated picture of India because there is no hope for us in any part of India unless there is a hope for India as a whole. Therefore, we have to work for India as a whole. And indeed, a time comes when we have to work for the world as a whole, when the world hangs together.

Well, I hope that, as I have said, this library and this university will throw out vital sparks and that will light the flame in many minds and hearts. *(Applause)*

98. SYSTEM OF MEDICINE FOR THE COMMON MAN*

(Inaugural address at the Silver Jubilee Session of the State Medical Conference at Meerut on October 24, 1959)

Prime Minister Nehru today called upon the people to join wholeheartedly in the revolution through which they were passing to build a prosperous India.

He was inaugurating the Silver Jubilee Session of the State Medical Conference here. The country, he said, though faced with numerous problems, had only one basic problem and that was of poverty. All other problems — health, education, social and others — were related to the main problem. Each was urgent and each needed priority. None could be divorced, but none could be solved without money. They must therefore, he added, produce wealth first. This must be their first objective. We need advance in all directions. We, Mr. Nehru said, are in the midst of an industrial revolution which requires constant hard work with no immediate fancy returns. Our labours will bear fruit only when our projects are in full speed in a few years hence. Mr. Nehru regretted that they tried to copy rich countries in formulating their projects. India was poor and could not afford to copy the prosperous countries.

Mr. Nehru stressed the need for adopting small projects requiring small sums. Big projects, he added, could be left to a day when the country achieved prosperity. Big projects, he said, swallowed the major part of the allotment in preliminary details and execution. Only a paltry sum went into their real scope. Currently, he added, our aim must be to save the people from the clutches of the present misery.

P.T.I. adds: Mr. Nehru said, "This scientific approach must govern all our constructive activity, our professions, our trade and industry. We cannot mix this approach with the religious approach which should be confined to the religious domain. In the sphere of medical

* *The Leader*, Allahabad, October 26, 1959.

science also we have to test our ancient systems of Ayurveda and Unani medicine on the basis of scientific approach. These systems are repositories of great ancient knowledge deserving our respect, but all this has to be put to scientific test". Mr. Nehru said that merely saying that the Ayurveda and Unani systems should be inter-related to allopathic system would not do. Every system has to pass the test of scientific approach.

Mr. Nehru said that India was passing through a stage of industrial revolution and it became very important to keep an integrated picture before one's mind. "The real problems of India are not in cities but in villages. Every politician, every industrialist, who does not have in his eyes the picture of the village has not understood India. Every person in India, who seeks real education, must have this picture of Indian village before him."

The Prime Minister said that the ultimate aim was, of course, to have free medical aid for all people. But this was not possible in present conditions with the limited resources of the country. The fundamental thing, however, was to learn, to understand the pattern of things in India and not to imitate or ape patterns in Western countries. "This unfortunately has not happened in India, and under the British influence selected few imitated the ways of life of Europeans, drew high salaries and lived in a world of their own, which was far removed from the world of the common man. This pattern could not be easily changed in India as it had entrenched itself here."

Mr. Nehru said that development work in India had to take Indian conditions into view all the time. It was no use putting up grand buildings for hospitals in a few cities. "It is my firm opinion that we should have small hospitals in villages with ten or twenty beds. They need not have expensive equipment but should meet primary needs of the people. The complicated cases could be sent to bigger hospitals in the district towns."

Mr. Nehru emphasised the need of young medical graduates working in villages for specified periods. "I am of the firm opinion that young medical graduates should be made to work for some years in villages. This should be done through legislation or through the efforts of the Indian Medical Association. Some system should also be evolved for training of assistants to the fully qualified doctors who could take charge of dispensaries and small hospitals in villages."

99. THE INDIAN STATISTICAL INSTITUTE BILL*

(Speeches while presenting the Indian Statistical Institute Bill before the Lok Sabha on December 14, 1959 and the Rajya Sabha on December 17, 1959. The Act (No. 57 of 1959) received the assent of the President on December 24, 1959)

LOK SABHA : December 14, 1959

Mr. Speaker, Sir, I beg to move:

"That the Bill to declare the institution known as the Indian Statistical Institute having at present its registered office in Calcutta to be an institution of national importance and to provide for certain matters connected therewith, be taken into consideration". (4869)[1]

* Director, Indian Statistical Institute, Calcutta.

1. The numbers given in bracket refer to column numbers of the *Lok Sabha Debates* (Second Series), Vol. XXXVII, Ninth Session, (December 14 to 22, 1959), Lok Sabha Secretariat, New Delhi.

The Institute is well known. Nevertheless, I should like to give just a few facts in regard to it. It was started in the early thirties, and has grown since then very considerably. Till now, it is not only the only but the very big institute doing statistical work in Calcutta, and in fact, all over India. There can be no doubt about its importance. In fact, its importance is recognised internationally, all over the world. It is one of the noted statistical institutes in the world, not only in India; in India, of course, there is no other doing that type of work....

I do not propose at this stage to take the time of the House in referring to its importance and to the work it has done. Statistical work of this kind is always important, but now, today, with our planning etc. it is of the utmost importance. There can be no planning without statistical work on a big scale. And this statistical work too, in the present context, is not merely compiling of figures. There, all kinds of other aspects come in especially planning aspects, what is called, I think, biometry and psychometry and various aspects of this where psychological and biological questions also come in. In fact, government today is largely based and would become progressively more and more based on accurate statistical information...(4870)

There can be no doubt about its vital importance in the scheme of things, and secondly also in regard to its being one of the recognised institutions of this kind in the world and respected greatly for not only its normal work but for certain original work which it has done and which has benefited and profited the science of statistics...(4871-72).

The whole question that arises in this matter is really how best to deal with this institution. Some people think that an institute of this kind should more or less be a government organisation. This Bill is not meant to convert this into a government organisation. After very careful thought we have come to the conclusion that it should maintain and retain the autonomous character which it has had thus far, subject to various checks etc. which Government or Parliament may have. Now this is a wider question which I should like to place before the House. We have been progressively coming to the conclusion that too much centralisation of our activities is not a good thing. Of course, Central control in some matters is a good thing, but too much centralisation and departmentalisation of our activities is not a good thing. Now, however that may be for our other activities one thing is quite certain, in my opinion, that science and matters connected with science cannot be and should not be dealt with by the normal governmental routine methods. Art in a sense cannot be dealt with or should not be dealt with in that way. There are other subjects too. You cannot have creative impulses dealt with by routine methods. That is why wherever science has grown very considerably – let us say, in the United States of America or in the Soviet Union, two entirely different types of countries with different structures of government – they give the widest latitude, both of them, to their scientific apparatus to grow. Naturally they have checks to see that their money is not wasted. But they give them latitude. These institutions do not have to come for sanctions to people who usually have no ghost of an idea of science or that special thing. What happens in the governmental apparatus normally, is that it is looked at, very competently looked at, but not looked at from the particular scientific or like point of view. (4872-73).

Now we want science to grow, and I think it is quite essential that we should accept this broad approach to this question that scientific work should have a certain latitude. Therefore, we have decided that in this particular matter, this should continue to be an autonomous organisation....

Now, it may be that if this type of approach is a successful approach one may even consider enlarging it, so that it may cover some of our own State-owned governmental enterprises, because as our work grows, as State-owned governmental enterprises grow, it becomes very difficult for them to grow if there is constant reference back to governmental agencies. However fast they may work there is delay, and delay is the most wasteful thing from

every point of view that one can have,...(4873).

For this reason and many others we feel that scientific organisations should be treated in this way. In the present Bill, therefore, we have accepted this basis for the Indian Statistical Institute to function as an autonomous organisation. But having said that we have put in quite a large number of ways in which Government can see that the work is done according to its wishes. Various checks and counterchecks are provided. But we have definitely and deliberately not put in Government Directors etc. which changes the whole nature of it.... (4873-4874).

Now, a question has arisen in this connection about the audit for the funds of the Institute.....(4874)....personally, I have for some time past held the opinion that it is better for such institutions – not only this but some other institutions too – that the Comptroller and Auditor-General be not charged with the audit of these institutions....(4875).

The really important thing in this as in other matters is for an audit, if I may use that word, of performance. What has been achieved or what is being done? All our audits are to see that certain sanctions are there and that money is spent according to certain sanctions. That is necessary, of course, for normal governmental work. But what should be even more necessary, even for normal governmental work is how much has been achieved by the money that has been spent. And I hope that gradually we shall be able to bring in this test of achievement in all our activities....(4875-76).

Further – and this is important –

'The Central Government may constitute as many Committees as and when it considers necessary....etc.etc.' (4877).

...This Committee can advise Government evaluate the work in every possible way and make recommendations to Government. That is what I call an audit of performance or achievement which is far more important – you see what you are getting out of it – than the otherwise technical audit of the money spent which is really the work of normal auditors. I think that this is a greater check and more useful from the point of view of Government or Parliament than those simple audits. The House will notice that all these various things that I have read give very considerable power to Government to deal with any situation that might arise....(4878).

Thus, we have tried to combine two major things in this, one flexibility and the other non-interference with its work. It can do its work properly and, at the same time, all kinds of subsequent checks will be there to find out whether it has done its work properly, with the ultimate authority to take over completely or for a period. I think it is on the whole a satisfactory compromise between these two different approaches both of which have certain merit – the approach of autonomy and flexibility and the other approach of the Government seeing that public funds are not wasted and applied in the proper way in carrying out the policies laid down by the Government and ultimately having authority for even taking over this whole Institute for a period....(4879).

But the main thing is the approach of this House to this Bill and it is that the Institution should remain a non-Government, autonomous institution. If a decision is arrived at that it must be taken over by the Government and run by the Government, the whole structure of course changes. I find that many people have suggested this kind of thing. I do not think it would be a proper approach because it is a scientific institute, all the time probing into new avenues of thinking and action and all that which are not normally done by the Government offices. Government offices look to precedents and do not probe into the future. Individuals in Government offices may but I am talking as an institution. I do not want our scientific institutions to get tied up in precedents and all that but I do want proper checks to see that work is done properly and the money is not wasted. I submit that these are provided for fully here...."(4880).

Acharya Kripalani (Sitamarhi): "Will this Institution yet remain a private institution?" (4881).

Mr. Speaker: "It is one of national importance".

Acharya Kripalani: "May be of national importance but it will be a private institution"

Shri Jawaharlal Nehru: "It is a private institution, meaning, non-governmental. It does not belong to anybody. It belongs to a non-profit making organisation, a registered society, which cannot make profit. But it is controlled by its elected members, chairman, etc. whenever it is."

Shrimati Parvathi Krishnan (Coimbatore): ..."Secondly, with regard to the Institute not being able to sell any property, clause 7(c) says:

> "The Institute shall not, except with the previous approval of the Central Government.... sell or otherwise dispose of any property acquired by the Institute with money specifically provided for such acquisition by the Central Government."

I would like to ask a small clarification here. Sometimes, equipment may be bought out of a sum sanctioned for overall purposes but, may be, not specifically given for that instrument."

Shri Jawaharlal Nehru: "I do not think it is meant to cover that. It is impossible if one has to come back to the Government for every little thing. I do not think it should cover that....." (4881).

Acharya Kripalani: "...What marks out the Indian Statistical Institute from other societies is the unusual volume of assistance furnished by the State. After this Bill goes through, Rs.80 lakhs will be given every year to the Institute."

Shri Jawaharlal Nehru: "No Sir; that is not necessarily so. I do not wish to interrupt the hon. Member but I just wish to say that out of the figure given there, Rs. 50 lakhs are contractual. It will be given, if you have a Bill or not, for the work done. If you do not get the work done, it will not be given. It is not a lump sum to be given to them; it is according to the work....." (4882).

The main thing was this. Here was an institution which has grown up. If it had not grown up during the course of these years, we will have to think how to have such an institute because statistics had grown into a very vital part of the nation's activities, planning etc. It is hardly possible to plan without it. Fortunately, we have this Institution which has grown up. It has been doing work for the Government on a contractual basis for these many years. Before Independence too, it did that work – sample surveys, etc. It is being paid for that work – I repeat – on a contractual basis. But if we take up any Ministry or any individual and ask him to audit his own accounts, in all honesty, there is a danger of his having a certain bias in his own favour. It happens even with high-souled people. Even high-souled people such as the Ministers, are subject to bias, so that, when audit is concerned, one likes an outside auditor to do it. In the same way where statistics are concerned, there is a weakness. Some hon. Member has pointed out how statistics differ and said that you could produce any statistics you liked. It may be so. It is desirable for an outside non-governmental organisation to undertake this work. That is much less likely to suffer from any conscious or sub-conscious bias. It is desirable that we have this check on the purely governmental statistics. In fact one of the reasons why there has been an unfortunate delay in the publication of these reports has been the fact that one set of statistics taken by some governmental authority did not quite fit in with the other and so they were being compared and examined. In future, I think this should be less because it is important that whatever the various statistical agencies might do, they should co-ordinate their activities as far as possible. In statistics also it is found desirable to take two different approaches to get the same type of

statistics and then compare the results. If the results are very near, one gets the assurance of their correctness more than if one approach had been there. Take even the sample surveys. If we take two sample surveys and the samples are different – not in the same place but in the same wide area – and you get the same results, the results of the sample survey are more definite and more reliable. They may differ one per cent or half a per cent. Therefore, there is necessity for having an institute of this kind; there is no other institute in statistics.

Prof. Ranga asked me: why don't you have an institute, perhaps for agriculture or other things? I cannot answer that question here... However, we are dealing now with statistics and not other institutes or other departments of human knowledge. It is necessary to have this. If it had not been there, we would have had to find it out somehow and build it up. (4929-30).

It is desirable, I submit, for such an institute not to be a purely governmental institute because then that inevitable bias may come in examining governmental statistics or other statistics. At the same time, one cannot give an absolutely free hand to do what it likes, in the manner it likes and dispose of considerable funds that it gets. It is, I admit, a slightly novel approach and, as I submitted in my earlier speech, if this succeeds we can adopt it for other purposes too. This approach has a great deal of decentralisation, autonomy and independent approach, and yet governmental, not control but governmental checks in a variety of ways ultimately going so far as to issue directions to have audit of performance, enquiries about performance, are there. It is the most important thing, I think, in any kind of audit, because, after all, when you spend money, the main thing is to see if it has been properly utilised and it has produced the results aimed at. It is not, after all, very satisfactory if the money has been spent strictly as laid down in the rules and yet not produced adequate results. That is the most important audit, not that I leave out the other audit.

Therefore, this has been devised after very considerable discussion. I can assure Shri Ranga – I may be at fault; of course, that is a different matter – that the amount of thought that has been given to this matter is something prodigious. There were discussions with the various ministries concerned, notably, of course, the Finance Ministry, and so many other people inside and outside. Enough thought has been given to it. If we still find some faults, they are our human failings which I cannot get over.

A number of relatively minor points have been raised. But I submit this is the main thing that has to be remembered, this approach of an autonomous organisation with governmental checks, directions etc., but not control in its normal working, internal working..... (4931-32).

....There was a reference to a rent of Rs. 8 lakhs or Rs. 9 lakhs paid to various firms – American and Britain – for tabulating equipments which are not made in India. I have just enquired and I am told that these particular machines are not available in India. Till they are available – it would be a different matter – they have got to get them from there on rent. In fact, these complicated sets cannot even be purchased. That is the normal practice, I am told, in other countries too. As a matter of fact, the Indian Statistical Institute has already devised some new statistical machines which they are using and which they are selling too – of a simpler type – and they hope to make other types also....." (4934-35).

Shri Bimal Ghose: "....So, I would ask the Prime Minister to consider – not now, because the Bill is going to be passed now, but in future – whether statistics and computation should not be centralised in one body so that this Institute could devote itself to research and training, which is a work of extreme importance and significance, which it continues to do today. It is an Institute of which we are all proud and I hope this Institute will flourish..." (4945).

Shri Jawaharlal Nehru: "Nothing has come in the way of Government giving grants in the past. In fact, they have given grants. So, the question does not arise... (4948).

But one thing I should like to say and that is that I entirely fail to agree about the separation of research and training from practical work. That, I think, will be bad for both. In fact, the tendency today is for teaching itself to do partly practical work. Both the teaching and research part will become ivory tower people, unconnected with what is happening in the wide world and the others who have not been in touch with the latest research mind will go. Therefore they have to be combined.

There is one thing else. I think Shri Ghosh asked whether they will in future be worked on a contractual basis. Yes, certainly. In the next clause, if you will permit me to say that, it is said that Government will give them such money as it considers necessary by way of grant, loan or otherwise. Part of the work must, I suppose, inevitably be done on the contractual basis..." (4948-49).

RAJYA SABHA: December 17, 1959

"This Bill really tries to acknowledge an existing fact. This Statistical Institute, which was started many years ago, has, in fact, become a vital institution in India performing a basic and essential task. It is well known that planning and indeed many Government activities can hardly function without proper statistics; and statistics today means something much more than the counting of heads. All kinds of social problems come in statistics, and the more the subject becomes complicated, the more they develop complicated machines to deal with the matter. All our sample surveys, which are so important, are done now by this Institute. In fact, there is none other of that size. Our various Government Ministries have, of course, their own statistical departments like Food and Agriculture and others which do very important work. But none of them covers the whole field and none of them can really take into consideration the entire country with its various problems. Obviously, the State Governments also have their statistical departments. Nevertheless, it was found necessary some time ago to have a Statistical Adviser to Government here, partly to advise Government and co-ordinate these activities. But the way of co-ordinating these activities, the major way, is through this Indian Statistical Institute. Many years ago, even before independence, this Institute was functioning on behalf of Governments on a contractual basis to carry out all kinds of enquiries. Till lately, even up till now, most of the work it has done for Government, like sample survey work, and the rest has been on a contractual basis. The Institute is a private, non-profit-making society... (2920)[2].

Now, the problem came before us as to how to put this Institute in a more effective relationship with the Government. On the one hand, it was considered undesirable to make it a governmental institution for a variety of reasons which, I think, are relevant not only in this case, but probably in other cases too. But in the matter of statistics I feel that one should have as independent an approach as possible. I do not mean to say that a Government institute does not have an independent approach. But nevertheless there would be a certain tendency, an unconscious bias, to show, let us say, that a particular Government Ministry is doing well. Their statistical department, without consciously trying to do that, could do it. Just like a kind of audit, it has to be independent and it has to get the objective facts. Therefore, it seemed desirable to us that this Institute should not be converted into a governmental institute. On the other hand, Government was giving large sums of money to it, whether on a contractual basis or as grants and it was necessary that there should be checks in regard to its work and its spending. Again, so far as spending is concerned, most people, I believe probably in this House also, are feeling that as against the necessity of having proper checks on public funds which are quite essential, we should have a certain flexi-

2. The numbers given in bracket refer to column numbers of the *Rajya Sabha Debates*, Vol. XXVII, Nos. 13-22, Twenty-seventh session (December 9 to 22, 1959), Rajya Sabha Secretariat, New Delhi.

hinty, so that these checks do not come in the way of work being done. One of our major problems in India, not about statistics only but about the whole system of Government is that excellent as it is, there are innumerable delays in it. I am talking more about the procedures – administrative and others... Now, those procedures are essentially meant for having proper checks which are are very desirable, but if the check prevents the thing being done or delays it so much that it is harmful, then obviously some other method has to be devised and that is a major problem which we have to face... (2920-2921).

Coming to this, we had to find a way between these two, that is, a certain flexibility, a good deal of autonomy and at the same time the ability to check abuses, and ultimately even to take over the whole thing. Now, hon. Members who have no doubt read this Bill as passed by the Lok Sabha will observe that we have tried to steer in between these two positions. It remains as it is, a private, non-profit-making organisation. But Government have taken very considerable powers of telling them what to do. They cannot change their rules or regulations without the consent of the Government. So far as audit is concerned, we thought about it very carefully and we decided that we should not compel the audit being done by the Auditor-General because, excellent as the Auditor-General's office is, it also functions under certain governmental routines which may not be applicable more especially in a scientific organisation... Therefore, we have suggested in this Bill that the auditors should be naturally Chartered Accountants but recommended or selected by Government on the advice of or in consultation with the Auditor-General... (2922).

Now, the really important innovation in this Bill to which I should like to draw the special attention of the House is the fact that Government normally can appoint any number of committees to find out what is being done, but the real thing is that they can appoint a committee to judge the performance, not only performance but achievement. Now, take audit, financial audit. It means that the auditor has to find out if money has been spent according to law and according to sanctions received. That is all his business. He cannot go beyond that. Whether the money has produced results or not is no function of the auditor. Surely, if we spend money, we spend it to get something, not merely because it has been sanctioned. What is most important for all activities of Government, therefore, is to find out what has been achieved by the money spent. That is an audit of performance or achievement. Now, in this Bill some effort has been made to bring that out. Hon. Members will see clause 8. (2922-2923).

What I was particular to point out was clause 9:

'The Central Government may constitute a Committee

(a) reviewing the work done by the Institute and the progress made by it;
(b) inspecting its buildings, equipment and other assets;
(c) evaluating the work done by the Institute.'
(d) .....

This is what I call a real audit of performance which I should like really in so many other activities which Government indulges in. And then, Government has the power to send directives, and if the directives are not carried out, Government has the power to take over the whole Institute. So, the House will observe that we have taken very adequate powers to see how work is done and left the normal working in the hands of the Institute, and it is not necessary for it to come up for sanctions, to make references of all kinds of petty things which delay. If, as I hope it will, this approach is a successful one, we should like to extend it to industrial enterprises and others also, because we cannot, at any rate I feel we should not, centralise all these activities too much under a Department of Government. There may be State-owned enterprises as many major enterprises are, and there may be many more State-owned enterprises, but I feel more and more that they should not be

directed from a Department of Government or a Department of Government should not interfere too much.... (2923-2924).

Now, clause 3 of this Bill says that because of this and that 'it is hereby declared that the Indian Statistical Institute is an institution of national importance, I submit that it is the recognition of a fact. We have been really treating it as that and, what is more, it has a very high place in the world today amongst statistical institutions. It is really considered one of the principal world organisations in this line. They have actually made some contribution to the advancement of statistical science in the world, and they are now beginning to make their own computing machines; they have made some smaller ones which are used, and probably the bigger ones will be used... (2924-2925)

Now, in clause 5 it is said that Government may, when it considers necessary, give this Institute help through grants, loans or otherwise... (2925)

Mr. Deputy-Chairman, the reaction of the House to this Bill has been not only favourable but, if I may say, enthusiastic... (2954). There was some vague mention, I think, by Mr. Bhupesh Gupta about reference to a Select Committee. The Bill is so simple – there is nothing complicated about it – that there is no necessity for reference to a Select Committee, apart from the fact that there is no formal motion to that effect.

Sir, one thing I should like to mention. It is our intention and the Institute's intention to send the Annual Reports to be placed on the Table of the Houses so that Parliament may be kept in touch with the Reports, Accounts, etc...." (2954-2955).

100. BASIC IMPORTANCE OF MATHEMATICS*

(inaugural address at the 25th conference of the Indian Mathematical Society at Allahabad on December 25, 1959)

Prime Minister Nehru today (December 25, 1959) stressed the necessity of conducting research in mathematics which, he said, was the foundation of all sciences.

Inaugurating the 25th conference of the Indian Mathematical Society, Shri Nehru said that every person knew how basic and important mathematics was in the development of modern science. Mathematics had always been important but its importance had been realised even more with the mighty changes that had taken place "in our conception of physical world", which were largely due to the development of mathematical theory.

"In a distant way", he added, "I have been associated with our work for atomic energy in this country and other important allied subjects. My association has not been of deep knowledge in the subject but of deep interest in them."

Shri Nehru said: "Two or three years ago we felt that Tata School of Fundamental Research in Bombay had made a considerable progress in regard to research in mathematical theory. We then decided to consider this institute as a national centre, so far as the Government of India was concerned, over its dealing with the subject. We were anxious to help this work from the point of view of improving and encouraging good quality work, which we found was being done there and so we appointed that institute as our national centre."

The Prime Minister added: "I do not know what measures of co-operation there is between various centres in India and the universities in this work. I am told and I have found that some of our young men are showing very great promise in mathematics in India. It is

* *The Hindustan Standard*, New Delhi, December 26, 1959.

very welcome. Historically, India has been one of the leading figures in the earlier development of mathematics."

Shri Nehru said that after the 11th or 12th century, there was like many other things, a kind of static period in India when no progress was made in mathematics. It was extraordinary. When a nation was alive and progressive, it progressed in all directions. When it was not so, it lost its freshness and creativeness.

In the 12th century, mathematics in India came with greater repetition, and not as a creative effort. "The moment you are repeating you are lost. To some extent you cease to grow. That has been the fate of India. Even repetition of highest thought, which is necessary, of course, by itself is not enough unless you can add to it and create something", he said.

The Prime Minister added: "I hope that we are entering, with the advent of freedom and independence, a creative period in our history. I believe we in India are making progress in all directions and now with new energies that have been released and for greater opportunities in our way for doing this work, we shall undoubtedly progress. Broadly speaking, we are progressing all along on scientific lines. We do not claim any startling discovery but foundation of scientific research has been laid. Startling discoveries can be there when there is wide foundation of scientific teaching and research work."

"Perhaps," Shri Nehru said, "one thing which I might say is that I am not satisfied with the research work that was being done in various sciences in our universities. I am not talking about any particular university. There has to be quantity and quality both. I am not quite sure if we can compare the quantity or quality with the quantity and quality of research done in some great countries. It is not due to any lack of quality amongst our people but somehow we get entangled in other activities with the result that the mind cannot divert itself to that kind of work."

Shri Nehru said that in a university, apart from teaching, the primary function was the research work. Similarly, delivery of lectures was not enough and the lectures would also grow flat unless the lecturer was moving into the creative field of thought. Test of a real teacher was his research work. Normally, a professor had got plenty of time for research. It was of the greatest importance that the Indian universities should encourage research work, give opportunities for research work and provide the tools and equipment for research. And teachers should realise that ultimately the worth of an individual was judged by the creative work he did and not by repetition of text-books which could be of importance, of course, in their own line.

The Prime Minister said that many of the sciences required a tremendous deal of equipment which was sometimes not available to a university. Therefore, they should follow two paths. One was to concentrate on really first-class work where they could provide a good deal of top men. If they spread out their work all over, then good men, who could do good work in conjunction with each other, would not produce good results, and the opportunity of doing first-class work becomes limited. A time might come when we might have in abundance first-class equipment and persons for research and the results of that research would be really first-class.

Stressing the need of cooperative energy for work, Shri Nehru said, "Secondly, our universities might perhaps each concentrate on particular types and specialisations apart

from general teaching. I am talking of high class research. If universities concentrate, by some kind of mutual consultation, they could take up different subjects suited to them so that the results might be better."

Shri Nehru pointed out that even in the richest countries like U.S.A. there was a tendency for a university to concentrate on one field and the best men in that field of work worked together. He did not know how far it was suitable to India. He said that the result of research was likely to be second-rate if everybody tried to do everything. "We must always strive to achieve high class research results", he said.

Talking about atomic research, Shri Nehru said that the subject was of the greatest interest to scientists and the public. "It is desirable that every university should have a sound foundation in nuclear physics because out of a university comes the highest stage of study and research".

Shri Nehru said that if every university tried to go ahead with the highest stage of research and tried to have atomic reactor they would simply spread out their top-ranking men working individually and separately and not achieving anything much. It was better to bring out these top-ranking men together and achieve good results. "Hundreds and hundreds of top-ranking scientists were collected in war time and were locked up together with every facility to work together on atomic energy. They would not have succeeded much if that tremendous collection of brain were not there". He was sorry that they produced atom bomb but that was another thing.

"Science", the Prime Minister said, "has always been and as long as it is alive, will be a quest for the unknown and that quest requires not only certain training of mind and competence but a large measure of cooperation in order to work together. It is that cooperative effort of the highest type that led to the advance in atomic science and invention of the crude atomic bomb and hydrogen bomb."

Shri Nehru said, "In regard to atomic energy, we decided to develop it as fully as we could through the Atomic Energy Department in Bombay. We have developed a powerful centre of atomic research and some of our young men working there were first-class in this field and already they have started making a mark in international gatherings doing research in atomic energy. If you spread out these good men, they would not have an opportunity and facility to achieve great results."

Shri Nehru said that Indian universities must have a sound foundation of nuclear physics. That applied to subjects like atomic energy and allied subjects, but to some extent that would apply also to other subjects.

He said that mathematics was more valuable even to a layman. Mathematics required, apart from functioning of our brain, a great deal of cooperative effort. He was glad that in mathematics India was gradually forging ahead. On January 12 next there was going to be an international conference in Bombay. Undoubtedly, great and the most top-ranking men of the world were coming there. They were the men who were supposed to be carrying on the great mathematical tradition of the last few generations in Europe. What would be the result, he did not know. But a quiet discussion on the work done was bound to bring good for mathematics in general and more particularly for mathematicians in India.

The Prime Minister referred to the suggestion made by Dr. Ranjan, Vice-Chancellor of the Allahabad University, that mathematics should be made a compulsory subject in high school and intermediate examinations and said that he did not believe in making subjects compulsory, irrespective of the fact whether a person was fit or not. It was a good thing that our young men should learn mathematics but there were people who were quite incapable of understanding elementary mathematics. What was the good of wasting time in teaching them something which they could not absorb? Every educated person must know some mathematics but to force on him more of it was not good.

101. ROLE OF ENGINEERS IN INDIA'S SOCIAL TRANSFORMATION*

(Speech at a dinner hosted by Institution of Engineers, U.P. Centre, Allahabad on December 26, 1959)

Prime Minister Nehru said here (Allahabad) tonight (December 26, 1959) that India today required engineers of various kinds to help her in building up her economy.

Mr. Nehru who was speaking at a dinner given in his honour by the Institution of Engineers, U.P. Centre, at the Government House, said that today they were living in a fast changing world of scientific age. Certain things had happened during the last few generations which had changed the whole conception of life. For the first time in human history it was the science and technology that helped the means of production to such a level that one could think of eradicating poverty. Poverty had vanished in many western countries.

Mr. Nehru said that there was a conflict between the ideologies of Russia and America; yet behind that conflict there had been a great development of science and technology. Scientific and technical elements were the same. "In spite of political and economic conflict the fact is that their objectives are the same. Broadly speaking, their methods of obtaining them are the same through utilisation of new resources of power and high techniques," he added.

Russia, he said, had made Sputniks but nobody still knew what kind of fuel was used in it. It was still a secret. It would be discovered in a year or so. But the speed of scientific discoveries and their translation into practical purposes was tremendous. The fact was that the whole world and our conception of physical world had changed very rapidly and was going into a strange direction.

But in India they lived in traditional conflict. The main problem in India was how to get out of this traditional structure of society into a modern structure, scientific structure, where atomic energy and other forces were coming out. Unless they did that, they could not get over the basic difficulties. For this, they required not only a large number of people trained to function in that modern way so far as science and technology were concerned, but realisation of those techniques and translating them into practice.

Mr. Nehru said that in India they were constructing big dams and development projects, but unless there was a background to know about these things they remained as isolated islands in a sea of traditional living. It required specialised education in modern techniques.

He said that though India was moving forward, yet one should always think that 400 million people of India had to move. In this connection, he was reminded of his visit to London where somebody asked him, "How many problems have you got? I said 400 million problems."

"We have to move 400 million people to various stages of education, science and technology, and it is difficult to pull a society quickly out of traditional background. It is easy for engineers to grasp this idea but it was not so easy for a lawyer. Broadly speaking a lawyer looks backward and forward too. Lawyers have brought polemical revolution but when you come to the social change we have to come to engineers. Lawyers are not even revolutionaries in social field. I am not talking about any individual. We have got difficult problems in India and we have to change our country quickly. It is through the efforts of engineers and scientists that we can progress speedily and march faster towards prosperity.

Manpower played a vital role in building up a country, Mr. Nehru said. In China, they were using every man and woman for doing some work by compulsion. That had speeded

* *The Leader*, Allahabad, December 28, 1959.

up their construction. But in India they could not do so and they did not want to do so though she had manpower in abundance which was lying idle.

He said that when Gandhiji asked every man to spin for a few hours daily, the idea was to use the unused manpower even if a man's earning was four annas, but if it was multiplied by one hundred million it was a big sum, and it added to the wealth of the country.

Mr. Nehru said that an average engineer should use the latest machines and must always aim at improved techniques: that was how a nation progressed. But they could not give a push to the latest techniques unless there was a background and unless social conditions were adapted to it.

He said that India required more and more engineers. Though India had set up three steel plants, they were thinking to set up two or three more. They wanted to set up those steel plants with machines manufactured in India — perhaps not hundred per cent but ninety per cent. But it all depended on the engineers engaged in big undertakings. Nevertheless, he thought that there was a great danger to the thousands of smaller undertakings spread all over the country. Smaller undertakings gave quick results, and created a tempo which was necessary to give impetus to the people.

Mr. Nehru said that India was progressing well and gradually they had arrived at a take-off stage. The second stage was when modern techniques of science began to impinge upon traditional stage, and the third stage was called a mature stage of self-generating economy without any help from outside. All the advanced countries of the West had passed their take-off stage and were in mature stage of modern technology. He said that the next stage of production would be of a very high order.

Referring to planning, Mr. Nehru said construction of roads and buildings was not planning. Planning was an objective and organised step for progress. There was not much difficulty to finance these projects, but the difficulty was in the implementation of the plan. The engineers had to make every worker engaged in the construction of any dam or project feel that he was not only a labourer but a partner in a nation-building undertaking. The spirit and feeling of partnership in a worker would yield better results.

102. INDUSTRIAL BASE, A PRE-REQUISITE FOR DEVELOPMENT OF SCIENCE AND TECHNOLOGY*

(Address to the 25th anniversary general meeting of the National Institute of Sciences of India at Bombay on January 2, 1960)

Mr. Nehru said here today (January 2, 1960) that India would not be able to achieve all-round progress unless she first built up the proper industrial base by adopting recent developments in the field of science and technology. India's most important task today was to build a form of modern society by changing many of the traditional ways of production and replacing them with modern methods, he said.

Mr. Nehru, who was addressing the 25th Anniversary General Meeting of the National Institute of Sciences of India here, said that in many advanced countries pressures of wars had inevitably led to development of science and technology. But in India it was the advent of freedom that gave a "big push" to progress and a great deal had been achieved during the past few years. India's march towards progress was to some extent hampered by lack of

* *The Hindustan Times*, New Delhi, January 3, 1960.

a proper industrial base and by lack of resources. The lack of resources limited the country's choice of priorities because India had various problems to tackle such as education, health and production. More than all these, the lack of a proper industrial base forced the country to give topmost priority to first achieving this base.

Mr. Nehru said that since the advent of freedom there were "domains" in which Indian scientists could work. There were the universities, the Council of Scientific and Industrial Research, the national laboratories, the defence science institutes and the Atomic Energy Establishment. He said he sometimes felt that Indian universities did not progress as much as they should because many of them dealt with subjects of general interest. Science was a vast subject which was growing vaster and vaster day after day and it would be better if the universities concentrated on specialised subjects. This would also help to utilise better the meagre resources. Mr. Nehru added that greater emphasis should be laid on equipment and giving opportunities to young scientists for research. Without research no teacher would be able to help his pupil. He could not do it by merely imparting knowledge acquired from books.

Mr. Nehru said the Atomic Energy Establishment at Trombay had, since its inception, produced a far greater number of young scientists than many of the universities put together. The quality of the scientists produced by this organisation had been recognised at several international conferences. In fact, it would be seen that India had achieved considerable progress in the field of atomic energy considering that she did not have the advantage of an industrial base on which she could progress. Nobody would claim that India's progress in this direction was of the highest order but it was remarkable that she was able to achieve this much within two or three years. This was recognised by several advanced countries.

Referring to the defence science institutes, he said, these institutions had done some wonderful work under the able guidance of Professor D.S. Kothari. The achievements of these institutions along with those of the Council of Scientific and Industrial Research, the national laboratories and the Atomic Energy Establishment could well be utilised for peaceful purposes and for the betterment of the people at large. It was unfortunate that in the past industrial progress was utilised for purposes of war.

Progress in one aspect of life was not sufficient for all-round progress. It was not individual progress that was required but the totality of progress. It was this task which the scientists of today and tomorrow must take up, so that the country could achieve all-round progress. The development of technology and science which India had achieved after independence was remarkable. "While this is so and while we have advanced considerably in the development of scientific institutions, the fact remains that neither science nor technology can go very far without an industrial base," Mr. Nehru said.

103. TECHNOLOGY MUST AID THE MASSES*

(Inaugural address at the Silver Jubilee Celebrations of the Department of Chemical Technology, University of Bombay, Bombay on January 3, 1960)

Mr. Nehru today (January 3, 1960) urged Indian technologists to evolve simple processes that could be understood by the villagers as 80 per cent of the people in the country lived in villages.

* *The Hindustan Times*, New Delhi, January 4, 1960.

The work of technologists, Mr. Nehru said, must reach the masses of people who were really interested in the outcome of such work. India was, at present, in the "bicycle age", but undoubtedly a new era was coming and it would come quickly. Scientists must encourage simple technological processes which would lead to a rise in the living standard.

Inaugurating the Silver Jubilee Celebrations of the Department of Chemical Technology of the University of Bombay, the Prime Minister praised the work of the Institute and said it must play a vital role not only in the educational system but also in the advancement of the country as a whole. Mr. Sri Prakasa, Governor of Bombay and Chancellor of the University, presided.

According to P.T.I., Mr. Nehru said, "I am looking at this matter always from the point of view of these ideas seeping down to the masses of our people. The question before us is how the common people can benefit from these technical advances." He said, cities comprised only about 20 per cent of India and only when modern techniques reached villages one could say that India had entered the technological era.

Nowadays, people talked about the atomic age and the jet age. Although India had not yet reached this stage of development, he would confidently say that India would soon manufacture jet planes. For after all, in the modern age the tempo of development had to be rapid. In fact, he added, some little progress had been made in this direction.

But the main question before the country today was how to encourage and bring into being similar techniques which could benefit the villagers. Of course, these techniques must be cheap and yet they must help the people to raise their standard of living. He said, the people were not very much interested in possessing automobiles or things of that sort. Even though they might aspire for these, they could carry on without them for some time more. What was immediately needed was things like simple and cheap housing and good water supply.

These institutes did very fine work and produced new things, Mr. Nehru said. But somehow or other these new developments did not pass the laboratory stage. Great research had been done in the country, but this had to reach a larger plane. It was not surprising that such a state of affairs should exist because people who ran these institutes were men of science and did these things in the laboratories or institutes. Other people should come forward to spread these advances in science and technology to the countryside.

104. SCIENCE AND CULTURAL VALUES*

(Inaugural speech at the symposium on "Science and Cultural Values in India" during the 47th session of the Indian Science Congress Association at Bombay on January 3, 1960)

The Prime Minister Mr. Nehru said in Bombay on Sunday (January 3, 1960) that scientific and technological progress did not come in conflict with culture, unless the world "culture" was given the limited meaning of the traditional way of living. Mr. Nehru said that India was now on the verge of becoming a "technologically mature society". In trying to build up a modern society, the adoption of scientific methods was inevitable. But, in doing so,

* *The Times of India*, Bombay, January 4, 1960.

the attempt should be to bring about the changes retaining at the same time the "things of value in the field of culture."

The Prime Minister was inaugurating a symposium on "Science and Cultural Values in India" organised by the Indian Science Congress Association. He was basing his observations on the remark of Dr. U.P. Basu[1] that "science clashed with culture" — contained in the advance notes on the symposium given to Mr. Nehru at the meeting. The Prime Minister said that scientific developments had their impact and "consequences" on society and these were unavoidable. At best, they could be delayed. Mr. Nehru spoke of the vast changes now taking place in the country and said he wanted the peasant masses in the rural parts to have a glimpse of them.

Mr. Nehru said that he had read a lecture series in which societies were divided into four: 1) traditional societies; 2) those affected by technological changes and groping forward; 3) technologically mature societies; and 4) those having reached a high consumption stage. Many European countries were technologically mature societies where technology became self-feeding and progressed on its own steam-power. America and Russia represented those having reached a high consumption stage.

India was struggling to become a technologically mature society and, along with two or three others, was approaching that stage very rapidly. In a few years, it might attain that stage. The present was a very difficult period and the people had to work hard to overcome the difficulties. Mr. Nehru did not think that technological progress affected the cultural content of mind. He spoke of the high culture of the people in the rural areas, and said it would be a sad day when India forgot the basic cultural content which it had received from its epics like the Ramayana. The real conflict was in regard to the traditional ways of living which the technological developments would affect. India was now going through a transition and was in the process of developing the country into a modern society technologically.

The Prime Minister said that science was useful in solving many problems like increasing food production. Some talked of "disaster", threatened by the population growth being faster than food production. He did not agree with that view. He was certain that food production would increase, but it called for hard work. Ultimately, the peasant had to change the traditional ways of cultivation which he was used to for thousands of years. Tractors might be used or not, depending on the ratio of peasant population to the cultivated area.

Another problem facing the country was employment. If we succeeded in using all the manpower, though not fully but economically, wealth could be created. All these were interrelated problems. The adoption of scientific methods in solving them was inevitable. But, in doing so, the change should be brought about retaining the things of value in the cultural field, Mr. Nehru said.

1. Dr. U.P. Basu, Managing Director, Bengal Immunity Research Institute, Calcutta, and member, Executive Committee of the Indian Science Congress Association.

105. INDIAN SCIENTISTS SETTLED ABROAD*

(Address at the annual general meeting of the Association of Scientific Workers of India at Bombay on January 4, 1960)

The Prime Minister, Mr. Nehru, on Monday (January 4, 1960) expressed his sense of disappointment at some of the country's good scientists settling abroad, attracted by higher remuneration. Mr. Nehru said that he was "a little hurt" when he came to know that "some of our best scientists" preferred to remain abroad and even settle down in foreign countries, because those countries provided them "inducements and better scientific facilities" for work. Indian scientists abroad, the Prime Minister said, should know that individuals could not set aside "certain bonds, responsibilities and obligations". He said that a person who wanted an easy life did not evoke "my admiration".

The Prime Minister, fulfilling his last public engagement in the city, was addressing the annual meeting of the Association of Scientific Workers of India, at the Convocation Hall in the University campus in the presence of distinguished foreign and Indian scientists. P.C. Mahalanobis, the President of the Association, presided.

Perhaps, it was a fact, Mr. Nehru said, that India was not in a position to provide Indian scientists settling abroad with similar inducements and facilities for scientific work. This should not mean that they should prefer to stay abroad. India wanted to progress fast, making the best possible use of the latest technical developments. In this endeavour, every scientist should assist her, Mr. Nehru said.

The Government wanted to give greater recognition to scientific workers. Their number was fast increasing. They were gainfully employed also. A number of institutions, both in the public and private sectors, were employing scientific workers. The Atomic Energy Establishment and departments of defence science were rapidly growing in size. The universities too were employing more and more scientific workers. The Government sector employing scientific workers was "pretty big and likely to grow fast."

Referring to the question of trade unions for scientific workers, Mr. Nehru said that this was a subject which needed "careful consideration and discussion." He could not express an opinion "off-hand". He could not also say in what way the problems facing these workers could be dealt with. The "main consideration" should be the future progress of science in this country. The Prime Minister conceded that it was the fundamental right of scientific workers that they should get a better deal in their own country. In this respect, Professor Humayun Kabir, the Union Minister for Scientific Research and Culture and he agreed that greater facilities should be provided for scientific workers so that the nation could have well-qualified workers.

At the outset, the Prime Minister referred to the presidential address of Professor Mahalanobis and said that it raised some important questions connected with the future of the Association of Scientific Workers in this country. The President had repeatedly requested the Government to come to the aid of the Association. But the Government did not decide anything unless it was called upon to do so. Further, he did not think that the Government was responsible for the formation of this Association. The Government had "plenty of problems" of its own too. But it was for the organisation to decide its future. The Prime Minister confessed that he did not know much about the Association and what it had done so far. Perhaps it met annually and passed resolutions. He said that he remembered that one of the resolutions was "particularly objectionable."

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* *The Times of India*, Bombay, January 5, 1960.

106. IMPORTANCE OF RADIOLOGY IN TREATMENT OF DISEASES*

(Message to the 14th Indian Congress of Radiology held at Hyderabad from February 15, 1960)

"I send my good wishes to the 14th Session of the Indian Congress of Radiology. There can be no doubt that the science of radiology is of importance in many ways and more especially in regard to treatment of cancer and other diseases. A thorough study of the subject, therefore, will be helpful in furthering human welfare."

107. CREATIVITY AND NOT IMITATION ENSURES NATIONAL ADVANCEMENT**

(Inaugural address at the twelfth annual general meeting of the Aeronautical Society of India, at the site allotted by Government to the Society at Indraprastha Estate, New Delhi on March 24, 1960)

I am glad to be here. If by my presence here the Aeronautical Society of India derives any kind of help, I should like to help it. Your President was just telling us of the small beginnings of the Society which is now growing. I hope it will grow more and do good work. I have, as you perhaps know, lived through a fairly long spell of years and seen many changes in India, in Europe and elsewhere. A little time back, 50 or 60 years — say 50 years — I am trying to visualize the picture of the world then. It is amazing how different it is today. Any part of the world — not only India — is different. Imagine 55 years ago — I was in Cambridge — I took my degree exactly 50 years ago at Cambridge — and the changes that have been made during these 50 years. Practically these 50 years include the earliest beginnings of the start of aviation in the world. Whether it was the Wright Brothers in America or others in Australia or France and I even remember visiting an aeronautical exhibition at Frankfurt in Germany in 1910, exactly 50 years ago when the kind of aircraft they were trying used to come down a slope with a bang at 100 yards or so and how rapidly it developed after that.

We in India are now, I may say, in the bicycle age. The bicycle has invaded the villages and is becoming a very popular means of transport all over India. Well, from the early developments — going back to the beginning of the century about 55 years ago or so, may be more, I think that the pace of change now is greater because certain new fields, new avenues, have opened out. All these fields of electronics, jet travel, atomic energy are entirely new avenues, new forces coming within human control to some extent. And so the pace of change comes more and more rapidly and only the community or the nation which keeps pace with this can keep pace with the rest of the world. That is why it becomes necessary that we have to be absolutely and thoroughly efficient in our Atomic Energy Establishments. No country advances merely by copying other countries. So, whether it is atomic energy which, of course, is one of the most advanced sciences now for research or any other activity or technology, one has to be intellectually in the forefront and to be creative to produce things. A man who copies may be an excellent person to live with, but he is not the person who makes changes in the world. Of course, learning from others is

* *The Hindustan Standard*, New Delhi, February 15, 1960.

** *Journal of the Aeronautical Society of India*, Vol. XII, No. 2 (1960), pp. 40-41.

totally a different matter. That is desirable. One should always learn. Knowledge is common to the world — any kind of knowledge and invention — and that is why again it is not a good thing for progress in knowledge and invention to be confined to a few.

I am talking about the general level of advance and we will have to make that up rapidly and we will, no doubt. We will only do so if we keep our eyes at both ends of the picture. One is, we have to be in the front rank of thinking, working and generally discovering — in front rank so far as our resources permit. We cannot be second-rate there. Even though our other activities may be backward, we have to be in the front rank in the newer fields of scientific endeavour and we must realize that. It is not by imitating or buying abroad that a nation makes progress, except to begin with. That is one side. The other side, the most important side, is that the general level has to go up. It has to go up economically; it has to go up educationally, because, really, you cannot build up a high ranking school of thought in the country without study in science, technology and like things, unless the general level has risen. You may have a brilliant mathematician. That is a possibility; but you will not have high standard of technological progress without the general level going up. It is not a question of half a dozen people carrying the country forward on their shoulders. Thus you will see the necessity of, shall I say, the Aeronautical Society of India, to aim not merely at large membership, although large membership is good, but rather encouraging in every way 'quality'. And the more you encourage quality in this as in other undertakings, the more you get sound roots; the more you grow in the future.

I hope that now that you have got a firm footing on this half acre of land, you will put up your building and encourage quality in your organization and thus make India more and more air-minded, more and more prepared to set forth for new adventures in this age of continuing adventure.

108. SELF-SUFFICIENCY IN DEFENCE EQUIPMENT*

(Speech during visit to the Exhibition organized by the Defence Science Laboratory at Metcalfe House, New Delhi on April 13, 1960)

Mr. Nehru on Wednesday (April 13, 1960) said that development of defence science within the country needed all encouragement. The Prime Minister was addressing scientists of the Defence Research and Development Organisation at the new premises of the Defence Science Laboratory, opened a few days ago by the Union Defence Minister, Mr. Krishna Menon[1].

In the present world which unfortunately depended on arms and ammunition, if the needed weapons were not produced internally but were imported from foreign countries, it could let down the country's defence any time. "It is better to produce and have a second class weapon than to rely on a first class weapon which you do not produce and get from outside", he said. Mr. Nehru said there were no two opinions about the importance of the latest techniques but "we could not be up-to-date in science and technology by relying on outsiders who supplied us". Of course, the country had to get things from outside sometimes, but it was not a sign of self-reliance. It amounted to a dependence of a deeper kind

* *The Hindustan Times*, New Delhi, April 14, 1960.

1. Mr. V.K. Krishna Menon, Union Minister for Defence, Government of India, New Delhi.

when "your intellectual background is not developed enough to produce that kind of thing yourself."

It was not fair, he added, to deprive the defence services of the best way of doing things entrusted to them. The best way of doing it was not the way of reliance on scientific developments and weapons produced elsewhere although from time to time we have to get them and learn from them. The minds of the defence science personnel should be occupied in doing some "creative" work and not merely copying them as it happened elsewhere.

The Prime Minister said the Defence Ministry and other departments had trained personnel. He did not see any reason why various large-scale defence factories should not produce goods other than defence apparatus which were needed by the country. He also pleaded for closer cooperation between the defence science personnel and scientists in other research laboratories and universities.

Speaking on the role of science in the development of the country, Mr. Nehru said it was important to develop industry on a scientific background to keep pace with the progress made in other countries. Referring to the role of science in human affairs, Mr. Nehru said he was struck by a phrase used by Acharya Vinoba Bhave in a message sent on the occasion of the inauguration of a women's college. Acharya Vinoba had said in his message "The days of politics and religion are over and the days of science and spirituality have come". This Mr. Nehru said, came from a man whom he considered the most religious man in India. The Acharya had distinguished between spirituality and religion and he gave the first place to science. A deep thinker like Acharya Vinoba who was instinctively not attracted towards modern life and its complications had come to this conclusion and so it had much significance.

Mr. Nehru said that he had heard of complaints that elder scientists did not, like youngsters going ahead of them. Sometimes, he said, "even the horrid idea had been put out that the elder ones took advantage of young scientists' work and palmed it off in their own name". The Prime Minister, who was addressing defence science personnel at a meeting, said such things should not happen. In a creative activity like science, one could not work in a set routine. All must have the opportunity to work, think and grow. All creative work should be encouraged. He would not like to encourage it by big financial rewards partly because all that money was not there and partly because he had doubts in his mind about a person who was too much after big financial rewards.

Of course, any person who wanted to do worthwhile work should be given adequate opportunity and status and should not be harassed all the time.—P.T.I.

109. SIGNIFICANCE OF MODERN COMMUNICATIONS*

(Address at the 2nd Plenary Assembly of International Telegraph Telephone Consultative Committee at New Delhi on December 8, 1960)

Those of you who are delegates to this Conference are experts and specialists in this particular field. I am, as you know, a layman not knowing much about the intricacies of this business. But the subject you deal with enters into the life practically of every human being today all over the world. It goes on growing and expanding not only in extent but also in depth, and so that means of communication have become available to the entire world.

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

There are many ways, I suppose, of writing the history of the world or of human progress. And yet, I imagine that probably one of the most effective ways would be to trace the history of the development of communications in the world — from the earliest days when some wise genius discovered the wheel. This revolutionary discovery of the wheel brought about many changes, and then of course so many other things happened. For a long time after that, thousands of years, there is no mark of any remarkable progress in regard to communications. Of course, there was some progress till after the Industrial Revolution, and so on. But then the pace of advance became ever faster, and the telegraph and telephone brought one of the major revolutions in the world. And then we go on to wireless, radio, radar and all that. It is a fascinating story and apart from that, I may use a rather much abused word — a story of great romance. And looking at it now, one sees this pace of change becoming faster and faster. Even, today the telegraph and the telephone system, the nervous system of the world, the pulse of world, has become such an essential and inevitable part of human life that one can hardly imagine it without the telegraph and the telephone, and its later developments, the wireless etc. Here are these innumerable messages linking the world together, bringing people near each other, sometimes also perhaps bringing conflict in its train. But, broadly speaking, making the world ever more one world.

There is so much talk of the one world of the future. But, so far as the telegraph and telephone system and its extensions are concerned, they have come very near this one world idea. But why should we stop at this one world idea? It is really an incursion into the new world. And I am not for the moment talking about the new world in the sense of other planets and stars — not that. But in this world of ours, new phases of experience and all that which are coming in the train of the development of communications. It must be an exciting process to go step by step in this way, viewing ever wider horizons. I do not know what the future will bring. But I am quite certain that it will bring many remarkable advances and changes. Even in my own life, I have seen these changes creep in upon us, gradually and yet in a very big way. We take many things for granted today, which certainly most people had not thought of earlier, even when I was a boy. We get used to them and then overlook the wonder lying behind them.

So, you deal with this very wonderful thing which is an essential part of human life and human progress, and which, as one of the speakers just said, approaches all the time a measure of universality. Politicians and the like often quarrel. This business of communication goes on in spite of these quarrels except when some terrible catastrophe comes. While your feet are of course on the ground, but at the same time, you are also in the air all the time, both physically and metaphorically. Surely, I imagine that any person who looks at this picture, in this broad and deep way, must be filled somewhat with a sense of excitement. Because, you uncover, discover new things, new ways in our world, new methods of communication which has become almost instantaneous and thus you change the texture of human life. What we do in our life is not something apart from it. When our conditions of living change, they change the texture of the life itself, and thereby no doubt affect the thinking of human beings. It is an odd fact that this thinking often lags behind the practical achievements of the human mind. The human mind has brought forth all those great advances in the science of communication etc. and yet it has not adapted itself to living in the world, in this world where this progress takes effect. The political level of the human mind is far below the scientific level of the world today. And therein, I suppose, lies this danger of conflict. I suppose when the time comes when the political level catches up with the scientific level, we may possibly have a much greater assurance, not only of progress, but of co-operative and peaceful progress.

So, being present at this Conference and looking at you here, I have the sensation of

being rather apart from the quarrelling world and having a peep at the future which I hope will be a much more peaceful and cooperative one. You are engaged, therefore, in this high task, which you may or may not realise has a powerful effect on life itself in this world. I hope that your labours will bear fruit to that end.

As I said right at the beginning, I am a layman and you are experts. I cannot tell you much about your subject except that I live as much enveloped by this subject as you, as all of us. But the main purpose of my coming here was to welcome you on behalf of the Government of India and myself. And I hope that apart from the good work that you may do at this Conference, you will enjoy, if I may use the word, this very pleasant climate of Delhi, and what you might see in this country. *(Cheers)*

110. MAN AND NATURE*

(Address at the anniversary meeting associated with the Silver jubilee celebrations of the National Institute of Sciences at New Delhi on December 31, 1960)

I am happy to be here today on the occasion of your Silver Jubilee marking twenty-five years of existence. That is a sufficiently long period to look back and examine the work done by the Institute. It has been considerable. I am quite sure that if, after another twenty-five years, you consider the second quarter of the century, the work will be infinitely more. Because, after all, the efforts of our pioneer scientists in the past – and as we all know some of them are very eminent – and the results of their work are considerable. They have worked under considerable limitations — lack of opportunity, lack of even numbers of people who lack the opportunity to take to science.

Indeed, it is surprising that in spite of these limited opportunities such good work was done by Indian scientists. Today and during the last few years after independence, the opportunities for scientific work have been increasing. The number of scientists coming out of various universities and special institutes is considerable and far more than ever before. This will go on increasing. But the major change, I believe, is the recognition in India of the extreme importance of science plus technology, so that on the whole there has been a progressive change in the atmosphere in regard to these matters. The Government or State is much more concerned with the advancement of science and technology and the public generally takes more interest. That is inevitable. Perhaps the one single factor which, from the public point of view, made the biggest impact was the explosion of the atom bomb. Advent of space age is another bigger thing that has happened. Sir, as you have just mentioned, the other biggest thing relates to certain nucleic acids as carriers of genetic changes that may be taking place. But, from the public point of view, there is no doubt that the coming of the nuclear age by these explosions impressed them much more with the power and importance of science than anything else. So, we in India are possibly at the threshold or beyond the threshold of a growth, of trained scientific personnel, of scientific work and the results that flow from that work. It has crossed the threshold of quiet research in universities or other laboratories. It remains there of course, but it has also come out – coming into touch with the problems of real life, the problems of a growing nation and so many other things.

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* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

This Institute was started a quarter of a century ago. Listening to you as you were speaking, it almost appeared that even when started a quarter of a century ago this Institute was a kind of foster child of some European parents who wanted to put it on our back and tell us to carry on. It has grown since then and no doubt it will grow with science much more. Now, the basic thing is the widespread recognition of the value of science in India. That itself, I think, is more important than anything else that has happened. And that is reflected, or may be independently of that, in the recognition by the Government of India of its importance. You have referred in your address to some fascinating aspects of modern problems, the control by man of nature, the relation of man with nature, the ultimate limits of the normal ways of scientific research, which are fascinating subjects for the scientists and perhaps to some extent even for the layman. And yet, the problems that immediately confront a country like India at the present day are obviously more insipid. Though I should not like to suggest that fundamental research should be ever given a second seat in scientific work – I think it is of the utmost importance, this basic research – nevertheless, the problems that face us here have to be solved, and in the solution of those problems scientists can and do have to play a very important part. In looking back not so much from the scientific point of view, but just from a layman's and thinking of what the world was like, say, 50 years – I can look back certainly 50 years and a little more – I am astonished in comparing that world even today to see how many changes have crept in into human life, normal life of individuals and of communities. It is a different life, certainly much more so in the more technologically mature countries than in India. It is a different life; conditions of life are different; and what is more, the mental horizons are also completely changed and different. Also, it appears that the pace of change has become faster and swifter. Therefore, one may well imagine that after the next 50 years the world is likely to be still very different – human life, conditions of living would be very different – from what they are today. That is, of course, provided that human life as a whole survives. Because, one cannot rule out the possibility of non-survival, at any rate in its present human form. It is a serious problem which even the scientist in his ivory tower cannot ever forget. Especially because it is the scientist himself who has provided the means both for its progress in life and for its extinction in its present form.

Now, with this rapid pace of technological and scientific development, and with new problems ever coming up before us, it becomes essential that any country that wants to keep pace with events and not to be left behind has to give the greatest thought and the greatest opportunities for scientific work – of both kinds, fundamental research and the practical applications of scientific research. Many of the human problems that arise elsewhere in the more highly scientifically or technologically developed societies do not arise here in our present state. In India, and in many of the countries which are relatively underdeveloped, the principal problems still are for providing the basic necessities of life to everybody, to all human beings there. That type of problems has been, by and large, solved by the more developed i.e. technologically developed societies. There, it has yielded place to entirely new problems which I have no doubt will perhaps grow bigger in the next decade – two or three decades. As you do the work more and more by machines or by automation etc., the problem of leisure arises. And there is no obvious answer to that problem in those countries. That again involves the problem of the development, not so much of the machine – which of course is taking place – but the problem of the human being in his development. Otherwise, he may be just overwhelmed and become, instead of the master and originator of the machine, rather a slave to it. And thereby the real basic incentive for progress may pass from him.

In the past, which is often being seen as past history, our country has risen from a relatively low state to greatness. It is step by step over generations. In terms of physical power,

it became a great country, may be it became an imperialist power — a description of this is available by the old Greek historians and the old Sanskrit writers. Our country goes up in power and when it reaches a certain height of power, it decays. How to analyse the decay of a human society, decay in gradual degeneration – from the high state of culture to a petty civilization and from that again to a decay of civilization. One reads about that. Now, one wonders whether in this entirely separate field, i.e. the field of science, mental development etc., the very fact of scientific development and with releasing of forces which make life easier to live, which do the work of human beings, if that by itself will not lead to a certain decay in the human being! Yet, to put it in rather colloquial language, human beings become too soft, just like a prosperous individual may become too soft by doing no work at all and decaying both in body and mind. There are plenty of examples of that. It is not a question, but it is an important aspect, about the future.

You, Sir, have referred to the genetic consequences. An eminent biologist some days ago only was telling me that you are worried about the genetic consequences chiefly because of the progressive effect of radio-activity and what not. Well, I asked him how long it will take for major changes to take place that were worrying him. He said about 30,000 generations. Well, I said probably there will be many other things to worry about before 30,000 generations approach them. But nevertheless, the problems of today are essentially different from the problems of yesterday. We in India, partly of necessity, are engaged in the problems of yesterday, which really have been solved, or can be solved, by the knowledge at our disposal today. They are not new problems. It is the implementation of things that have already been solved elsewhere, that is the problem before us. But immediately you take the step to solve any problem, it appears in another way. You cut off one head, then two heads will appear in its place. That, of course, is a good thing. Because if we did not have this kind of challenge of problems all the time, that decay would set in – mental decay of a community or a race or humanity itself. Well, I hope your minds will engage themselves in these apparently distant pursuits, although they are not very distant because they affect our lives today. But inevitably, one has to think of the immediate difficulties we have to face in our country or in other countries and to find out ways of solving those difficulties with the help of scientists. And therefore the importance of the practical applications of science has been more and more recognised today.

I repeat I do not understand this conflict between fundamental research and practical applications. It seems to me they are different facets of the same thing. Nevertheless, there is always a danger for the scientists or for any intellectual in fact, to adopt what is called an ivory tower attitude in a world which demands our attention, our thinking, our action, our cooperation to such an extraordinary extent as at present. You are in touch with the scientific work going on in India today and are probably in a better position to judge it than I can. Nevertheless, I am in touch with it to some extent also. And while we criticise it, and rightly – we are always criticising it, that this should be done and why this has not been done and why this has been done in a way it should not have been done – the fact remains that, looking at the picture as a whole in India, the scientific progress has been very considerable. I believe that many of our younger people are quite outstandingly able, whether they are working in our national laboratories or in our atomic energy departmental activities which are very considerable as you know, or in our defence industry. These are that I come in contact with directly, and therefore I am referring to them. I do not come directly into contact with the other fields where scientists are working – I hear about them. But in these three, i.e. the national laboratories, atomic energy and the defence science, I see many of them and I have been much impressed, not only by their ability but a certain measure of enthusiasm with which they take up things.

A recent development in India has been our development of oil exploration – quite

recent. And I was exceedingly pleased and I went to see the young men who have been drawn either straight from the universities who got good degrees or were doing something else or got some training two or three years ago. I was exceedingly pleased to see the enthusiasm with which they are doing this work. It is not a job which they have got: it is a quest, it is an adventure, it is a crusade, call it what you like! – the quest for oil in India. And so, it is not doing a few hours' work in an office or on the ground but really the excitement of trying to do something worthwhile, trying to discover something, find out something. That is a spirit which is more important than anything else. This is the real spirit which makes for inventions, the spirit which makes for discoveries, the spirit which makes people to go up and try to climb Mount Everest. That is the spirit which is the basic spirit of science, of the discovery of truth, of the application of truth to the human conditions.

So, I find therefore that the background in India is very promising. And more and more the Government, with all its difficulties and pressures on it, wants to encourage this to develop. It is doing so to the best of its ability. You will appreciate that the demands on the Government are tremendous. And when some people compare, "Oh! What are you doing in regard to science – compare it with what has been done, or is being done, in the United States of America or in the Soviet Union" – well, we are naturally impressed greatly by what America is doing or what Soviet Union is doing, certainly not to life but to science. But I think we are doing, relatively speaking, much more than a vast number of countries in the world are doing. And basically we are training the mind of people in that direction too, because it is important. Because, in the final analysis, in India we are trying to jump a few centuries – a few centuries of not only living conditions but to some extent of mental outlook. I am not talking about the intellectuals and the more educated people. I am talking about the mass of the population in India. Because my work – and conditioned as I am – my experience always forces me to think of this vast mass of our four hundred million people in India: how to make them take steps in this or in that direction. Naturally, I am interested in the intellectuals because they set the pace. But the problem before us is not of taking a few intellectuals to some intellectuals' paradise but of taking four hundred million people somewhere. Therefore, when I say that we have to jump a few centuries of habits of mind and ways of living, I am thinking of those people in the field or the factory or wherever they function. And it is a tremendous job, making people get out of those ruts in which they have lived in this static society for a long, long period. In fact, one finds this often even among, if I may say so with all respect, intellectual people. One is surprised that although they function in a different way – in a more modern way, if I may use that word – still the old habits of functioning in a rut remain at the back of their minds. They come out and produce, I suppose, some measure of confusion or lack of integration. That is to say, we have to pull out the mass of the Indian people who could ultimately usher India into the modern age, from thinking in terms of norms and habits of rather long ago.

Now, let me be quite clear: I am not so enamoured of the modern age as to discount or discard the previous ages. I think they are very important. We are the offspring of those previous ages; we are the culmination of them and we look forward. I think India's previous ages are something of tremendous value. And I think India, if it had forgotten those previous ages, would be rootless and sapless, in spite of all it may learn. Having said that, nevertheless, a country must live in an advanced, in the modern, age. It is no good a person using today, a plough which was used a thousand years ago even though it might have been a very suitable thing a thousand or two thousand years ago. He has to use a modern plough. It is obvious; he has also to think in that way in terms of the modern. The farmer has to think of this. And so, this process of getting out, keeping your roots and many of the important and vital aspects of life and existence, and yet coming up to the modern age and in fact trying to improve the modern age, taking the

lead in it — that is a problem for us. You may call it, to develop an industrial society, a technologically mature society and all that certainly, but essentially I would call it something deeper even in there. That is an outward expression of it. These are tremendous problems. And just at this moment, when the world is threatened by so many conflicts and the possibility of wars which may lead to extinction and all that, it becomes even more necessary for us to be wide awake, for us to function together, to extend the domains of the knowledge and at the same time, to keep to our roots: many things to be done at the same time.

Anyhow, in this world the scientist, the technologist, has to play a tremendously important role. He has to play an important role by reason of the important aspects of his work. And I am sure that more and more facilities and opportunities will be coming his way. There can be no doubt that science and the scientist will grow in India, grow in numbers, I hope grow in quality. Numbers certainly; already, I have no idea how many people there are in India who can be termed as scientists. The figure must be fairly large. And if you include all the engineers and others, it will no doubt run into several hundred thousands in India. They will go on growing. Now, how are you to maintain real quality? It comes from the type of educational institutions, your research institutions and your laboratories, your this, your that! But to some extent, in a matter of this kind, it comes from the quality of the leadership that science itself provides to the scientist, or scientist provides to science, call it what you like. It is very important, and that should be done, so that the very growth of science or growth in the number of scientists should not water down the leadership which should be given to science.

I am all for democracy, but democracy normally means mediocrity too. It is a well-known thing you put up with it in a democracy because, well, it is better to have democracy than having something worse. But the fact is that numbers lead to mediocrity specially in the matter of science etc. That is just like vast numbers of people, I would say the people in India who do not know anything about science, choosing — somebody who is well-known whose name appears in the newspapers. I think it is an important matter: this question of leadership, leadership not in any physical sense — I am talking about intellectual leadership — to lay down proper principles, proper approaches, maintain high standards which include undoubtedly high ethical standards apart from scientific standards. That is necessary, and it is for the institutes, bodies of scientists, to remember this because there is a tendency to slip away from these matters. And specially that difficulty arises — while in gradual growth one can control a situation, but if the growth is sudden, as it is likely, as it is happening in India in regard to science, then the difficulty becomes all the greater. As I commend this, I want you to think about it.

And in your address, Mr. President, you referred to the beginning of this Institute, how it has grown, and something about Government recognition about this Institute as an advisory authority. Government of course respect your Institute, and attach value to whatever advice you may be giving. But I seem to remember that there are a number of Institutes in India of scientists, may be some are bigger, some are smaller. And many of you are members of two or three, three or four, whatever it is; they all overlap which may not be a bad thing. But I suggest to you to give thought to this aspect of preventing this confusion arising in a layman's mind like mine and trying to bring together these various organisations of eminent scientists so that their united energy may be directed to playing up not only in advancing science in all its ways but to maintain high standards in it. *(Cheers.)*

111. DEVELOPMENT OF A CLIMATE OF SCIENCE*

(Message to the Director-General, Council of Scientific and Industrial Research in response to greetings, regard and respect from the Directors of National Laboratories in their conference held at the Central Food Technological Research Institute, Mysore on June 29 and 30, 1961)

"Thank you for your message.

I send you and the Directors of our National Laboratories my greetings and good wishes. These Central Institutes have played a great part in the advancement of science in India, both in research work and in its practical application. The future of India depends I think on our development of the climate of science in this country and our laboratories and institutes have therefore a tremendous part to play."

112. NOVEL APPROACH IN PROGRESS OF CANCER INSTITUTE**

(Speech at the inauguration of the Cancer Institute building at Adyar, Madras on October 8, 1961)

I must say that I have been somewhat bowled over by my visit to this Institute. I am reminded, and if my memory had not failed me, I say the big, what you call it, marvellous slab to announce the fact that I have laid the foundation-stone here almost exactly nine years ago. Then, Dr. Krishnamurthi[1] said that he started the operation in 1955, *i.e.* three years after. It is rather slow-going, but after that, something must have happened and the progress since then has been phenomenal and is extraordinarily rapid, not progress merely in the sense of putting up buildings that anybody can do. I have been very much impressed by it and the quality of the work that has been done, in spite of meagre resources. Well, I wish you had more resources and I wish I could give them. I am almost led to say that good work is done when resources are meagre. I find plenty of money flowing about and magnificent buildings are put up. I do not say that good work is not done there. It is done. But, that peculiar urge that comes from overcoming obstacles is absolutely commendable. Now, I think one of your wards with the thatched roof etc. is most attractive and a very airy ward. Why should people spend money on bricks and mortar? I do not understand. Most of our institutes, hospitals and the like are quite expensive. I like good hospitals, well-built and all that. But, I like also more hospitals, small ones in the villages and elsewhere, not magnificent structures in towns and practically nothing in the villages. Why should we not build much more cottage type, thatched roof hospitals or parts of hospitals and save money for our equipment and competent persons to be engaged. I do not understand, it seems to be such an obvious thing to do. Why waste money on the school buildings and the

* *Proceedings* of the 9th Conference of Directors and Heads of National Laboratories/Institutes of the Council of Scientific and Industrial Research, New Delhi, 1961.

* Director, Cancer Institute, Adyar, Madras.

1. Dr. S. Krishnamurthi, Director, Cancer Institute, Madras.

Pandit Jawaharlal Nehru arriving at Vigyan Bhavan, New Delhi to inaugurate the 14th World Health Assembly (February, 1961). Others in the picture (from left) are Dr. A.L. Mudaliar, Dr.C. Mani (Regional Director, WHO) and Dr. M.G. Candau (Director-General, WHO).

Pandit Jawaharlal Nehru at the Bhabha Atomic Research Centre, Trombay (January, 1961) watching the working of the Cooling Channel Flow at CIRUS. Others in the picture are Dr. Homi J. Bhabha (Director, BARC) and Shri N.B. Prasad (Director, Reactor Operations Group)

Pandit Jawaharlal Nehru at the opening ceremony of J.K. Institute of Radiology and Cancer Research, Kanpur (May, 1963) Sir Padampat Singhania introducing Shri Lakshmipat Singhania to the Prime Minister.

Pandit Jawaharlal Nehru at the inauguration of the Ciba Research Centre at Bombay (March, 1963). Also seen in the picture are Shrimati Vijayalakshmi Pandit, Dr. Albert Wettstein, Dr. Robert Kappeli (President, CIBA, Basel) and Dr. Burnett (Managing Director, CIBA).

hospitals and the like, too much brick and mortar, well, when you can erect attractive and airy structures at very little cost? For some time past, I regret my advice has not been found good echoing so far as I could see, at least not to my knowledge.

I am very much impressed by the fine quality work done here. I would like to congratulate Dr. Krishnamurthi and the staff who obviously do this work in a crusading spirit and are devoted to it. And, that is the ultimate aim and the biggest thing that counts. I wish that the foundation-stones that have been laid in various parts of the country follow the inspiring example of the good work done here and I really congratulate you once again.

113. OPPORTUNITIES FOR SCIENTIFIC WORK AND PROMISE OF THE FUTURE*

(Speech at the inauguration of the new buildings of the Tata Institute of Fundamental Research at Colaba, Bombay on January 15, 1962)

You have been told that a little more than eight years ago I was invited here to lay the foundation-stone or the corner-stone of this structure. It is so long ago that I had almost forgotten that I had done it. And I began to think of another instance which happened in Delhi when the foundation-stone was laid and after a few months people discovered that somebody had stolen it. *(Laughter).* Normally speaking, a delay of eight years in completing this structure seems rather excessive. But coming here once in-between and today, going around partly over this building, my original impulse to criticise the delay was considerably modified because it has been a great effort to put this up as it has been done. There have been difficulties and anyhow the result achieved is something very much worthwhile. So I am happy to be here today to associate myself again with this function in this Institute.

The previous speakers so far have referred to the growth of scientific work in India in the last few years. They have referred to that pioneer, Jamshedji Tata[1], who, at a time when few people, certainly in India thought about this, encouraged this kind of work both in science and technology and heavy industry. A man who could look ahead and whose traditions have been followed by those who have followed him, who have come after him. And therefore the Institute is appropriately named after the house of Tata. Now, in these years much has happened and many big laboratories have been put up in India and I believe they are doing good work. But there is one aspect of that work which sometimes is not perhaps as good as it might be. Although so far as that matter is concerned, here in Bombay, under Dr. Bhabha's[2] guidance we do not suffer from that partial disability. I have found going about and generally keeping in touch with these developments, that we really have a very fine lot of younger scientists in India. But I am not quite sure that in many places in India they have got all the opportunities that they should have to do their work and to develop. Now that does not apply either to this Institute or to the Atomic Energy Establishment at Trombay. Because, here one among the many virtues and qualities that Dr. Bhabha possesses, of which we have heard praises a little while ago, one is that he not

* Director, Tata Institute of Fundamental Research, Bombay.

1. Mr. Jamshedji Tata, Chairman, Tata Sons and founder of the House of Tatas, Bombay.
2. Dr. Homi J. Bhabha, Chairman, Atomic Energy Commission and Director, Tata Institute of Fundamental Research, Bombay.

only encourages people to do their best work but has built up very fine groups of able and brilliant young scientists in these two establishments. It is really meeting these young people who have already distinguished themselves and who I am quite sure will distinguish themselves still more in future — it is meeting them and finding out what they have been doing that I have felt so hopeful, optimistic, about the future of science in India. I would like this example of Dr. Bhabha, that is, to build up these groups of young scientists wherever there is an opportunity in India, to give them worthwhile work to do and opportunities, to be followed all over this country. It is true that previously the opportunities were perhaps not adequate. Now with these well-equipped magnificent structures, the opportunities are there and therefore it is easier to provide these to the young people to do good work. Anyhow, I am quite sure that in the future good work will be done by the younger scientists who, as I have just said, I have found to have quite unusual capacity.

Just before the start of this meeting, Dr. Bhabha was good enough to take me round this building and show me some of the work that is being done here. Because this building has been functioning for some time, it is not quite correct to say that I have come to inaugurate it. I went over this building and saw it. And I looked wise and understanding, but the fact of the matter is that I could not understand much of the things that I saw. We are now entering into an age of the scientists beginning to function like the high priests of the old who looked after sacred mysteries. We all bow down to them in reverence and awe and sometimes in a little fear, as to what they might be up to. But anyhow, one cannot escape science and the scientists in this age. And perhaps the scientist might — and I say might — make a better job of it if he has a chance in future, than the politician. I am not sure, of course, but I put it to you that might be possible. So I am prepared to take the risk because anyhow it is a risk living in these days and dealing with politicians of my own tribe.

But one does feel that these new discoveries — tremendous discoveries — coming one after the other, that we live perhaps at a time, when the nature of our knowledge of the physical world and all that flows from it may change, affecting even the human beings. They may gradually get into another phase, work themselves up in another phase of existence. I am sorry I speak in a confused way because my mind is not clear except that I feel that we are gradually getting out through science and the discoveries of science from the very gross and purely material way of looking at the world. Science itself is, although very material, goes on hinting at something which is much less material. And one does not quite know what this future may bring, provided always of course that science itself does not help humanity to commit suicide.

So we live in this age of transition and those who are pessimistic may take a pessimistic view of this world; those who are optimistic may do that. Both are possible. And anyhow the scientist has a very important part to play, and it is important I think that we should encourage him to play that. And therefore the growth of science in India is very welcome to me. And in so far as I am concerned, I believe that the Government of India will encourage this growth of science in the future as it has been doing in the past. A number of eminent scientists have come here from abroad. I am happy they have come because it has been a pleasure and privilege of the Atomic Energy Department and elsewhere to cooperate with other Governments and other eminent scientists in various countries. And therefore their coming here today is very welcome, so that we might strengthen the bonds that tie us to the scientific developments elsewhere.

I do not know that I need take your time any more. It has been a great pleasure to me and something like an exhilarating experience to come here from time to time and to see the growth in our scientific work whether on the other side of Trombay or here or some other parts of India. They take me out of the normal rut in which I live. It is rather de-

pressing. So I am grateful to Dr. Bhabha for this opportunity given to me to come here to associate myself with this ceremony and to meet many eminent people. Now I am supposed to inaugurate this and to formally declare this open. I do so with great pleasure.

114. HALTING OF NUCLEAR TESTS AS A STEP TOWARDS TOTAL DISARMAMENT*

(Speech at the concluding session of the Anti-Nuclear Arms Convention at New Delhi on June 18, 1962)

We are on the point of concluding our three days' session and I have been thinking what we have achieved during these three days. Presently, the statement will be placed before you which you have already approved. I am in the happy position of not knowing what this statement in its final form is! Happy, I say, because I have not got to speak on that statement, not to praise it or criticise it. I did see an early draft of it, but what changes have been made, I do not know. That is really a matter of wording, because all those who are gathered here in this Convention did not require to be converted. We were converted even previously or broadly held the same opinion, apart from minor differences. What did we represent? People have talked about non-violence. Do we all fully believe in non-violence? Taking it to its utmost conclusion, I suppose not. We are not all pacifists. The word "Gandhian" is used more and more frequently and by frequent use it has lost all meaning. So the most violent of men call themselves Gandhian. We, all of us, had the privilege of serving Gandhiji, but I think it is a little presumptuous on the part of myself, for instance, to call myself a Gandhian. We were powerfully influenced by what he said, by what he taught us, but he was too big. Let us recognise it that we live in his glory, the glory of his name. We, in India, take the name of the Buddha and Gandhi and think that we have done our duty. We assume vicariously the virtues of the Buddha and to some extent Gandhi, just as to some extent in the West, fierce and brutal wars are fought in the name of Christ.

I have been wondering whether it was only a tournament of talk for three days or whether we have achieved anything worth while. I do not know. But I have a feeling that we have achieved something worth while. And without attaching too much importance to it, it will help in the solution of this tremendous problem which faces the world today. The problem is, put it as you like, one of survival, one of not being gradually reduced to brute beasts, one of the crisis of civilization, of moral values and all that. I think that what we have done in the last three days, the mere fact of meeting, has helped us somewhat in the solution of this problem. I think that certainly in India it will help to draw attention of the people and make them feel a little more consciously, a little more intensely about this problem. And from feeling about it, they will perhaps be led to doing something. And therefore I would like to congratulate the Gandhi Peace Foundation for this idea and for giving effect to this idea of holding this Convention.

Now, all of us know, it does not require any argument from me, that a nuclear war does not only mean the end, the destruction of humanity, but it is something infinitely degrading to our sense of all the values that we have had. It surprises me that — the practical aspect is bad enough but the moral aspect — the standards we presume we have — how can they be even thought of in connection with a nuclear war? Well, we agree about that and I take it that vast numbers of people in the world also agree about that. Nobody can like

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

being liquidated, or joining in this and being part of this widespread destruction. But nevertheless, large numbers of people are also prepared to put up with this idea, because presumably they think that something worse may take place unless they are ready for a nuclear war. They are afraid of defeat by another country. And therefore this arms race may continue even when facing the possibility of a nuclear war. Or else they satisfy themselves by saying that nobody wants a nuclear war but we must have nuclear bombs as deterrents to prevent the other party having, or using them.

All this is curious logic. And meanwhile, as the eminent Russian delegate said, we go nearer to an explodon. Because all this, all the bombs that are being made, collected, and all the tests and everything, gradually bring the probability of an explosion nearer, and the time is limited. If you do not put an end to it, soon enough, it may be beyond the capacity of human beings or nations to stop this rot. At the present moment, we have three powers or four powers, essentially two super powers and two others who have these nuclear arms and who have already collected vast numbers of them. If and when we decide on this complete disarmament, it will be a terrible problem — what to do with these bombs that we have collected? How to dispose of them, without injury to somebody? You cannot throw them into the sea. The sea would be contaminated. I do not know what they will do — well, that is a matter for the scientists. Anyhow, there is this vast collection, even without any future addition to it. Time is limited and it is really a question of race between the good sense of humanity and the fear of the humanity.

Now, fear I think is a terrible thing. Fear and cowardice are the most degrading things that anybody can have and any nation can have. They make one brutal. That is why, when people talk about non-violence in theory — speaking for myself, I completely agree — but I am horrified at the idea of the coward and the weak and the person who is afraid, living under the shade of non-violence. Gandhiji's non-violence was of the brave, and he said, "I rather you took out the sword which you have in your heart and use it, than through fear keep it hidden in your hearts." In his mind, his idea of non-violence has nothing to do with fear. But I am afraid that the non-violence of many people in this country — and I say so quite frankly — is a non-violence of the timid. They are afraid and are fearful and from that nothing good can come. Nothing good can come from people who are afraid, who are cowards. And if they said so under some kind of non-violence, the result will be, they will condemn even non-violence as such. But of course, such an attitude has to be separated from the very idea of non-violence.

We are, not all of us here, dedicated to non-violence. But, speaking for myself, I accept completely the theory of non-violence. But, but there is a 'but'. An individual may accept it (non-violence) if he is strong enough and lives up to it. But when you come up to reality, you have to deal with large numbers of people, a large population, the people of a country and adapt them, ask them to be non-violent. First of all, you require a Gandhi to deal with the situation and secondly even Gandhi may not wholly succeed. Even while Mr. Gandhi was here, and he had won this great battle of Indian independence mainly through non-violence, we saw terrible things happen here in this city of Delhi and in Pakistan and in Northern India, after and as the result of the partition. Non-violence did not help us. That was sheer cowardice and brutality of the worst type. Speaking for myself, I prefer any amount of violence to that type of thing. *[Applause]*. So, the difficulty arises, that when you ask masses of human beings to follow a policy, they must be trained up to it; as indeed Gandhiji tried to train up and succeeded in a large measure, in a limited field. But they must morally, spiritually, — call it what you like — they have to realise the significance of their action. If not, then they fall between two stools — they are neither here nor there — and they fearfully look on what might happen to them. That is a bad thing — that is my difficulty.

When I think of applying non-violence to large numbers, it is not to make them cowards. If they are really non-violent, well and good. Let us go ahead. And I am quite sure, if we went ahead in courage, that non-violence would win, but not cowards. And in India especially we talk, we have a habit of talking in the highest terms, but not acting up to it. And in action, not coming anywhere near the ideals we profess. I am quite frank, because I am speaking largely to Indian friends. I have the greatest pride of India and of India's many things that India has given to humanity. And I think those are things of the greatest value to humanity, and humanity will yet profit by them. But I believe I know my people to some extent, liking them enormously. I do know their failings too and I do not want to make them profess one thing and do something entirely opposite of it. That is hypocrisy and cowardice and there is a grave danger of that. So, while I am convinced of the virtue of non-violence and its power, I am not sure that people in this country, or for that matter in any other country, at the present moment, are capable of carrying the burden of non-violence. And if they fail, they fail utterly. That is one difficulty. To put it differently, one has to face the problem of a leader of a country.

Well, I am talking of a good leader because bad leaders, of course, are bad. But presuming an honest and good leader, comparing him to another type of human being, who might be called a prophet like Gandhiji. Now, Gandhiji had the supreme virtue of joining the role of the prophet and the role of the leader. That kind of thing seldom happens — training the people, while never losing sight of his methods or his standards — and he performed wonders in this country. Yet even he did not wholly succeed in changing all of us. We are weak mortals, still making enormous number of mistakes all the time. Now the prophet declares the truth in him regardless of consequences. It is the truth which has to be declared and as a result the prophet is usually stoned to death. Later his name may resound through the ages — but for the moment he suffers martyrdom. He will not temporise, he will not qualify his statements or qualify truth as he sees it. The good leader is limited and inhibited, especially in a democratic age, by how far he can get those whom he leads to understand what he says. Even if he is strong enough to act up to what he says, their receptiveness to truth is limited. Presumably, he cannot go too far beyond the receptiveness to truth of his followers. And if he did go far beyond, he would cease to be the leader. There is that essential difference between the prophet and the leader, however great the leader might be. In a democratic age, which is an age of levelling, the difference comes out even more. However, these are considerations, thoughts, which I have placed before you. But difficulties one has to face all the time. The leader, presumably a good leader, even if he does not let go of the truth, he is always in danger of compromising, of temporising. Because in politics and in the life, there is always a matter of compromise — and in compromising there is a danger of slipping and falling lower and lower.

There is no hard and fast rule left, because in all this, in adopting the rule of non-violence and of unilateral disarmament, I am absolutely convinced that any country which adopted unilateral disarmament through strength nobody can injure it and it would win. But what is the good of my saying so, when I feel that those who adopt it, do not adopt it through strength — will not adopt it at all. In fact, probably they will be fearful of the consequences and indulge in violence of all types. Vinobaji is a man of the present day — in the great tradition of India. Vinobaji has said in his message to us that he is a little more afraid. He is less afraid of nuclear bombs; he is more afraid of the dagger and the sword. What does that mean? — that he is rather referring to the evil in our hearts, to the violence in our hearts which comes out in whatever little thing that we may do — we will commit murder!

It is true that nuclear bombs increase the danger tremendously. But the fact remains that we have them. I am sorry to repeat something which has become too common, that a

crisis has arisen in human affairs, where either humanity survives or it does not. And I think this crisis can only be resolved finally, not by some nuclear tests being stopped but by something deeper — by the minds of men and the hearts of men and the spirits of men rising to somewhat higher levels. I believe they will do that; I believe humanity will rise. I have this firm faith. Because, there is no other way; otherwise it will perish.

But we cannot bring about that change. We still talk about nuclear bombs etc. These are parts of the larger things, abolishing war, putting an end to war absolutely. I am quite clear, before war goes, we must have full disarmament and so on. These things are connected to each other, and one step leads to the next step. But if we talk about the final step all the time, we never take any step at all. Therefore, for the present concentrate at this Convention on the stoppage of nuclear tests. I do not know what has been done or suggested. I shall be very happy to subscribe or say something against the whole manufacture of nuclear bombs etc. That is an evil thing. But remember that all your desire to put an end to it will not lead you far — because nuclear bombs in this advanced scientific age, in a country which is advanced scientifically and technologically, can be manufactured with ease. You put an end to all the nuclear bombs today and if a human being wants to make them later, he will make them in a year or two. They are advanced enough and, may be, technology will advance still further and make it still easier to make them. I remember a very eminent nuclear physicist telling me once that one of these days you will be able to manufacture nuclear bombs in your backyard, in a small laboratory. That may be a slight exaggeration, a manner of speaking, but the fact is that nuclear bombs are all the time planted in our minds and hearts. And unless we get rid of that, we can never be certain. If war comes, they can be easily produced. Even if there is no nuclear bomb and a war comes, nuclear bombs will be made by the fighting countries while war is progressing, and these will be used too. So, in the ultimate analysis, war must be abolished. War will not be abolished till there is a change of heart in the human beings. That is a big question. I do not feel competent to argue it. But there is no alternative left.

So, we must have disarmament; we must have a world without war. But as I said, a present step and an urgent step is to put an end to nuclear tests. Not only because of the horror and the abomination of these tests being carried on but we are told that every test, every series of tests, means many hundreds of thousands of children, born and unborn, being affected, and that already millions have been affected. The horror of it! It seems to me amazing that a thing like this could be continued, even purely on ground of decency. And also the continuing of nuclear tests does bring the possibility of war nearer. It creates an atmosphere of an arms race, of fear and of the possibility of those accidents happening in which reference was made — because it is recognised today that no country is deliberately going in for a nuclear war. But it is equally recognised that accidents are likely to happen. And if accidents happen, the result is the same, whether it is deliberate or accidental. A war starts and once it starts, it brings all its terrible consequences in its train: a nuclear war. So, personally I should like, not as a solution but as a step to lessen these tensions — that is, having areas, atom-free areas, or areas in Asia, in Africa, Europe which are recognised to have no nuclear secrets and which will not be used for nuclear weapons. All this does not mean much, because the ultimate thing is the abolition of the thing; the ultimate thing is having no war, full disarmament. But all these are steps which help. Today the worst thing is this terrible tension and fear behind it. Imagine, thousands of these aircraft with nuclear bombs are always in the air, day and night — it is a horrible thought — in order to protect one's country for fear of somebody invading it. And imagine also those thousands of aircraft piloted by young men, brave young men. Any person may lose his nerve and losing his nerve or losing his head or whatever it may be, may do something which may lead to a war. It is a terrible thought, and still this mad race goes on.

I feel that merely for putting an end to these tests, we talk about unilateral disarmament. Unilaterally putting an end to these tests is a little easier, much easier — that surely can be done. This idea that if one country does it another must do it necessarily, or else it will lose in the race, is odd. So, I hope and I think that this Convention has done some good. I will not put it higher than that.

Every little step that we take towards the goal is a good one. We do not know what effect it will have in other countries, but in India at any rate, I hope it will draw the attention of our people to these problems. So, we are a curious mixture of exceedingly mild people, who turn terribly violent occasionally and misbehave. We are mild — there is no doubt, and an average Indian will deliberately avoid stepping on any little insect; will go round it. But the same average Indian may not be so kind to the human being. And war which has devastated humanity so much has not in that form descended upon India. We have no idea — most people have no idea — what nuclear war or any war means. So, I hope that this Convention will bring some education and throw some light on these problems on our own people. Because, after all, all of us are rather small men grappling with enormous problems, grappling with the future of humanity. And small as we are, we can do something to it if we can work together, if we understand it, and do our little bit to that end. So, if every little step counts I think this Convention has been a good step to that end, and therefore I congratulate the Gandhi Peace Foundation and all of you delegates because you have taken, are finally going to take presently, that step.

115. SYNTHESIS BETWEEN THE PAST AND THE FUTURE WHILE LIVING IN THE PRESENT*

(Address at the 16th General Assembly of the World Medical Association at New Delhi on November 11, 1962).

It is rather embarassing for me to follow our President[1]. He has already welcomed you on behalf of our country and I should like to add, on behalf of the Government of India, our welcome to all the distinguished delegates that have come here at this General Assembly Meeting of the World Medical Council. You represent a great profession and a profession which has always meant to be one of service to mankind, whether you take the oath of Hippocrates or the ancient oaths to which reference has been made by our President and Dr. Sen[2]. They all refer to the service and betterment of mankind. And in India, this tradition is an old one and the principal treatises on it were written as long ago as thousand years before Christ. Later, if you have the time, you could visit some of the old seats of learning here which were famous for their schools of medicine in the old days.

Indian medicine largely affected Arab medicine. In fact, in the old days in the Arabian Nights when the Caliph Haroun-ul-Rashid was ill, he sent for an Indian physician to Baghdad. From Arabia, this spread through various channels — Cardova and Spain and elsewhere to the Western world. So, in those days Indian medicine was for the time advanced and in its own way, it had a scientific basis. Unfortunately, in the later centuries, it became rather sta-

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

1. Dr. S. Radhakrishnan, President, Union of India, New Delhi.
2. Dr. S.C. Sen, Chairman, Reception Committee.

tic and it lost that scientific basis – just before the development of modern science as it is. And the torch of learning in medicine, as in many other things, went to countries where science was advancing at a rapid pace.

I do believe and I do think that any progress that can be made in this or other matters must be based on the scientific method and on the achievements of science. That is so, but I would submit to you that it is worthwhile even for modern people, modern medicine and modern science to find out what was achieved in olden times and perhaps to get some ideas from it, which examined by the scientific method might prove profitable. We read the history of medicine. Unfortunately, so far as I know, the history of medicine as taught rather ignores these earlier periods which are full of information as to how in the old days these matters were treated. They were treated always, I believe, from the point of view of an integrated human being — mind and body. And I believe that this is a fact which is fully recognised by the medical world today.

As our President said, health is important for the body; it is even more important for the mind. And in fact, if either of these do not come up to the standard, the other suffers also. Then again, in seeking health we may have as we have, enough hospitals, enough trained physicians and the like, but the basic thing for health is proper nutrition. And a country which is not rich enough, wealthy enough, developed enough to solve the food problem and the like problems, naturally suffers in health. It is not a question of drugs and medicines but good food.

Now, in countries which are not developed in the modern sense of the word, the barest necessities of life are often lacking for large numbers of the people. And I should think that the first duty of the people who are responsible for the destiny of that country is to provide those basic necessities. In the industrially more advanced countries, where the primary necessities have been supplied to practically all, there may be differences but the primary necessities are fulfilled. And, therefore, they seek other things which may be worthwhile or which may not be! Then other problems confront them. But in countries where these primary necessities are not fulfilled, that remains the primary and the chief problem. Naturally, you cannot confine yourself to only that aspect; other aspects have also to be viewed, because they are all inter-connected in the system of development. But, first of all, the primary necessities must be fulfilled. Apart from food and clothing, health and education are among the primary necessities. Health particularly is a matter with which you are intimately concerned. Now the problem for us in India is – it is the same problem in many other countries – how to give proper health services to the nation. In the last 15 years or so since we became independent we have done something to that end. There are many more hospitals, many more medical colleges and the like. But still we have only touched the fringe of the problem of this country with a vast and growing population.

I read somewhere among your papers that your Council does not approve very much of the State interfering in or taking direct part in organising health services. Now, that may be good for some countries, but I do not know how we can face the problem in a country like India – its enormous problems before us – unless the State interferes. Not only interferes but largely controls the health services for the people, because her objectives – as it must be for others too – are to make the health services, the treatment of disease and all the matters connected with it, available to every human being. And where human beings are poor and cannot afford much, how are we to deal with them? Only the State can do it on a big scale. Therefore, we feel that without infringing on the private practitioner, State medical services become essential to meet this problem. No number of private practitioners can deal with it in a country like India, having regard to the conditions prevailing here. I am merely mentioning this to you because of this difficulty that I felt in this country. That may apply to other countries also.

Then there is the question of modern drugs which are, many of them, very wonderful, some almost miraculous. And yet it often happens that a drug which is called miraculous today falls into disuse very soon. Something else and some other miracle drug takes its place, and there we are: miracle after miracle comes; some good and some wrong miracles. And the whole of this drug business is associated with a kind of industry, which is good in its own way but which has often done harm. I do not quite know how one can get over all these difficulties. I hope your General Assembly or part of it or some committee will consider this question of drugs.

Only recently, we have heard of great harm being done by some drug, which perhaps was not tested properly. But apart from that, my own reaction to drugs, perhaps fortunately, has been not to take them. And I have largely succeeded in doing that though not wholly, because when trouble comes one falls into the hands of a doctor whether one wants to or not. So sometimes, I have had to take them too; but rarely, I am glad to say. And it is better I think to err on that side than on the other, which seems to be a growing habit among the people. They seem to think that health lies in a pill. They will swallow any pill which is sufficiently advertised to bring them relief. This kind of thing. The drugs do a lot of good, I have no doubt, but perhaps they also do a lot of harm. Some method should be found and adopted and encouraged by you, who are experts in these matters, to check the overuse of drugs and somehow to separate the bad from the good ones. I am venturing to say something that is obvious and it must be in your minds. But because we ourselves are troubled in dealing with these problems here, I thought I might mention them to you, so that you might give us the benefit of your knowledge and experience.

For the rest, we face, apart from our very special problems, the general problems of the medical profession all over the world. Special problems are because we are changing over in India from a somewhat old pattern of society, to a modern pattern. We are modernising India in its industry, in its agriculture, and that results in modernising it in many other ways. When I say modernising, it does not mean that we are uprooting ourselves from our past. We are the outcome of hundreds of thousands of years of the past of India and there is much in it that we value exceedingly. And if we uproot ourselves from that past, we will be rootless. We do not wish to do that but while keeping to that past, traditions of the past, we nevertheless want to marry it to the present, to the modern age; to the modern age of science and technology, but always keeping some basis of the past too. Past is not always good, nor it is always bad, as one of the famous classical poets of India said long ago. So, we try to bring about a synthesis and at the present moment we are endeavouring to bring the basic things of the modern age. That basic thing is bringing science and its applications and the growth of science here, thereby trying to better the lot of our people and to raise their standard of living. To give them first of all the basic necessities which, as I said, apart from material necessities include health and education specially, because from education come out all other things. And we want a long period of peace for this, so that we may work out our destiny accordingly. We may progress and we are convinced that we will make much greater progress. Unfortunately, in this world other things happen to come in the way. At the present moment, as some of the previous speakers have reminded you, we have trouble on our frontier.

It is extraordinary that we, who have loudly proclaimed – and I think truthfully – that we stand for peace all over the world, we who in our own struggle for freedom here adopted peaceful methods and achieved our freedom through peaceful methods against a powerful imperialism, that we who are so passionately fond of peace should suddenly have to face a war situation. It is a queer, an odd happening which, apart from being undesirable, shows what games destiny plays with the people in the country. Well, if it plays that game, we shall face it; we are facing it; we will face it. The only regret that comes from our minds is that

possibly our march forward in developing the country and a large number of projects for the benefit of our people may be delayed. But, however that may be, nothing is more important than maintaining one's freedom and integrity. Therefore, we have to think a great deal and spend our resources on this primary matter. But even so, we realise that we cannot give up the basic objectives which we have set before us to raise the level of our people and give them a better life. We shall endeavour to do so and I hope we shall succeed.

I would like to welcome you, ladies and gentlemen, again and I hope that your visit to this ancient city of Delhi which is not only old Delhi and New Delhi as you perhaps know, but old Delhi itself is the seventh city on round about this site. Six cities have gone before and the seventh is old Delhi, and New Delhi where you sit now is the eighth city. So, we are surrounded here by a multitude of past happenings, old memories, racial memories and the like. We live in them, we have grown in them and yet we live in the present and work for the future. And we hope it may be given to us to be able to bring about a synthesis between our past and the future which gradually unveils itself.

116. SCIENTIFIC EFFORT FOR SELF-RELIANCE IN DEFENCE*

(Address to a special conference of the Directors of National Laboratories of the Council of Scientific and Industrial Research for coordinating scientific research with defence needs at New Delhi on December 8, 1962)

Prime Minister Nehru said yesterday (8 December 1962) that the National Laboratories and other research institutions in the country should give major attention to defence science in the present crisis. He specifically suggested that they could consider how to lighten the load that a soldier had to carry, especially in the mountains. He should have enough and yet be relatively lightly loaded and carry on for a few days without fresh supply.

Pandit Nehru was opening a two-day conference of Directors of Laboratories of the Council of Scientific and Industrial Research. He also laid stress on these institutions furthering the production programme in the country – industrial and agricultural. He added that a war situation demanded not only soldiers in the front but behind them all kinds of production. Eighty per cent of the Third Plan was essential for the war effort. While the Laboratories should work in close liaison with the Defence Science Organisation, they should also help in the general effort to raise production. Pandit Nehru reiterated that the strength of the country lay in doing things within instead of "begging elsewhere". He said that though India had decided not to make an atom bomb, there were modern weapons which she could produce. "We have to concentrate on producing these things as far as possible here and I believe we are now in a much better position. We have got an industrial base. If it is directed by scientific brains, they can produce anything in India now", Pandit Nehru said.

In talking of defence, Pandit Nehru said, one should not ignore the basic things of industrial and agricultural production. "We should have proper concentrated food which can be easily carried. A soldier carries, including the rifle, about 78 pounds. This is quite a bit of weight to carry especially in the mountains." How to lessen the load could be considered by the Laboratories. Similarly, in regard to agricultural production, it would make a mighty difference if a million *panchs* all over the country plus others under their influence turned their minds to stimulating agricultural production.

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* *The National Herald*, Lucknow, December 10, 1962.

117. DEFENCE EFFORT AND THE ENGINEERING PROFESSION*

(Address at the 20th annual meeting of the Engineering Association of India at New Delhi on December 28, 1962)

I am grateful to you for having invited me here today for a while and to say a few words to you about what I think of engineers and engineering today, specially in India. I have often spoken about the great importance of engineers in India today, because we have to build India and engineers are essentially builders.

We have a great task before us. The task, if I may put it this way, of modernising India. That does not mean that we reject what India has achieved in the past or in the present. Because, I think that is very valuable and that has made us what we are. Hundreds of thousands of years have made India and the Indian people what they are today. It is not necessary for us, as is often done in various countries, to praise our country because it is ours, or to think that we are better in some ways than other countries. We may be in some ways; we may not be in others. But the fact remains that each country has a certain special peculiarity and special genius apart from the common things that we have with other countries. And India, a country with a very long history running into thousands of years, has gathered a tremendous deal of experience, generation after generation, and this experience has conditioned us, and we have developed certain special traits – a certain outlook on the world – and I think there is a great deal of value in that for us. If we discard that broad outlook on the world for which India has been noted in the past and even in the present, we lose our roots– we become uprooted. And however much we may succeed in some aspects of life, an uprooted individual or a group or a race somehow gradually loses vitality.

So, therefore, we have to keep to our roots but at the same time it is equally obvious that no country in the world today can succeed in any sense of the word without understanding what the new world is – the new world of science, technology etc. Even to solve our immediate problems, it is essential to have recourse to science and technology. You will see that in the last 200 years or so great differences have arisen in various countries of the world; in the countries of Asia and Europe because Europe had what is called the Industrial Revolution and is continually having that revolution which is changing the life of human beings and life of groups and societies. And which is not only bringing a measure of well-being to those people who live under that dispensation but strengthening the various nations. It is obvious, therefore, for us to realise that in order to solve our problems we have to have recourse to science, technology etc. That is what, in fact, we and other countries are trying to do. So that, we have to find some way of combining the two – a synthesis between what we consider of value in the old and what we consider of value in the new. Mere attempt to copy other countries is not good enough. Imitation is sometimes helpful but generally for a group, for a race, for a nation, it is not very good. To learn from others is always helpful and always good, but keeping oneself stoutly on one's own feet is essential for a person; otherwise, as I said, there is no root left. So, we have to find a synthesis. That is the broad approach to our problem.

Now, we have had ever since Independence various Five Year Plans which you have referred to, Mr. President. That was an attempt to bring more and more of the modern world into India, modern science and its off-shoots. You will remember that almost from the very beginning of our period of Independence we started a large number of national laboratories, research institutes, because we wanted to, as early as possible, launch out on this development of science in our country. Science again, not merely reading text-books

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

and getting a few degrees here and there, but the essentials of science, developing it so that we can do research work and advance the cause of science not only in India but in the rest of the world. We did that and I think we have profited by it. But essentially what we want is not only to do all that but to create a temper and a climate of science in the country out of which great things are done. I suppose gradually that is taking place also. In doing all this, we have to remember always this gist of its findings – synthesis between the old and the new.

Kalidasa, the great dramatist, said that all that is old is not bad nor is all that is new is good. We have to pick and choose. We can neither reject the old nor the new nor we can accept either without scrutiny. That being the basis of our approach, now the first thing that we have to consider is from the larger point of view of raising the standards of our people, getting rid of the curse of poverty that oppresses most of them, providing them with the necessities of life, all of them. In the advanced countries, industrially advanced countries, one might say that most people or nearly all have got bare necessities of life, that is, food, clothing, housing, health, education etc. There may be some difficulties sometimes, but as a whole they have got them. Therefore, the problems they face in those countries are somewhat different. For us in India and for most countries which are not adequately developed in that sense, we still have to get that minimum, which every human being should require. After that one can play about, but the first essential is to get that minimum in food, in clothing, in housing, in health, in education and work. That should be given to everybody.

Now, it is a large task in India where there are four hundred and forty-four million people and yet I have no doubt it can be achieved and will be achieved. So, when we framed our Five Year Plans, the basic objective was to develop our productive capacity, our wealth and to see that it goes down and spreads out to our people. We call that the building up of the socialistic structure of society. We did not define it; we did not dogmatise about it, but we did feel strongly that the first objective should be the good of the people of India as a whole.

Perhaps you may remember that Gandhiji once said that his test of any change, for any proposal, was how it would affect immediately or ultimately the poorest in India. It was a good test, and if we keep that in mind probably we shall not be far out. Of course, other tests have also to be applied and generally speaking, we cannot affect even the poorest till we take some other steps to increase the wealth of the country. So, it is not a question of doling out things to the poor, considering our country a kind of poor house in which doles are given out, but of making each individual productive, creative, producing wealth for himself and for the nation. To do that, it is essential to use the latest techniques which science, technology etc. have given us and which have succeeded in producing wealth in other parts of the world. In that work obviously various branches of the engineering profession have a very important part to play and you who are members of this exceedingly important profession, therefore, play a vital part in the building up of this new India.

One or two things I would like to say about it. Of course, you bring your knowledge of the latest techniques in the work you do, yet there is sometimes, not always, not enough appreciation of the facts of life in India. What I mean is, suppose so many of you have been trained in the United States of America where life is very different, life is very mechanised, the human being counts relatively far less and the machine far more. Now, for us to introduce that type of thing here under the present circumstances would be out of place because we have not got the background for it; we may gradually develop. A person comes – a highly trained engineer from the United States – back to India and he starts sniffing and complaining that he has not the latest type of machines for him to work with. Of course, he has not. We have not got them. We cannot afford them. But we have got something in very large numbers, that is, manpower — tremendous. America may not have that much; Soviet Russia

may not have that much; it has not got. If you compare the ratio between land and people in the United States of America or in the Soviet Union, it is far different from the ratio of land and people in India. For Soviet Union it may be profitable – I have not to judge – I have to merely say, it may be profitable for them or America to have many, many labour-saving devices. Labour-saving devices are broadly good, but in this place where the ratio between human being and land is entirely different and human beings predominate, it has to be seen whether from the social point of view it is always a good thing to save labour and have some new type of machine which does that. I do not mean to say for an instant that modern techniques should not be employed; they of course have to be. But the social point of view and the consequences of it have always to be considered in some things. Of course, in some areas they may have to be employed entirely – in some others, the change-over might be gradual. But anyhow, at the present moment, where you have a choice of doing something, with employing a considerable number of manpower and not of doing it with the machines alone, probably it is better to use the manpower than simply the machine. Of course, a balance has to be found in them.

I have seen big hydro-electric works using the latest types of machines and doing very well. I have also seen in parts of India, specially in South India, where the engineers in-charge use manpower more, with the result that the whole neighbourhood round those works gradually becomes a relatively prosperous neighbourhood, because the money given to the people was spread out all over. So, we have to keep that in view, ultimately perhaps even approximate to more and more machines being used. But, where that work can be done by other means, it may be profitable to do it that way and do good to the people. But, that is only a transitional phase; ultimately, I have no doubt that the latest techniques have to be employed and we shall do so as we advance.

Now, you Mr. President have referred to the emergency and crisis that we face today in India. That is so basic to all the work we do that everything else in a sense has to be given a secondary place. Because, unless a country can achieve freedom and maintain it, all else will not do it very much good. Every individual in a country must feel that freedom is the basic essential and a country which is prepared to think so, to work so, and to sacrifice everything for it, can never be subdued. I have not a shadow of doubt. When you think in terms of war and military conflict, you will necessarily have to think of the best means of waging the war, the latest techniques, the best arms and all that. And we have to do that. But the essential and basic factor is the will of the people: the will of the people not to be subdued, not to bow down to insolent might, to aggression. If that is there, then I am absolutely positive that no country can subdue it. But this dichotomy, this conflict of interests, does not really arise very much.

While today we have to mobilise our resources for what might be called war effort or preparation for it, that should not come in the way of our advance as envisaged in our Five Year Plans. Naturally, our planning has to be conditioned, to some extent, by the new situation that has arisen. But as a matter of fact, even the new situation demands our concentrating on many of the important aspects of the Five Year plan: in fact, even going ahead of the targets laid down. In India almost everything begins with agriculture. We are an agricultural country. Industries are most important; without industries, we cannot make progress. But industry itself depends on the growth of agriculture and production in agriculture. Therefore, war or peace, it is of the highest importance to develop agriculture and bring modern methods into agriculture. In doing that, not only modern methods but to create that spirit of self-help, self-reliance, initiative etc. in agriculture is very important. We talk about fertilisers and various other methods of improving agriculture. They are important. But the human being is more important than all of these. If the human being gets out of his old rut, in which he has been for hundreds or thousands of years, then other things follow. There-

fore, that is why we started community development; that is why we started Panchayati Raj and all that. And I believe all that has helped greatly in gradually changing the mentality of our agricultural, rural population. That big change is more important than any other change that may be more obvious. Because out of that change, other things flow out. Therefore, I lay stress on agriculture. But even with agriculture I have to add, apart from the other industries that you might start, the growth of industrial employment in rural areas. For the moment, I am thinking in terms of small industries there, which I think are very essential for rural areas. They lead to a balanced condition there.

Now, out of agriculture grows industry. Out of the surplus, agriculture creates other things. As I have said, the growth of industry is essential to raise the standard of the people. The engineers, of course, come in agriculture and small industry and big industry and everything. Now, if we have to think in terms of war effort, as I said the growth in agriculture and greater production is essential. Even more, it is necessary for our industrial output to grow. It may be that greater importance is laid on certain aspects of industry, which are more useful for war effort. But, essentially it has to grow as a whole.

Take another thing – power. Everything requires power nowadays. You can never have enough power in India and whatever you may have, it will always fall short of the needs for a long time to come. Therefore, provision for growth of power in our Five Year Plan has to be maintained; in fact, perhaps added to. That is one reason also why we intend proceeding with our atomic energy programme for power generation. These arguments about whether they are economically worthwhile or not, in so far as I have been able to study the problem, they seem to me certainly worthwhile from the economic point of view, apart from other things. It is a good thing to have some of those things to know exactly how far they are viable in that sense. Because, power is always going to be a very important item in our nation and any nation's life. If they succeed we have another opening. When they will succeed, they may succeed in a great way or in a small way, but they are bound to succeed. But power is important, whatever the source of power. I am glad that soon we are having a kind of survey of power resources – a very high class survey of power in India. I look forward to that survey helping us in our future programmes. So that, in effect you will find that much that is said in the Five Year Plan is directly connected, or can be directly connected, with the war effort except for some minor changes here and there.

Take another thing which some people may think is not directly connected, that is, education or health. Now, as a matter of fact, education I think is of the greatest importance for any industrial growth, for any kind of growth and even for war effort – the general education : mass education plus of course technical education of various kinds. We have in fact started technical education and mass education greatly in the last few years. I do not think we can afford to relax, because out of that reservoir of people having general education come the specialists or the technical people. And out of that come those who are required for industrial growth, agricultural growth and all kinds of specialised activities.

Health – you cannot have a vital nation which is not healthy enough; we have to do it. It is really very difficult to say what you can leave out. We have to leave out something; we may postpone something; but on the whole, we have to go ahead with all these. Now, it is an extraordinary thing, that while war means carrying a tremendous burden for the nation, war is also – or the effort, not war but the effort which it entails – is also a great energiser. It makes people work; it makes people think hard. You know that many inventions, many improvements and techniques and everything, even the atom bomb, are the result of war: past wars. Not that I approve of these atomic or nuclear weapons, but it shows how, under pressure, a country can do many things which it would not do in peace time. Therefore, I think it is quite possible that we should utilize this opportunity and lay a strong basis for progress, industrial base, increase our present industrial base. It is already much better than

it was, very much better than it was 10, 12 or 15 years ago. We can make it stronger, improve our agriculture, improve our education, utilising the new energy that comes out of the people under the stress of war conditions.

Now I am talking about war. We are not at the present moment at war. We are not actually fighting anywhere even in a small way. It is a kind of 'cease fire' as you know. How long it will last I do not know. But one thing is perfectly clear, that whatever the near future might bring we have to be prepared for every possible contingency. And it will be a very sad and unfortunate thing if we relapse into indolence or into complacency, because actual fighting is not taking place today. We have had a lesson and if we do not learn from that lesson, then it will be a bad day for us. And that lesson teaches us to prepare our country in every possible way. First was defence and secondly, as a part of defence and otherwise, its industrial growth and other kinds of growth. Therefore, we have to carry on at high pressure and not relax. I want to lay stress on this, because there is always a risk of our slackening and feeling "Well, fighting is not taking place". The fighting took place this time rather suddenly without any previous notice to us, we might say, and it might take place again rather suddenly without notice to us. And if we do not prepare now then we shall suffer for it later. So, we have to carry on in that way.

I am quite clear in my mind that, whatever the future may bring, one thing we have to do and that is to work hard to strengthen our defence apparatus not only in military terms but in many other terms too, because army after all is something at the top of the country's strength. You see it; it shows off; but behind the army lie vast numbers of people maintaining that army, feeding that army, supplying it with all kinds of everything that it needs – that means, industry, agriculture etc. – all that is essentially a part of the defence effort. An eminent economist from abroad the other day compared this to an iceberg. You know that an iceberg, the top of it, shows above a level of the sea, but nearly 8-9 or 10 times of it is underneath the sea. Now the top you may see – the army functioning, for everyone to see – but below it is not seen that which maintains the top, that is, the whole agricultural, industrial and other activities of the nation. That is all part of the war effort. It is not necessary for every person to take a gun and call himself a soldier. He is a soldier if he is working adequately in the other activities which keep a soldier going. Therefore, we must have this sense of urgency because time is important; we cannot lose the time; we may have to prepare ourselves fully, and that preparation means not only the top of the iceberg preparation, but also the bottom of it – the understructure of it, which is really the economic life of the country – industry – and in this engineers have a vital part to play.

I am sure that the engineers of India will play that part. I do not know how many there are in India at present. I know about 6 or 7 or 8 years ago, we had a kind of census, rough census – I had been told a little over a hundred thousand engineers in India, big and small. I do not know what the latest figures are, but I suppose they must have grown considerably since then. Our scientists have grown too. They are really the foundations of growth – the scientists, the science and the various parts of engineering that we see. And therefore your Association performs a vital task and I am sure that it will look upon its task as something bigger than having a job to do for a profession, which is a useful profession. Think of it, each one of you, as doing some little bit in building new India; then you become tied up somehow with this great process of the change of a nation. And in thinking in big terms like this you yourself become bigger than you are. That is a great thing in life, that if you attach yourself to a great cause, then somehow you grow up with it and your strength grows to do things. In India, we are passing through a phase which is what might be called the historic phase. One historic phase was when we struggled for Independence; that struggle conditioned us and made us stronger and better than we were before. We slackened after that; we took things for granted. Now, again, a challenge has been thrown at us. And if we utilise this

opportunity rightly, we shall not only meet the challenge as it is, but grow with it, and make our country not only secure in its freedom, in territory, but capable of giving a good life to every individual who lives here.

118. GROWTH DEPENDENT ON UTILIZATION OF POWER RESOURCES*

(Inaugural speech at meeting of Committee for Power and Energy Survey at New Delhi on December 29, 1962)

I have come here today, a layman amongst experts, merely to express my pleasure at the work you are undertaking and show our appreciation of the importance of it. I thank those of you who have come here as our guests from outside, for having joined us in this undertaking. I suppose that there are various ways of writing history, the history of the world. One such way can certainly be the growth of power resources as used by human beings. The whole of the Industrial Revolution is basically based on that, as also everything that has happened since and in the earlier days too, although the tempo was relatively slow.

Today, I suppose one could form some idea of the state of development of any country without knowing anything in detail about it by merely knowing how much power it produces and consumes, nothing else. That will give one some idea, a very good idea. So, it is obvious that the growth of energy and power is most important. In your inquiry, you are supposed to find out the demand, or the potential demand, there is for it. I do not quite know how you measure demand, because I should imagine that in India the demand is so great that you never reach it, you never fulfil it. As you fulfil it, the demand grows and grows further. You can have some idea of what the immediate use would be or what quantum can be put to immediate use, and so what the demand is. But ultimately, there is no limit to the demand in any country, even in the highly developed and industrially advanced countries of Europe.

Well, I understand many of you, gentlemen, have been enquiring into this and you have produced a report. You have found that a great deal has to be done to supply the demand of energy. Here in India, there is enormous room for improvement in this respect. This business of tapping nature's sources of energy, converting them into power and utilising that power for human needs is a fascinating subject. When you look at it here in India, you see various periods of history represented at the same time : old and very primitive methods and right up to modern methods. You see the use we put cowdung to – most primitive thing, still in India it is largely used. You also see the growth of atomic energy. And you will see all the intermediate phases and stages. So, it is a fascinating subject. Apart from its utility, which is very great, one can deal with it not only in the strictly businesslike point of view–that you will no doubt take up–but a certain romantic view too, of how civilization has grown because of it, because of the growth of the use of additional power resources. So, I have little to say except to tell you that we attach very great importance to this survey and we hope that the survey will be followed up rapidly by utilization of the results of the survey.

I have just mentioned atomic energy. Now, it is rather odd that in a country like India where to a large extent very primitive sources of energy are still used we should

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

talk of atomic energy. Yet, that is to some extent the paradox of India. And while conventional methods are obviously dominant in India for producing power, whether it is coal or hydro-electric power, oil – we are increasing our oil production and we will increase it–still, we are going ahead with atomic energy because we have felt that we must tap that source of power also, not in competition with other things but rather in addition to them. Perhaps, you will be able to find out what our existing resources of power are, how much of it is in hydro-electric power or other sources. But we think that in some areas of India, which are far removed from these conventional sources and where the cost of production of power is very high, as it involves transport of coal and things like that over long distances, in such areas the atomic power stations may be economic. Apart from that, it is a good thing to gain experience of these new methods to some degree. And I suppose as we gain experience, the process possibly becomes cheaper–and production of it more and more useful. In those places in India which are far removed from our coal-bearing areas and far distant from oil, there *prima facie* it appears that atomic power plants should be useful.

Anyhow, I wish you well in your inquiry and we shall look forward to the results of that inquiry with great eagerness. I hope in dealing with it in a strictly businesslike way you will also to some extent keep the romantic aspect in view. Anyhow, it will make your report very much more interesting to the public – the growth of human civilization as based on the discoveries of fresh power sources and their utilisation. I wish you well in your inquiry. *(Applause)*

119. PLACE OF SCIENCE IN NATIONAL EMERGENCY*

(Speech at the 28th anniversary general meeting of the National Institute of Sciences at New Delhi on December 30, 1962)

You have done me an honour by asking me to attend this annual meeting of yours. But you have not shown any great consideration by putting me down as one of the speakers on this occasion. I have come to this gathering of scientists more to learn than to say something on my own behalf, except something in relation to science and the activities of the Government.

Dr. Khosla[1] has referred quite at the beginning of his address today to the emergency that has arisen and the place of science in it. It is an odd thing that science and astronomy usually make great progress under stress of emergencies. In peace time also we make progress, but it is only when a nation is face to face with a crisis that progress is speeded up. If that is so, and if that is the result that will come to India from the emergency that we have to face, then this will be one of the great results of this crisis that we have, that we are facing. It has, as a matter of fact, to be looked at from another viewpoint. We, all the time, have been facing other crises, the crisis of poverty in this country and the lack of adequate development, and it has been the job of the scientists especially to meet this. But somehow we get used to living with the ills. We suffer from them continuously and do not consider

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

1. Dr. A.N. Khosla, Chairman, Central Board of Irrigation and Power, Government of India, New Delhi and President of the Institute.

them as very urgent or requiring very urgent treatment. But when a crisis in the name of some war emergency comes, everyone wakes up. I hope, therefore, that we shall see in the present instance a flowering of scientific talent in this country, and in research and in the application of that research to practical problems we have to face.

We have many of our scientists, many of our professors in the universities and other places, engaged in administrative and like duties. They are necessary, but probably their actual work in research is more necessary than the administration. I should like to lay stress on this because sometimes I feel that relatively a large number of scientists and others are employed in administration, in the administration of each other and not so much in the cause of research. After all, the essential value of science in a country is dependent on the real scientific work that country produces. So, I hope that this emergency will especially turn people's minds to research, whether it is pure or applied, dealing with the problems that arise from this crisis. Now, at least in theory we attach a great deal of importance to science ever since our Independence. On the whole, it may be said that scientific effort has grown in this country. It has grown considerably and there are, comparatively speaking, a very large number of scientists in this country, compared to what they were before and they are growing in number. That is all to the good. I believe that the quality is also improving. Necessarily, men and women of high quality are somewhat limited, but anyhow they are getting more and more opportunities. Out of this opportunity, more and more will come.

Now, people often ask us how far our Third Five Year Plan will be given effect to in view of the emergency in which we live. If you analyse that Plan and the crisis such as we have, you will find that most of the important things given in the Plan are equally necessary and important for the purposes of the crisis and the emergency. Whether it is in agriculture or industry or education or health, all these are necessary from this point of view also. It is really rather an odd thing to realise that the country progresses more under stress of crisis. Science has progressed in the past few months more under stress of the crisis like this than in the peaceful times. So, the one pleasing aspect of the present situation is that with all its burdens and difficulties we may actually advance in many ways, not only in science, but in widening the basis of industrialisation and other ways, because of this present difficulty that we have to face, that is, if we apply ourselves to it and not, as many people say, rely on others doing their job and we merely look on. That will be a betrayal of faith of the people. Because, as the President has said, we have to justify ourselves and shoulder the burden of the situation as it occurs.

Naturally, we are grateful for the help that we may get from others – and the more we get, the better it is for us. But, in any event, whatever help we may get, whether it is in this emergency crisis or it is at the time of development, the fundamental effort has to come from the people of our own country. All our Five Year Plans have been helped considerably by friends abroad, friendly countries, but still the main effort has always to be borne by our own people and in the future also it has to be borne that way. Therefore, we must realise this.

Also, even while making a war effort, we should try to do it in a way which is of permanent significance in the growth of this country and not such of some temporary importance. Of course, some things have to be done anyhow, which may appear to be permanent. But I think many of these things have a certain significance which is greater than that of facing a crisis, and that is also a war effort. We talk of soldiers, of airmen and others and praise the gallantry of those who have sacrificed. But really the war effort is something much more than the soldier in the field. It is the vast apparatus behind him, of the nation's mobilization for a certain effort that comes and that keeps up the more visible war effort going. In that sense, every peasant in the field is a part of that effort, a very important part; every worker in a factory is playing a very important part. And, of course, trained people like the scien-

lists and technologists are exceedingly important. In fact, all of us – every person who does anything – is important. And the young people in schools and colleges are important because they prefer to train themselves for the future. In this way, the whole nation comes into the picture.

Now, if you look at that not only from the point of view of doing a job, which we have to do anyhow, but also from the point of view of building up the nation at the same time, then that war effort is much more profitable. Building up the nation: that is right. What nation? What kind of a nation? The questions arise just as if we drew up a Five Year Plan, we have to keep in view what kind of a nation, society, we are aiming at, broadly speaking. We have defined it to some extent and it goes on being defined almost by the sheer impetus of events. Obviously, we cannot build at any time, least of all during war time, a society in which the good things of life go to a few and others have to carry the burden. That is quite apart from this being ruled out by the spirit of the times; it just cannot be done. People do not put up with it and I do not see why nations should put up with it. I will not put up with it, and I suppose that kind of approach should be a common approach to human beings – when sacrifice is to be made everybody should share in it; when the good things of life come to them, they should also come to everybody. Therefore, even in laying the foundations of future progress, we have to bear this in mind and not forget the human and social aspect. In times of war it is this social aspect that comes with a brutal force before a nation, but the question has to be solved not actually perhaps quickly, but in the minds of men and the direction we give for work.

So, the basic question still remains. Whether there is a war crisis or not, the basic question is of raising the people of India to higher levels. We think of providing so that all of them have the basic necessities of life and have a chance to progress open to them, so that they can live the good life and enable all others to do so. That question we have to solve by our planning. It is a big task, a tremendous task, and even great countries who have planned and who have made tremendous progress still have to face difficulties. The numbers of our four hundred and forty million people pose a problem which is frightening in its bigness and yet which is very exciting.

Now, yesterday I was present at some opening ceremony of a seminar. A Committee is being set up for planning energy and power resources of India. We have a number of Indian scientists, and some eminent foreign scientists have also been attached to it. That is of great importance. As you will realise, the greater the power resources which are exploited by a country, the greater the speed of its human advance. As I said yesterday, you might almost write the history of civilisation in terms of power resources being exploited. And in India today and in many of the less developed countries, it is of the highest importance. Indeed, as it is, even the developed countries do not exploit their power resources to the full. That seems to me almost, in a sense, the base of all our progress although every activity is so interlinked that it is very difficult to say which is more important than the other. So that due to the emergency, even without the emergency, scientists in India have a vast field to work in order to solve the obvious problems that we have to face. In an emergency that field becomes vaster and vaster and still more urgent. And, of course, the State should help them, should give them opportunities to work. Sometimes, I feel that there is too great a dependence on the State effort. I am not opposed to it. I think it is highly important. But merely waiting for something to happen is not good enough. The universities can certainly do a great deal, and ought to. There may be other ways too. And the best way would be not to do all this in separate ways, perhaps not in conflicting ways, but in a cooperative way, so that progress might be balanced on all fronts. So, I hope that especially the scientists of India will use this opportunity not only for the good of the country, but for their own good. By their own good, I mean the good of science which they seek to represent – the growth of

that. The individual good may also come into that picture, but that is relatively a minor thing when many people have to face the issue of life and death. I think one should see it in that context.

War is a terrible and highly undesirable thing. We have been known for our special adherence to peace, yet, what is one to do when one is attacked? It is a difficult problem even for some people who may call themselves pacifists. We are not pacifists but we very much dislike war and all its consequences. And we are very much attached to peaceful methods even though we may not be pacifists, whatever pacifism may mean. But I remember that one of the greatest pacifists that has ever been, Mahatma Gandhi, always repeating and telling us that violence of any kind is bad. He would not indulge in violence, but surrender to evil is worse; cowardice is worse. Because if you surrender yourself to an evil thing and because of fear do that, then you give up something that is very valuable – your spirit and your soul, call it what you like. If any nation does that, or an individual does that, it is bad for him or for the nation. Therefore, he said, if it is a choice between violence and surrendering to evil, take out the sword and use it. Now, if a big pacifist, a great pacifist, says that, if I may venture to say so respectfully, he is perfectly right in that. Because many people take refuge in being adherents of peace, because they are too cowardly to face the situation. If they are real adherents of peace, all honour to them; they must go to the end. Peace should never be a refuge for hiding the fears in your hearts. The bravest man I have known was Gandhi, the great pacifist who would not indulge in any act of violence. But he was not a passive pacifist; he was an active pacifist. And we have clearly to distinguish between the active pacifist as a person who fights an evil through peaceful means and the person who condones evil because he imagines that not to do so will be violence. That is an encouragement of evil, and you become an accessory to it. So, we have to face this situation. Although I believe India is, by and large, a country devoted to peaceful methods – by and large, an Indian is: I do not pretend to say that he is better than others – but in this particular matter, he carries sometimes his peaceful inclination to an extreme which other people do not. So, we have to face this and we will, of course, face it, and I have no doubt that we will overcome this.

It is an odd thing. There is a definition of *Ahimsa*, non-violence, in one of our ancient books. It is defined that *Ahimsa* is 'not having any hatred or violence in your heart'. But it does not talk about the deeds you perform, but the motive and the mind behind the deed. If it is not vitiated by hatred, then that deed becomes more or less non-violent. So, we have to face this contingency without hatred and without violence in our heart and yet effectively, and I hope we shall succeed in doing so.

We live in this world at the present moment, always on the verge of a mighty crisis, the crisis which may almost endanger the continuance of the world. The war comes, the nuclear war etc. and everybody realises it, almost everybody, and they avoid it. And yet fear or hatred and apprehension make one live on that verge and not withdraw from it. I do not know if it would be possible for us to withdraw from it by disarmament or some other methods. But that is the problem of the age and yet, we have to face other forms of this problem. They have to be faced by the individual nations as we have to face it. Of course, what we have to face is very important for us, but it is not that size, that world nature which has to be faced if nuclear weapons etc. came in. But all of us have to face that major problem and try to solve it, because there can be no great future for humanity if it continues to live on the brink of a crisis. We have to acknowledge that there is no other way but the way of co-existence, because of some nations trying to compel other nations to function in a particular way, force them, is neither desirable nor even possible. The world is a variegated one; there is a great variety in the world and it is a good thing that there is variety. It

will be a very dull world if it were all conditioned to work in a particular way and no other way. If we accept the fact of countries following their own light and influencing the other countries, that has been the old tradition of India at least for over two thousand years and in a sense much before that.

But when I mention this, people wonder that we talk of war effort and all that – how far are we then in keeping with our peaceful methods about which we spoke so long and which we laid stress on? I think they are in keeping with the fact that there is no choice for our country except the one I have ventured to place before you, because any other choice, any other road which you may travel by, would mean the greatest violence that one can do to oneself or to one's country. And that is to sell one's spirit because of the fear of consequences. That is the greatest violence, and if a nation does it, it is all for the worse. So, we have to face the problems we have to, whatever they may be, whether we like them or not. If force of circumstances makes us face these problems, we have to do so with courage, and with all the strength that we have, but at the same time aiming always at peace and as far as possible without fear and hatred, because that is the only thing that is worth striving for in the end. Science has given so much power to humanity, power to improve the human being, that however bad war had been previously, today it is a simple folly. It does not even seek to solve the questions we have to face, when we can get everything that we want through peaceful methods. And science has got to do all this and scientists have therefore to face the present as well as the future – with all this in view, with all this in mind, not in a warmongering frame of the mind, although we prepare for struggle and war, where it is thrust upon us, in order to save ourselves. I do not know what the future will bring to us. Whatever it may be, whatever the turn of events might be, that is the solution of these problems that face us.

I hope this Institute of Sciences will certainly do it, because science and its votaries have got ever-increasing power and authority in the world, fundamental power and authority – not the power and authority of a general on the battlefield or even the statesman – but a greater power and authority, because they have it in their hands to change the world as they have done in the past. see even the history of the last hundred, two hundred years, how the world has been changed essentially by scientists; although they may not have been wholly conscious of the fact, but their work has changed the world. We talk about revolutions. The greatest revolutions that have existed among the revolutions are the industrial revolutions. They have changed the world, the electrical revolution and others – electric one and the nuclear one. These go on coming, these great revolutions, if we only could utilise them for public good and not to slaughter each other! So, we live at a time of great ferment in the world, great possibilities and great dangers. In a sense, it is an exciting time to live in. And we should take advantage of it and try to direct world forces as far as we can in the right direction for our own country and for the whole world.

120. ERADICATION OF DISEASE AND THE PROBLEM OF POPULATION CONTROL*

(Speech at the International Congress on Diseases of the Chest at New Delhi on February 20, 1963)

I am having a rather unusual experience today and that is having to speak immediately after our President.[1] I try to avoid this as far as possible and have on the whole succeed-

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

1. Dr. S. Radhakrishnan, President, Union of India, New Delhi.

with the Society for the last dozen years or so – perhaps a little less. When I received your invitation, I had to rack my memory as to when my original association with the Society began. Then referring back to some records, I felt very glad to have been associated with this Society at the very start and to help it to the extent I could, because I think it is of the utmost importance that we should make progress in aeronautics and create, shall I say, a mental atmosphere in favour of it.

A curious thing in India is that different stages of progress overlap so much, different centuries overlap. We travel here both by air and by bullock cart at the same time–not exactly at the same time but simultaneously. And so while some aspects of Indian life take you back hundreds of years, other aspects make you look into the future. India has enormous capacity for synthesis in whatever it finds, trying to find means to carry on with the old and the new, everything together. There is virtue in that, and yet it may be carried too far. Anyhow, there can be no doubt that aeronautics is something which will concern itself more and more with the future, whatever the future may be. It is indeed, even now, very much affecting this future for the world. And if that is so, it is but right that we in India should try to keep abreast of developments. And the only way to keep abreast of developments is not merely to copy out what others have done but to try to think originally: if not, keep in view, of course, that we should learn from others. The type of mentality which merely copies never gets ahead very far in science and technology. Therefore, research is necessary, therefore, minds adapted to research are necessary and such Society will not doubt give opportunities for that.

Even in my own lifetime, I have seen the growth of flying practically from the very begining in so far as modern flying is concerned. I remember the excitement when I was a small school boy at the report of the Wright Brothers' performances in America and later others in their attempts to cross the British Channel, and so on. I remember, I think during 1910, that in Frankfurt there had been an Aeronautical Exhibition, where a plane was to come down slow, gather impetus, I suppose, and it went up and came down with a thump after 200 yards. That very year 1910, two or three months later, I saw a plane flying over Paris, the first plane:I think so. Later – much later – from Paris, Lyndbergh arrived crossing the Atlantic. Naturally, all this left a powerful impression on my mind. And I think that it is of the utmost importance for us to develop this mind and climate of aeronautics so that we may take our place somewhere in the front for the future developments.

So, I am glad to come here after many years and to justify to some extent my being Patron of this Society. I wish it success.

123. POVERTY, THE REAL CAUSE OF TUBERCULOSIS AND CANCER*

(Speech while declaring open the J.K. Institute of Radiology and Cancer Research, Kanpur on May 12, 1963)

Pandit Jawaharlal Nehru in his address disclosed that the number of T.B. and cancer patients was increasing much in spite of many checks. He pleaded for finding out its causes and the ways to control it. In this connection, he said that the number of patients of cancer in India was increasing because of the poverty and the low standard of living of the people. At

* *The J.K. Review*, Vol. XXIV, No. 2, August 1963, pp. 52-54.

the same time, we did certain things without caring for their after-effects and thus we encased ourselves in trouble. Similarly, we fight wars and then we need hospitals, he added.

Pandit Nehru congratulated Sir Padampat Singhania[1] for his bold venture in the service of the humanity and hoped that people of Kanpur would certainly heave a sigh of relief in spite of the fact that the hospital could not meet their complete requirements.

He said that researches in the field of detecting ways and means for eradicating cancer should be made. He expressed his satisfaction that the Institute was pondering over this vital issue and the programme was under way in this regard. In this connection he cited the example of the European countries which were planning to completely eradicate this venomous disease. Much has been done by them but still more was to be done.

Pandit Nehru wanted India to follow these precedents. He said that in spite of the fact that there was much scarcity of equipments etc. research should go on to serve the humanity. He said, "Something has been done in India but still much more was to be done!"

124. INDUSTRIAL RESEARCH IN SERVICE OF THE NATION*

(Extract of speech during visit to the Madras Rubber Factory (M.R.F.) at Tiruvottiyur near Madras to inaugurate the Rubber Research Centre on June 12, 1963)

He (Jawaharlal Nehru) underlined the importance of research and said:

"Research is the word which moves me. It gives me all kinds of perspectives in my mind. In the larger sense of the word, research is essential for an industry, but I look upon it as something more than that: as something leading a community or country forward or humanity forward in its march towards the goal that it has. Therefore, when I was invited to come here at the inauguration and the foundation-stone laying of this Rubber Research Centre, I gladly agreed.

I shall confess that part of the reason which made me agree was also the fine record of Mr. Cherian[2] and his family in the business they have undertaken; and so I am here and presently I shall perform my allotted task in connection with this foundation-stone ceremony."

Mr. Nehru, continuing his address, expressed his happiness at the opportunity he had of seeing many parts of Madras, where he saw large numbers of pleasant, happy and cheerful faces. He praised the industrial progress made by Madras and hoped that the State's example of dynamism, enterprise and growth would be emulated by others.

Mr. Nehru concluded: "So, I am glad to be here today because it is the Research Centre that we are opening, because this is an addition to the industrial progress of Madras City and because it is good for India. I congratulate all those who are connected with this undertaking and I hope that in carrying it forward, they will always keep the larger interest in view, the larger interest of the nation, the interest of the workers who work hard so that this may be some kind of a joint enterprise in which all share and all have a sense of partnership. If that is so, it will prosper all the more and do good to itself and to the nation."

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1. Sir Padampat Singhania, Chairman, J.K. Industries Ltd., Kanpur (U.P.)

* *Down Memory Lane*, M.R.F. Limited, Madras (1963).

2. Mr. K.M. Cherian, Chairman, Madras Rubber Factory, Tiruvottiyur (T.N.).

125. PLANETARIA HELP GIVE A TRUE PERSPECTIVE OF THE UNIVERSE*

(Speech at the Birla Planetarium, Calcutta on July 2, 1963)

Ever since I heard that this planetarium has been put up in Calcutta, I have been wanting to visit it. I have been seeing some planetaria in other countries and I thought it very desirable that we should have at least one in India. So, I was glad to learn that Ghanshyamdasji Birla[1] was having one constructed in Calcutta.

Now that I and you also have had the chance of seeing it, it appears to be one of the best planetaria that exist. Evidently, it is a place for learning something about this universe of ours. It does give some – very limited no doubt, and very vague – but some idea on which we can build our future knowledge, something that will draw us out of our narrow selves and enable us to think in bigger terms than we normally do. Anyhow, it is a very good thing that the citizens of Calcutta and those who come here have got the advantage of visiting this planetarium and for a moment drawing themselves out of their old shells, thinking of vast spaces in which our little speck of dust which is the earth floats about.

Perhaps, it may give us a truer proportion, a truer perspective of life than we might have otherwise. We tend to exaggerate the importance of the earth. And we exaggerate the importance of our own petty selves on this speck of dust. It gives us some idea of what we are and we can think in a truer perspective. I am sure all of you are grateful to Mr. Birla for having provided this to Calcutta and thus added to the sources of knowledge of many people who can come here.

I am sure and we all hope that this will become better and better equipped in the future so as to enable us to have a more intimate glimpse of the universe.

126. FACILITIES FOR STATISTICAL RESEARCH**

(Speech during visit to the Indian Statistical Institute, Calcutta on July 2, 1963)

I do not quite know what I am supposed to say at the moment. In a sense I have been connected with this Institute through Professor Mahalanobis for many long years. I came here perhaps for the first time eighteen years ago and several times subsequently. Now this time I have come, I am told, after eight years. But, in between Professor Mahalanobis took care to inform me of what is happening here and how it is developing and I am deeply interested in its development and growth. Now,today I have had the opportunity of paying a relatively hurried visit to your various departments and to see the diversity of your work – various kinds of work which you are doing here.

I have always thought of the Statistical Institute as a vital institute from the point of view of our national work. I have been confirmed in my opinion. You who work here know much more about it and I am telling you what I have felt from a distance. Now, any institution of this kind really depends not only on the broad outlook of it, but what the workers, students and others feel about it, how far they are imbued with their ideal

* Director, Birla Planetarium, Calcutta.

1. Mr. G.D. Birla, Chairman, Birla Group of Industries, Calcutta.

** Director, Indian Statistical Institute, Calcutta.

and their sense of co-operative efforts in research and all that. After all, it is human beings that make the institutions, and institutions help in moulding the human beings, both have to go together. Now, a large number of people are coming here to get training and they will no doubt go out and spread on the basis of this training to other parts of India and may be to other parts of the world too. So, you are privileged to work in a very worthwhile institution which has done very good work and will no doubt do good work, better work in the future.

One difficulty we have in India among many things is that relating to students – we have extremely good talents but we have not got the opportunity to fully exploit them, due to lack of facilities which we can offer to these people. That is why students sometimes work in other countries because they get better facilities. That is gradually lessening, as we get improved facilities here. Obviously, we cannot afford to send all our bright young people abroad, not only from narrow nationalism but because obviously we want our country to develop and therefore have adequate facilities to train people within the country. And here in this Institute, I think in this particular line, you have got the facilities to work. I cannot compare these with others in the rest of the world because I have not troubled much about visiting statistical institutes elsewhere. Nor do I know about them. But I imagine and I am told that this Institute has a reputation amongst statistical institutes all over the world. And so you have facilities of working here which will grow. I wish you well and I hope you will take full advantage of these facilities to do worthwhile work and yourself grow in the process–that every person who does worthwhile work grows. It is only the person who does dull repetitive routine work which perhaps does not result in so much growth.

So I am happy to be here and to see you flourishing and hope you go on flourishing under Professor Mahalanobis' fatherly care.

127. TASK BEFORE THE SCIENTISTS AND EDUCATIONISTS*

(Inaugural speech at the conference of Scientists and Educationists at New Delhi on August 4, 1963)

I am grateful to you for inviting me here today, though I rather doubt if I can help you very much in your deliberations. All I can do is to encourage you and to express the goodwill and the earnest desire of the Government to see that science flourishes in India and grows and scientists have every opportunity to do good work. Dr. Kabir[1] has surveyed the field of our work here fairly comprehensively–what has been done, what is being done and to some extent, what he hopes will be done. Largely, I agree with what he has said.

A little more than five years ago, we passed the Scientific Policy Resolution. I was reading it today and I felt, if I may say so, that it was a good resolution, and that perhaps even if we sat down to draft it today, probably it would not be every different from what

* i) Nehru Memorial Museum and Library, Teen Murti House, New Delhi. ii) *Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi (1968), Vol. V, pp. 143-148.

1. Prof. Humayun Kabir, Union Minister of Scientific Research and Cultural Affairs, Government of India, New Delhi.

it was then. The resolution was a good one. The question that arises now is: how far have we lived up to it, acted up to it and implemented it. To some extent undoubtedly we have, perhaps not as fully as many of us had hoped and expected.

I think there is a general realisation in India about the importance of science and technology and it is growing. In our universities and special institutes more and more students take to technical and scientific subjects. That is true, and yet I do not suppose it will be true to say that the background of general thinking in India is governed by the scientific approach. Nor can it be done by some mandate of the Government. That has to come out of the educational process and by the industrial and technological changes that are coming about in the country. As a matter of fact, the two are closely allied—the actual changes that take place in the country and the education that brings them about, education and training.

There is one criticism that is often made about the resources – the financial resources that are put by for scientific work. Although we are giving more and spending more on scientific work than previously, it is, I suppose, true to say that even so we are rather slow-moving in that direction. And some of our scientific work may have suffered because of lack of money. Recently, some months back, a Committee was appointed, I think with Dr. Bhabha as Chairman, to look into this matter and to recommend both what is happening in scientific research and what more might be done and generally where possible to economise. The object of that Committee was really to encourage useful and profitable expenditure for scientific research although economy is important and was stressed. We did not want merely to say that so many crores of rupees would go into scientific research, but rather to have it examined and to say definitely how it should be done. That Committee, so far as I know, has not yet produced any report or recommendations. I do not know if they have even met; it is not a very hopeful sign. But I wish to assure you that in spite of our very considerable difficulties at the very present, because of the Emergency and for other reasons, the Government will not hesitate to supply more funds for scientific research, provided some kind of a reasonable approach is made. It is not quite enough merely to say generally "Give more funds". But if it is explained where more funds are required, I am sure and I have, in fact, been told by our Finance Minister, that he will certainly meet such demands wherever necessary. Perhaps, that might help in increasing our output and quality of work.

Ultimately, it is the educational apparatus behind all this that counts, especially the universities and specialised technical institutions. They are growing, I hope they are growing both in quantity as well as in quality. And behind that again lies the general level of mass education. During these days of Emergency, when very considerable burdens were cast upon us by defence, we decided that in spite of carrying those burdens we must not slacken in our efforts at development, Five Year Plans etc. Because that development itself was basic to any scheme for strengthening the country. And any kind of attempt to cut down on that would ultimately weaken the country or lessen the progress of the country towards strength. And in that scheme for development, I attach the greatest importance to education, although some people seem to think that useful as it is, it (education) is not so important as putting up a factory. I think I will sacrifice any number of factories, but I will not sacrifice human beings or their education. Because it is the human beings that set up factories and produce the things we want that count. The factory by itself is very useful, very desirable, but unless it has that impact on the human being, it will not be so useful. After all, what is our purpose in life? – certainly many purposes, raising the level of living and all that—I would put the producing of good trained human beings as the main purpose. It is the trained human beings that produce the rest. If you do not have the trained human beings, then you will get a lop-sided growth, and you will not

make as much progress as you should. Of course, trained human beings : that is a big thing to say. It is not merely the training, technological training, that you give the human being but other kinds of training also which enables him to think and to lead what might be called a good life.

The value of science is most important, as was stated in the Scientific Policy Resolution. But it is not complete by itself unless you use the term 'science' in the much wider sense than the word 'technology'. Today we see enormous changes being brought about by science and its ramifications. The whole context of life is changing. Even, as a matter of fact, looking back at the last half century with which - I have been more or less connected — some of you also — we see the enormous changes that have been brought about chiefly because of science and technology. And the pace of change grows. And I have no doubt that looking after another fifty years or even twenty-five years, you will see even greater changes — changes not something merely in the moon or in the space research, that may happen, but something affecting human life. And in order to participate in this movement, you have to build yourself up in the scientific and technological sphere.

There is always a possibility that this rather mad race may end in disaster. And because of that, people have sometimes condemned the advance of science in that particular direction. Well, we try to avoid that disaster and it has been a very happy sign that a step--which is not a very big step but which is a very important step--has been recently taken by the agreement between the United States, Soviet Union and the United Kingdom in regard to a partial ban on nuclear tests. By itself, it does not take one very far, but it is almost what might be said to be the crossing of a watershed in the direction of disarmament and the peaceful progress and perhaps at least towards limitation of arms and disarmament. We have, therefore, welcomed it very much and we hope that other steps will follow, so that by following these, science may progress more normally and not be so tied up to the wheels of the armament race.

So far as we are concerned, we are definitely committed both by our general planning approach and more particularly by what we have said about science, to encourage science and technology — encourage it not only in its various technical fields but all that lies behind it, the scientific temper, the scientific approach to life's problems. Unless we get hold of that and gradually function more and more according to the scientific temper, the advance we make may not be wholly good, because science is not merely training to do a job but a training to think in a particular way. That is highly important. It is not unusual for a competent scientist to be not much of the scientist outside his field of knowledge and not to apply scientific temper in other aspects of life.

And so we stand at, I think, what really is a watershed in history, watershed in science if you like. Are these advances that are being made ultimately going to be for the good of the humanity and our own people, even though they could lead to conflicts on a tremendous scale and to disaster? It is very difficult to prophesy, because all manner of factors come in, including the factor of the human beings. The human being is said to have advanced greatly and advanced in many ways, but in some way he remains very much of the devil and the brute in him is coming out. How is that to be controlled? It could be controlled if our approach was really scientific, but you enter into other regions than the normal definition of science when you talk about the control of human nature. Anyhow that is a big problem.

The more limited problem for us is to apply science and technology to solve the problems that we have to face — whether they are defence problems or what is basically more important, problems of development, production etc. And in this work I have no doubt the scientists can do a tremendous deal. Science is not limited to any particular nation, and any benefits that come should be enjoyed by all. Nevertheless, there is a certain im-

portance for science in a country which believes in not being wholly dependent on other countries, and has some capacity for self growth and self-reliance. We are developing that, I believe, in this country. We have to develop that spirit in other ways too, in industrial ways and in technological ways – not to be dependent on others, not to go on the band-wagon of others. No doubt, we get some advantage out of that, but we do not get the real advantage of doing things by ourselves. That is most important in every aspect of life – the capacity to do things by ourselves, to think and to act. No doubt, in our thinking we should be taking advantage of others' thinking too, but that should not mean being dragged or pushed around by others.

I hope that our science will be – all science will continue to be – international. But internationalism does not mean being dragged about hither and thither by others. We cooperate with others, and we get the benefit of what they have done and give them the benefit of what we do. That is all right. But it is not internationalism merely to become camp-followers of others and consider that we are very international. That applies to every aspect of activity, whether it is industry, science or technology. And there comes in the whole approach, educational approach and the opportunities to be given to our people to develop themselves, think for themselves, and give a push to all these activities themselves, no doubt in cooperation with others.

I believe that both the humanity as a whole and we in this country, are passing through a very big stage of change, of transition. It is rather a common thing to say that we are in a transitional age. We are always in a transitional age, but I think it is more true today than perhaps at any other time. And what we or others do in this age and in this generation and the next generation will make a tremendous difference to the future of the world and of our country.

We talk about the world and it is right that we should do so. In a way, we are shaping the world. All we can, we do is to shape, try to shape our own country. In doing that, we help the world too. In trying to work along these lines, we have to keep certain ideals in view. After all, as I said a little while ago, the main thing is the human being and not what plants or factories we may put up. They are put up there for the human beings. Human beings are not there just to feed a factory, but ultimately the factory is there to feed the human beings, or the plant. Therefore, the human aspect has always to be kept in mind and the growth of the human being. And all our social, scientific thinking should be governed by this. Our social approach to problems should also be governed by that.

In India, the differences between different parts of the country are extraordinary. Some parts are going through a fairly rapid change, industrial and even to some extent agricultural, though the latter not as much. Industrial changes, as somebody told me, reminded him of the Industrial Revolution coming in fairly rapidly. In other parts we live in the distant past. And our people in these parts are very, very backward in the sense of any amenities that they might have. There is always this problem of either concentrating on the more prosperous areas and thus getting good results out of them, or thinking a little more of the backward areas and pulling them up. I do not suppose you can solve it by any theoretical approach. You have to do both to some extent, almost always but especially in a democratic set-up. You cannot afford to have areas which are very backward, and where human beings suffer too much. It is painful even to think of it, or to see it and to satisfy yourself by saying that some big job is being done somewhere else. It does not take you very far. We have to try to do both. In doing all these tasks and indeed in considering the problem, the scientific approach is indeed sure to help.

We talk about planning. What is planning? Planning is a scientific approach to the problems that face us, to the national problems that face us, not leaving it just to chance and circumstance or the desires of individuals, each person pulling in a different way.

Having a planned approach means to work it out logically and scientifically. Of course, there are uncertain factors in it – the human being himself is an uncertain factor. There are urges and emotions; some urges and some emotions are good, some are bad. It is important to try to encourage the right urges and not the wrong ones. So essentially, it is the scientific approach to life's problems, to national problems, that constitutes planning which we have undertaken to do. That planning must have an ideal before it, some kind of an objective, a social objective – not a rigid objective but still some kind of a social objective towards which we go – and try to realise our social objective profiting by our experience, by trials and errors.

We are committed to the ways of peace and desire peaceful development. Unfortunately, we are being pulled more and more by dangers to our country, external dangers, which necessitate thinking more and more of defence. We have to do it, because a country which cannot defend itself can do precious little otherwise. Nevertheless, we must realise that our real ideal must be peace, peaceful settlement of problems and peaceful cooperation in the world, because there is no other hope for the world or for our country.

So, I have talked about various general matters, probably not the subjects that you are going to discuss. But perhaps it is a good thing to keep these broad aspects in view even when you think of more specific problems that confront you. Because, after all, all of us are engaged in a great adventure. We may be small parts of that enormous machine that is working, that is writing history and moulding India. But when we have a conception of being part of that big thing, then perhaps the work that we do also gets a slightly greater significance than individual effort which is cut off from the rest. Nothing is cut off from the rest of course, but we have to think more of the great things that have to be done, of which we may be but small agents. Those of us who have the benefit of some scientific and technical training have a greater responsibility than others. Because, after all, this is a scientific and industrial and technological age and we should utilise the opportunities that we have. We have to give back to the people, to the country, what we have received from it in the shape of training, education and other things, so that the heavy debt that we carry is paid back to our people. I hope scientists in this country will look upon their work from this larger point of view and more in the sense of a crusade than just a profession. I wish you well in your work and I hope your meeting here will help to solve these problems. *(Applause)*

128. SCIENTIFIC COOPERATION PROMOTES COOPERATION IN POLITICAL AND OTHER SPHERES*

(Speech on the occasion of the 8th International Conference on Cosmic Rays held at Jaipur on December 14, 1963)

I feel somewhat embarrassed on this occasion. It is not a usual thing with me, but the weight of scientific learning that is present here rather oppresses me–I have a kind of a feeling of inferiority complex. Fortunately, I have not got to read a paper to you on 'Cosmic Rays'. I suppose you had quite enough of these things during the last few days you have been

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

here. Dr. Bhabha referred to the part I have played in developing science and scientific work in this country. My part, needless to say, chiefly consisted of laying foundation-stones. I suppose that also has some importance though not a fundamental importance.

Although Dr. Bhabha has welcomed you on behalf of the Government of India, as I happen to be also a member of the Government I should like to also give my greetings to all of you, especially to our friends who have come from foreign countries, and to express, offer to you, my good wishes for all the work you have been doing here. You deal with Nature's forces, and try to understand them, control them and to some extent to mould them to your wishes, in order to create a future world. I am unfortunately tied up too much with the present, which is a very troublesome present--but sometimes one tries to get out of the present by thinking of the future. There is always a snag about it somewhere at the back of one's mind, the fear that future may not come at all because something happens in between. That too is a matter which I am sure worries you and you devote your energies to prevent that something happening which might come in the way of the development of the world as you, me and all of us desire--a peacefully progressing world, a friendly world in which people co-operate instead of quarrelling.

I suppose one of the great advantages of these conferences of scientists is that you meet in a friendly atmosphere, unconnected, I hope, with political issues and by this friendly co-operation you help in the advancement of science and in creating an atmosphere where perhaps people may co-operate in other spheres also. You know that we have started on a Decade of Development – UN has started it – which means co-operation of various countries, not only to help this development process, but to create an atmosphere of friendly co-operation. And, therefore, apart from the good work that you do, you help in the basic work of creating a congenial atmosphere in the political and like fields. It is noticed that the intervention of scientists in matters which are usually dealt with by politicians is all to the good. They (scientists) take it out of the spheres of emotional controversy into one of more objective thinking. As a rule, I suppose most scientists want a peaceful life and want the world to be peaceful in future so they can continue their work. Therefore, such conferences, meetings, are very helpful in showing to others that even countries which are not in good relation with each other, in the scientific field they can work together and co-operate.

I hope in this Decade of Development various processes involving co-operation will grow. Indeed, there is such a great deal of co-operation which takes place in the world automatically; otherwise, the world may probably collapse. One does not notice it since the newspapers give publicity much more to the possible conflicts than to the vast areas of co-operation that exist in the world. It is a good thing that the United Nations has emphasised the co-operative aspects, so that our minds may be attuned still more to this approach and help to rid us of the fears and apprehensions which normally press in upon us.

So, I am very glad you have met here in the city of Jaipur which was founded by a rather remarkable man, who lived during a period of turmoil and difficulties in India – empires breaking down. He showed firstly his ability in holding on to what he had got and not allowing the falling empire to crush him down. But apart from that, he was a famous astronomer and he sent a team of people for astronomical purposes to Europe and they went to various places there and brought information from there as to how astronomy was progressing. And he built – you might see here and elsewhere – enormous observatories, huge brick structures here and in Delhi and elsewhere. He was also a town-planner – Jaipur was planned by him two hundred and fifty years ago. His name was Jai Singh; that is why the city is called Jaipur.

I understand that you have finished with your labours here and will soon be departing for your own countries. I hope you will carry pleasant memories with you of your stay here and a good impression of India. Whilst here, you might have heard of our own little troubles, controversies and debates in Parliament which have not been very complimentary to some of us. It is a good thing and we have ourselves produced a book – a report, "A Mid-Term Reappraisal of the Five Year Plan" – which points out all our failings. It is a good thing that we point them out ourselves because we ought to know our failings if we have to

put an end to them. Others : they take advantage of what we have said about ourselves and about our work. They cannot find anything more to say. That is a sign of the way we work in our Parliament. The fact is that while we have failed in achieving some targets, we have achieved many others. Anyhow, we are determined to go ahead on the lines we have charted out for ourselves and on those lines we attach great importance to science which, after all, is a search for truth. It would be in the practical applications of that truth that science would benefit the people. I believe we made a good choice when we became independent and we laid stress on this. I hope this will continue and I also hope that we shall have the goodwill of all of you, especially our friends who come from foreign countries--for science is a matter of co-operation between different countries, different scientists, and not something which is to be confined to a particular area.

Dr. Bhabha has referred to some of my virtues, at any rate, some things that I am supposed to have done. As a matter of fact – well, I have tried to push things as much as I could – but whatever we have achieved is the work of a large number of people. Indeed, it could not be otherwise; you cannot get a huge country like India moving – four hundred and forty-five million people – without the efforts of a large number of people and without the goodwill of the millions of people who live here. The fact is that we have succeeded in one thing apart from others. When we became independent and even for a long time before that, we were stagnating in most spheres of activities, economic and others. We have broken through that period of stagnation, which is a considerable achievement. There is now a certain dynamism, in spite of our errors and failings, and where there is this dynamism one makes progress. We have made progress--I wish we had made more progress--and I hope we shall continue to do so and work.

Naturally, our interest is in India and in the people of India, so that they might get rid of their poverty and other forms of unhappiness. But apart from that, we are convinced searchers after peace--workers for peace. Partly because we have been conditioned that way in the past long period and partly because commonsense tells us that there is no other way if the world is to progress. I hope that every country realises that. There are people who work for and labour for peace, and they are growing in number. The people in general are naturally attached to that idea and I believe scientists are also generally devoted to it. So, I hope that we shall succeed – you and I and all the people of goodwill in the world shall succeed – in our efforts to promote peace, assure it and remove the causes that might come in the way.

I hope you will go back with pleasant memories and although the day of your journey back is still fairly far off, I wish you a happy travel and return.

129. IMPORTANCE OF FRIENDLY INTERNATIONAL COOPERATION IN INDIA'S DEVELOPMENT*

(Speech on the occasion of inauguration of the Indo-Swiss Training Centre at Chandigarh on December 18, 1963)

I am glad to be here to inaugurate this training centre — this Indo-Swiss Training Centre. Firstly, such training centres are good from the point of view of the progress of our country and secondly, they are the symbol of Indo-Swiss co-operation. We have launched a process of industrialising our country. The industrial revolution has come to our country and

* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

specially here in the North – in the Punjab – it is spreading apace. In the process of this, we must train our people adequately and take advantage of other countries which are more advanced than us.

Switzerland is a small country in Europe but a highly advanced country in many ways and for us to co-operate with Switzerland is very much to our advantage. I hope, therefore, that this co-operation between India which is a big country and Switzerland which is relatively a small country will grow. The importance of a country does not lie in its bigness in size – it lies in the quality of the people that that country possesses. So, it is a big thing that this training centre has been established here and I welcome the people who have come here from Switzerland to impart training in instruments which are so necessary for such kinds of work.

For this type of training the Punjab is perhaps specially suited and the people here are specially suited for this thing – because in the Punjab many people are mechanically-minded. They become mechanics easily and I suppose they will come to learn and also get to learn easily how to make precision instruments. This centre is meant not only for the Punjab but it is meant for the whole of India and people have come for training from other parts of India. But it is situated in the Punjab and, therefore, it will to some extent help Punjab to grow and establish a specialised industry.

I do not know if I can say very much on this occasion. I do not wish to repeat my joy and pleasure at the establishment of this Centre here with the help of our friends, the people of Switzerland, and I hope this will help in the process of change that is coming to India and especially to the Punjab. I hope that the cooperation between Switzerland and India will grow.

130. GOAL BEFORE THE MEDICAL PROFESSION*

(Speech at the second convocation of the All India Institute of Medical Sciences, New Delhi on April 15, 1964)

May I, to begin with, join you in your tribute you have paid to the Founder-President of this Institute, Rajkumari Amrit Kaur![1] In my mind this Institute is so intimately connected with her that I can hardly think of one without the other. Right from the beginning of this Institute she was constantly discussing this Institute with me and whenever any kind of difficulty arose, she came to me. It is a great pity that she is not here today, because as far as I remember, she was the first to invite me to come to the second convocation, which I gladly agreed to then. Now that the Institute has grown in size and quality — and I believe in quality — she would have rejoiced to see it as it is and it promises to be. After all, the whole purpose of this Institute is to maintain certain standards and quality, and I believe it is recognised that it has succeeded in doing so. In India, and perhaps even in the wider sphere, it stands out. It is an outstanding place as an Institute of post-graduate training. Looking through the various subjects which are taught here and the stress that is laid on quality, it is comforting to find that your Institute has not so much cared for quantity as for quality. It is essential that we should have higher standards at the top as these will determine the quality of work below to a large extent.

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* Nehru Memorial Museum and Library, Teen Murti House, New Delhi.

1. Rajkumari Amrit Kaur, Union Minister of Health, Government of India, New Delhi (1947-57) and Founder-President of the All India Institute of Medical Sciences, New Delhi.

Pandit Jawaharlal Nehru laying the foundation-stone of MRF Research Centre at Tiruvottiyur near Madras (June, 1963). Others seen in the picture are Shri T.T. Krishnamachari (Union Minister of Finance) and Shri K. Kamaraj (Chief Minister, Madras State).

Pandit Jawaharlal Nehru inaugurating the Indo-Swiss Training Centre at Chandigarh (December, 1963). Also seen in the picture are Sardar Partap Singh Kairon (Chief Minister, Punjab), Dr. S. Husain Zaheer (Director-General, CSIR) and Mr. F. Claus (Principal).

Pandit Jawaharlal Nehru delivering the convocation address at the Second Convocation of the All India Institute of Medical Sciences, New Delhi (April, 1964). Also seen on the dias are Dr. Zakir Hussain (Vice-President of India) and Dr. Sushila Nayar (Union Minister of Health).

India is a country with very old traditions in medicine. You have got some inscriptions behind me and in front of me, some of the ancient physicians and surgeons who made themselves renowned and whose services were wanted outside India too. The question often arises as to how we are to deal with them. It is clear that in their day they were very competent and advanced, and they have left a legacy behind which we treasure. At the same time, somehow or other, in later years we became rather tied up with old practices and not sufficiently alive to knowledge, to changing conditions, with science. But I suppose in modern times this Institute is closely allied to science, as it must be; but even so, there is no reason why it should not investigate some of the old methods, old practices, old approaches and try to profit by them, provided of course they fit in with the spirit of science which is the very basis of this Institute. I hope this Institute will do that, because I am sure that great men of the past were very wise although they did not have the advantage of scientific techniques and scientific knowledge. They were wise men and many, many things that they said would profit us provided they fit in with our modern scientific techniques.

I notice that one of your subjects is preventive and social medicine. That is particularly important in the modern age. In the old age – I suppose and I speak without knowledge – medicine was largely for curing the people who were ill. But later on, the idea of preventive medicine and social medicine has been taking root. And that is, and should be, the dominant function of the Institute and the people who go out of this Institute, because social medicine prevents those things happening which require treatment later on. I hope enough attention will be paid to the social aspects of medicine. Personally, I hope that the time will come when our State will be strong enough, and rich enough, to provide proper treatment to all, that is, medicine will become not merely a thing for those who could afford it but for everybody. To some extent, we are going in that direction and the process will continue till, I hope, it covers almost everybody in the country.

One thing that troubles me is that in spite of such fine institutes as this one, yet there are vast areas in this country, vast number of villages in rural areas, where the benefits of modern medicine do not reach and sometimes we are rather overwhelmed by the problem. So many people are wanted there – qualified physicians, surgeons and properly equipped institutions – and we have so few. It is obvious that, however good an institute like this may be, that is essential of course; one can only be satisfied if it reaches down to the villages and if thousands, hundreds of thousands of villages feel the impact of it. I do not know how we are going to train the people in such large numbers to go there; and I will suggest to you, those who are trained, have received the benefit of training at these special institutes, should always bear in mind the need of the people of India who live in the villages. Because they are in numbers as well as otherwise the real people of India and unless we know them, we do not function properly. And then how to deal with such vast numbers and how long it will take to train enough people to go there, is a difficult matter. Whether it is conceivable to have institutes at these villages, some kind of assistance to serve the community, bring up the real cases to experts or how to deal with it, I do not know. But something has to be done to bring modern medicine to the great majority of our people in the country.

I know that things are growing and medical colleges in India are producing more doctors. Even so, the rate is rather limited and most of them, I fear, prefer living in towns and cities and do not want to go to these odd villages, tribal areas, mountains etc. although I would have thought that the challenge of these areas, in mountains, in tribal areas, will appeal specially to men and women of enterprise and would draw them to them. It was suggested some time ago that all those graduates should, in the first year or two, function in some of these village areas or tribal areas and hills which otherwise do not attract people. I think it would be a good thing if they had that practice. It will be good not only for the place they go to but it will be good for them. They would get a human outlook, an outlook for under-

standing about their own people, and then apply it to wherever they may serve in the future. I do not know how far it is possible to do that, but I do not see why it should be difficult. The period may be considered by Directors and others but some period is desirable for people to do that. You have, I think, some social workers and organizations working in the villages, mostly in social medicine and adopting a village and helping it. That is good but something more is needed than taking a village, adopting it and working there. It is rather you should be adopted by the village, by the villagers and the people. That is more or less all I have to say to you.

I am grateful to all international organizations who have assisted this Institute. The Government of India has, of course, borne principally the burden of it and will continue to do so, because we are proud of this Institute and I want it to continue as an example to others in quality and in its pursuit of ideals. I congratulate all those who got various degrees here today and hope they will keep the ideals of the Institute always with them and specially keep these perceptions in mind which are placed before them, ethics of the highest order being part of your profession. I think you should remember, even though you deal with and you learn so much, that we have to learn from the great men of medicine and surgery, of science; that you have an ancient tradition in India of which we are proud; a tradition when the Caliph Haroun-ul-Raschid used to send for Indian doctors for treatment to Baghdad in the 9th century and the Indian doctors went there; when Takshashila which is in Pakistan now was a great university, a great school of medicine, the most respected in Asia. We should remember that and although there has been a break between that and modern medicine, it is a break which it should be our endeavour to bridge over and cover up. But nevertheless, the fact that we did excellent medicine in the past thousand years or more is something to remember and keep in perspective.

I congratulate you all – the Doctors and the Dean and others at this Convocation, at this Institute and I wish you all success.

ADDENDUM

The addendum contains Science-related material appearing in Volume 6 of the *Selected Works of Jawaharlal Nehru* (Second Series). This Volume appeared when the material in the publication was already being printed. (Ed.)

131. SCIENCE FOR THE PUBLIC GOOD*

*(Message dated April 22, 1948 sent on the occasion of foundation-stone laying ceremony of Central Leather Research Institute, Madras)**

I send my good wishes on the occasion of foundation stone laying ceremony of Leather Research Institute at Madras[1]. Each such ceremony is symbolic of foundations we are laying for great development of scientific research and application of science for public good. Indeed these are foundations strong and true of India of the future that we are building today. May science flourish in India and remove the many ills that our people suffer from.

132. FUNDAMENTAL RESEARCH**

(Remarks at a Cabinet meeting on May 19, 1948)

The Prime Minister whilst stressing the need for the formation of a Department of Scientific and Industrial Research[2] explained that this did not mean that the Ministries would have no right to have sections of scientific research in their respective fields. What was required was that fundamental research should also coordinate scientific research in the other Ministries. The question as to which of the existing institutions of scientific and industrial research should go to the new department was another matter and could be settled in consultation with the Ministries concerned.

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* i) *Selected Works of Jawaharlal Nehru* (Second Series), Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1987), Vol. 6, p. 348; ii) File No. 17(61)-PS/48-PMS.

1. Mr. Syama Prasad Mookerjee laid the foundation stone of the Central Leather Research Institute, Madras on April 24, 1948. This was the sixth in the chain of national laboratories set up by the Council of Scientific and Industrial Research.

** *Selected Works of Jawaharlal Nehru* (Second Series), Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1987), Vol. 6, p. 348. ii) Cabinet Secretariat Papers.

2. The Cabinet decided to set up a department to take over the Board of Atomic Research and the Council of Scientific and Industrial Research and appointed a committee with Nehru and four other ministers to decide as to which of the functions of the C.S.I.R. should be transferred to the Ministry of Industry and Supply.

133. RESEARCH ON ATOMIC ENERGY*

(Note for the Cabinet dated May 22, 1948 File No. 17(30)/47 PMS)

Any consideration of this matter involves a discussion of highly technical processes many of which are secret. If India is to make fairly rapid progress, this can only be done in co-operation with some other country which is fairly advanced in atomic research otherwise we shall remain on the lower rungs of the ladder while the rest of the world goes ahead. Dr. Homi Bhabha, the Chairman of our Atomic Energy Board, has recently toured about Europe and America and come in contact with eminent atomic energy scientists and Government representatives. Dr. S.S. Bhatnagar has also been in touch with scientists abroad more specially energy scientists who have recently built up a pile at Oslo. It appears from these contacts that it may be possible for us to have the cooperation of one or more countries in the development of atomic research in India. Probably we are not likely to get much cooperation from the U.S.A. The U.K., France and Norway may prove more cooperative.

2. Before we can proceed with the matter and discuss it in some precise form with foreign atomic energy organisations it is necessary to know what we propose to do in the matter. We have already passed an Atomic Energy Act. That was an essential step. We have an Atomic Energy Board. It may have to be considered whether for the purpose of atomic energy experiments a much smaller board may not be more desirable as secrecy is essential. However, this matter might be considered later.

3. The third question relates to funds. Some indication has to be given about the funds which can be made available not only this year but during the next two or three years. If Government are agreeable to making some such provision, then the Atomic Energy Board can go ahead with the preliminary work both in India and abroad.

4. It is difficult to say exactly what the minimum amount would be which would give a fairly good start to this kind of research in the country. The research can only be carried on by having a pile put up which will enable us to undertake all kinds of experiments needed for the utilisation of atomic energy for several purposes. It must always be remembered that atomic energy is not just meant for making bombs but is likely to be the basic form of energy used for social purposes in future. It is, therefore, essential for us to keep in the forefront in this matter or otherwise our social, economic and industrial development will suffer.

5. While it is not possible to indicate figures with any accuracy some attempt has to be made to calculate what amount of money might be needed. These provisional calculations lead to the following tentative results:

6. 1st year 1948-49 Rs. 10 lakhs

This expenditure will be largely on the training of personnel and for financing fundamental research on the subject of atomic physics and for obtaining such help from outside in personnel and equipment as may be necessary for the initial work. Terms

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* *Selected Works of Jawaharlal Nehru* (Second Series), Jawaharlal Nehru Memorial Fund, Teen Murti House, New Delhi (1987), Vol. 6, pp. 349-351.

will have to be negotiated with outside organisations on the basis of mutual cooperation.

2nd year 1949-50 Rs. 20 lakhs

This will be spent on the construction of a small pile as well as for the purchase of necessary equipment for advanced research.

3rd year 1950-51 Rs. 30 lakhs

This should complete the pile with the necessary uranium and graphite and heavy water.

4th year 1951-52 Rs. 30 lakhs

For further equipping the atomic pile and for distribution of radio-active isotopes and by-products for more research work in India.

7. These figures are, as has been pointed out, purely tentative and much will depend on future developments, political and scientific, but they give some idea of how much we might have to spend. We are proceeding, of course, on a small basis and considering the magnitude of the work the sums involved are relatively small. In America and elsewhere far bigger sums have been spent. We might say that in the course of the next 4 years a crore of rupees might have to be spent on this undertaking. For the present, however, we might set aside Rs. 10 lakhs for the current year.

8. One of the heavy items of expenditure is the cost of heavy water. We shall have to buy this from abroad at a high price, probably from Norway, but it would be desirable to produce heavy water in India and if this is done, our cost would be proportionately reduced. There is a proposal for the establishment of an Electro-Chemical Industries Research Institute at Karaikudi for which Dr. Sir Alagappa Chettiar has donated a sum of Rs.15 lakhs[1]. Such an institute might well undertake the manufacture of heavy water.

9. It is, therefore, suggested that Cabinet might express its approval of the proposal to erect a small pile in India for atomic energy research and should allot a sum of Rs. 10 lakhs for this year's expenses to that end. The Board of Atomic Energy should be assured that further sums as indicated will be forthcoming during the coming years.

10. The Atomic Energy Commission[2] or Board should not consist of more than 5 persons at the most or perhaps even less. This Board should function directly under the Prime Minister or as a part of the Department of Scientific Research which should for the present be under the Prime Minister.

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1. Nehru laid foundation stone of Electro-Chemical Research Institute at Karaikudi on July 25, 1948.
2. On August 15, 1948, under the Atomic Energy Act the Government set up an Atomic Energy Commission which was to work directly under the Prime Minister's guidance. H.J. Bhabha was appointed Chairman, S.S. Bhatnagar, Secretary and K.S. Krishnan, a member of the Commission.

Appendix - I

SOME OF THE OTHER SCIENTIFIC EVENTS WITH WHICH JAWAHARLAL NEHRU WAS ASSOCIATED

1937-1946

December 26, 1937	Message 'Science and Planning' to the Silver Jubilee session of the Indian Science Congress at Calcutta on January 3, 1938 (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 1-3).
November 27, 1946	Speech at the opening of an exhibition on Irrigation, Engineering and Research at New Delhi (*Selected Works of Jawaharlal Nehru*, Second Series, Nehru Memorial Fund, 1984, Vol. I, pp. 368-371).

1947

January 3, 1947	Presidential address at the 34th session of the Indian Science Congress at Delhi (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 4-10).
January 8, 1947	Elected as first President of the Association of Scientific Workers of India (ASWI) at its Annual General Meeting at Delhi.
January 13, 1947	Remarks at the Mineral Conference at New Delhi (*The Hindu*, Madras, January 14, 1947).
August 1, 1947	Elected Fellow of the National Institute of Sciences of India at a meeting of the Council at Bombay (*The Statesman*, New Delhi, August 2, 1947).

1948

January 4, 1948	Re-elected President of Association of Scientific Workers of India (ASWI) for the year 1948 at the Annual General Meeting of the Association at Patna (*The Amrit Bazar Patrika*, Calcutta, January 7, 1948).
June 1, 1948	Inaugural address at the third session of the United Nations Economic Commission for Asia and the Far East (ECAFE) at Ootacamund (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1967, Vol. I, pp. 306-315.
June 1, 1948	A new Department of Scientific Research in the Government of India, created under Jawaharlal Nehru (*The Tribune*, June 2, 1948).

N.M.M.L., New Delhi – *Nehru Memorial Museum and Library, Teen Murti House, New Delhi.*

October 4, 1948	Inaugural speech at the first meeting of the Regional Committee of the World Health Organisation (WHO) for South-East Asia at New Delhi (Regional Office, WHO, New Delhi; *Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1967, Vol. I, pp. 345-347).
October 23, 1948	Luncheon meeting with eminent British scientists at London including Sir Henry Dale, Sir Alexander Fleming and Prof. A.V. Hill (*The Hindustan Times*, New Delhi, October 25, 1948).
November 10, 1948	Inaugural speech at the Asian Regional Conference of the International Meteorological Organisation at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1967, Vol. I, pp. 322-324).
November 23, 1948	Speech at the South-East Asia Regional Air Navigation Meeting of the International Civil Aviation Organisation at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1967, Vol. I, pp. 348-352).
December 5, 1948	Speech at the nineteenth annual meeting of the Central Board of Irrigation at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1967, Vol. I, pp. 83-90).
	1949
January 3, 1949	Inaugural address at the 36th session of the Indian Science Congress at Allahabad (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 11-15).
January 4, 1949	Foundation stone laying of J.K. Institute of Applied Physics in Muir Central College Building, Allahabad (*J.K. Review*, Vol. 16, Issue 2, page x).
April 9, 1949	Inaugural address at the First Conference of the Indian National Commission for Cooperation with UNESCO at New Delhi (*Report of the Session of the First Conference of the Indian National Commission for Cooperation with UNESCO*, April 9-10, 1949, Ministry of Education, Government of India, New Delhi, pp. 3-8).
November 5, 1949	Visited Princeton University in New Jersey (USA) and met Professor Albert Einstein at his residence. Later, met Prof. Robert Oppenheimer, the atomic scientist and head of the Institute of Advanced Scientific Studies and had lunch at his residence (*The Sunday Hindustan Standard*, Calcutta, November 6, 1949).
	1950
January 2, 1950	Inaugural address at the 37th session of the Indian Science Congress at Poona (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 16-18).

February 12, 1950	Address to the Institution of Engineers (India), Central India Centre, at New Delhi (*The Hindustan Times*, New Delhi, February 13, 1950).
November 7, 1950	Opening of Gliderdrome at Poona under the auspices of Indian Gliding Association (*The Times of India*, Bombay, November 8, 1950).

1951

January 2, 1951	Inaugural address at the 38th session of the Indian Science Congress at Bangalore (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 19-26).
January 16, 1951	Meeting with Prof. J.D. Bernal, British Physicist, at London (*The Hindustan Times*, New Delhi, January 17, 1951).
January 18, 1951	Meeting with Prof. Frederic Joliot Curie, Nobel Laureate, French Atomic Physicist at Paris (*The Free Press Journal*, Bombay, January 19, 1951).
January 31, 1951	Visit to the Research Laboratories and the Textile Research Laboratory of Gujarat University, Ahmedabad (*The Hindustan Times*, New Delhi, February 1, 1951).
March 24, 1951	Address at the Indian National Commission for Cooperation with UNESCO at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1963, Vol. II, pp. 368-374).
November 27, 1951	Inaugural speech at opening of the Medical College at Trivandrum (*The Mail*, Madras, November 28, 1951).
December 19, 1951	Address to officials of the Indian Council of Agricultural Research, New Delhi (*The Statesman*, New Delhi, December 20, 1951).
December 20, 1951	Address at the UNESCO Symposium on the "Concept of man" at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1963, Vol. II, pp. 379-385).

1952

January 2, 1952	Address at the 39th session of the Indian Science Congress at Calcutta (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 27-32).
January 2, 1952	Visit to the Indian Association for the Cultivation of Science, Calcutta, (Director, Indian Association for the Cultivation of Science, Calcutta).

January 2, 1952	Visit to the Central Glass and Ceramic Research Institute, Calcutta (*The National Herald*, Lucknow, January 4, 1952).
March 2, 1952	Visit to the Central Fuel Research Institute, Jealgora, Dhanbad (*The Hindustan Times*, New Delhi, March 3, 1952).
March 3, 1952	Foundation-stone laying of the main building of the Indian Institute of Technology, Kharagpur (*The Hindustan Times*, New Delhi, March 4, 1952).
September 25, 1952	Address to the scientists and staff of the Central Laboratories for Scientific and Industrial Research, Hyderabad-Deccan (Director, Regional Research Laboratory, Hyderabad-Deccan).
October 9, 1952	Address at the Madras Institute of Technology, Chromepet, Madras (*The Hindu*, Madras, October 10, 1952).
October 10, 1952	Foundation-stone laying of Cancer Institute, Madras, and donation of Rs.15,000/- to the Institute (Director, Cancer Institute, Madras).

1953

January 2, 1953	Speech at the 40th session of the Indian Science Congress at Lucknow (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 33-39).
July 17, 1953	Visit to the Central Drug Research Institute, Lucknow (*The Statesman*, New Delhi, July 18, 1953).
November 8, 1953	Address to the technical experts at the Bhakra-Nangal Project, Nangal (*The Times of India*, New Delhi, November 9, 1953).
December 13, 1953	Visit to the Indian Statistical Institute, Calcutta (*the Indian Nation*, Patna, December 14, 1953).
December 14, 1953	Opening of new building of Marine Engineering College at Behala, Calcutta (*The Amrit Bazar Patrika*, Calcutta, December 15, 1953).

1954

January 2, 1954	Inaugural address at the 41st session of the Indian Science Congress at Hyderabad (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 40-45).
January 9, 1954	Inaugural address at the conference on the Indian National Commission for Cooperation with UNESCO, January 9-14, 1954 at New Delhi (*The Statesman*, New Delhi, January 10, 1954).

February 1, 1954	Inaugural address at the Regional Conference of Town Planners and Architects from eight South-East Asian Countries at New Delhi (*The Statesman*, New Delhi, February 2, 1954).
February 8, 1954	Inauguration of the Medical College Hospital at Ulloor near Trivandrum (*The Statesman*, New Delhi, February 10, 1954).
April 10, 1954	Opening of the main building of the Ahmedabad Textile Industries Research Association, Ahmedabad (*The Statesman*, New Delhi, April 11, 1954).
July 2, 1954	Visit to Shalur Wheat and Potato Development Centre, Narkanda (*The Hindustan Times*, New Delhi, July 3, 1954).
October 13, 1954	Speech at the inaugural meeting of the Co-ordination Board of Ministers for River Valley Projects at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1958, Vol. III, pp. 4-7).
November 3, 1954	Opening of the Dr. B.C. Roy Polio Clinic, Calcutta (*The Hindustan Times*, New Delhi, November 4, 1954).

1955

January 4, 1955	Inaugural address at the 42nd session of the Indian Science Congress at Baroda (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 46-49).
April 2, 1955	Convocation address at the Golden Jubilee Celebrations of the Indian Agricultural Research Institute, New Delhi (*The Hindu*, Madras, April 3, 1955).
June 4, 1955	Visit to the Central Water and Power Research Station, Khadakvasla (*The Indian Express*, New Delhi, June 6, 1955).
June 22, 1955	Visit to Russia's Atomic Power Station near Moscow (*The Hindustan Times*, New Delhi, June 25, 1955).
July 1, 1955	Visit to Yugoslav Institute of Nuclear Research "Boris Kidric", Vinca (Yugoslavia) (*The Statesman*, New Delhi, July 2, 1955).
November 25, 1955	Inauguration of the International Training Centre for Water Resources Development at Roorkee University (*The Hindustan Times*, New Delhi, November 26, 1955).
December 8, 1955	Visit to the Radium Institute and Cancer Hospital, Hyderabad-Deccan (*The Hindustan Times*, New Delhi, December 10, 1955).

1956

January 2, 1956	Inaugural address at the 43rd session of the Indian Science Congress at Agra (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 50-53).
January 7, 1956	Speech at the meeting of the Standing Committee of the National Development Council at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1958, Vol. III, pp. 76-83).
February 2, 1956	Address to the United Nations Economic Commission for Asia and the Far East (ECAFE) Session at Bangalore. (N.M.M.L., New Delhi).
April 4, 1956	Opening of J.K. Institute of Applied Physics, Allahabad (*The Statesman*, New Delhi, April 5, 1956).
April 21, 1956	Opening of the new building of Indian Institute of Technology, Kharagpur and delivery of the first convocation address (*The Amrit Bazar Patrika*, Calcutta, April 22, 1956).
May 2, 1956	Address to the UNESCO Mission on Technical Aid Programme at New Delhi (*The Hindustan Times*, New Delhi, May 4, 1956).
November 5, 1956	Speech at the inauguration of the tenth annual session of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1958, Vol. III, pp. 499-504).

1957

January 14, 1957	Inaugural address at the 44th session of the Indian Science Congress at Calcutta (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, pp. 54-59).
January 16, 1957	Inauguration of the Institute of Post Graduate Medical Education and Research, Calcutta (*The Amrit Bazar Patrika*, January 17, 1957).
June 16, 1957	Visit to Danish Atomic Research Station at Risee near Copenhagen. Taken round by Prof. Niels Bohr, the nuclear physicist (*The Hindustan Times*, New Delhi, June 17, 1957).
September 20, 1957	Visit to the Central Food Technological Research Institute, Mysore (*The Hindu*, Madras, September 21, 1957).
October 8, 1957	Visit to Hiroshima, Japan (*The Hindu*, Madras, October 9, 1957).

November 27, 1957 — 'Ban Nuclear Tests' — a statement to the Press, New Delhi (*Jawaharlal Nehru – An Anthology*, Oxford University Press, Delhi, 1980, pp. 428-429).

1958

January 6, 1958 — Inaugural address at the 45th session of the Indian Science Congress at Madras (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 60-67).

January 6, 1958 — Meeting with Mr. Pavic Savic, Vice-President of the Nuclear Energy Commission of Yugoslavia at Madras (*The Statesman*, New Delhi, January 7, 1958).

January 24, 1958 — Address to the Resident Representatives and Experts of the U.N. Technical Assistance Board at New Delhi (*The Indian Express*, January 25, 1958).

February 15, 1958 — Inauguration of the third session of Indian Board for Wild Life at New Delhi (*The Times of India*, New Delhi, February 16, 1958).

March 2, 1958 — Visit to the National Metallurgical Laboratory, Jamshedpur (Director, National Metallurgical Laboratory, Jamshedpur).

April 4, 1958 — 'Halt to H-Bomb Tests' — Press Conference at New Delhi (*The Hindu*, Madras, April 5, 1958).

May 18, 1958 — Inaugural address to the seminar held under the auspices of the Contributory Health Service Scheme (CGHS), New Delhi (*The Indian Express*, May 19, 1958).

August 2, 1958 — Visit to the Oil and Natural Gas Commission's, Department of Palaeontology, Dehradun (*Hindustan Standard*, Calcutta, August 3, 1958).

August 24, 1958 — Inauguration of tenth International Conference of Agricultural Economists organised by Indian Society of Agricultural Economics at Mysore (*The Hindu*, Madras, August 25, 1958).

October 1, 1958 — Inauguration of the Sikkim Research Institute of Tibetology, Gangtok (Director, Sikkim Research Institute of Tibetology, Gangtok).

December 25, 1958 — Message to the Golden Jubilee Celebrations of Calcutta Mathematical Society (*The Amrit Bazar Patrika*, Calcutta, December 26, 1958).

December 27, 1958 — Message to the 20th annual conference of the Association of Surgeons in India at Vishakhapatnam (*Hindustan Standard*, Calcutta, December 27, 1958).

1959

January 21, 1959	Inaugural address at the 46th session of the Indian Science Congress at Delhi (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 68-72).
February 4, 1959	Visit to the Raman Institute, Bangalore (*The Times of India*, New Delhi, February 5, 1959).
February 22, 1959	Azad Memorial Lecture delivered at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1964, Vol. IV, pp. 1-7).
February 27, 1959	Laying the foundation-stone of the Science Laboratory of the Punjab University, Chandigarh (*The Times of India*, New Delhi, February 28, 1959).
March 1, 1959	Visit to the National Botanic Gardens, Lucknow (*The National Herald*, Lucknow, March 2, 1959).
March 9, 1959	Laying the foundation-stone of a theatre-cum-museum which would have an artificial planetorium with revolving copper dome, Bombay (*The Times of India*, Bombay, March 10, 1959).
March 9, 1959	Visit to the Atomic Energy Establishment – Canada-India Reactor, the uranium plant and Apsara and Tata Institute of Fundamental Research, Bombay (*The Free Press Journal*, Bombay, March 10, 1959).
March 10, 1959	Laying the foundation-stone of the main building of Indian Institute of Technology, Powai Lake, Bombay (*The Bombay Chronicle*, Bombay, March 11, 1959).
March 16, 1959	Inauguration of the Third Asian Malaria Conference at New Delhi (*The Hindustan Times*, New Delhi, March 17, 1959).
March 17, 1959	Speech at the Seminar and Exhibition of Architecture at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1964, Vol. IV, pp. 175-176).
April 11, 1959	Address at the meeting of the National Productivity Council at New Delhi (N.M.M.L., New Delhi).
May 21, 1959	Address to the doctors and students of the All India Institute of Medical Sciences, New Delhi (*The Hindustan Times*, New Delhi, May 22, 1959).

August 5, 1959 — Message to the opening session of the World Convention against Nuclear Weapons, Hiroshima (Japan) (*The Hindu*, Madras, August 9, 1959).

October 13, 1959 — Speech while inaugurating the Science Block of the Engineering College, Tirupati (N.M.M.L., New Delhi).

October 31, 1959 — Laying the foundation-stone of National Council of Applied Economic Research, New Delhi (*The Statesman*, New Delhi, November 1, 1959).

December 1, 1959 — Inaugural address to U.N. Seminar on Management of Public Industrial Enterprises in the ECAFE Region at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1964, Vol. IV, pp. 131-133).

December 5, 1959 — Address to 11th General Conference of International Federation of Agricultural Producers at New Delhi (*The Hindustan Times*, New Delhi, December 6, 1959).

December 11, 1959 — Speech at the World Agriculture Fair at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1964, Vol. IV, pp. 434-435).

1960

January 2, 1960 — Visit to the Atomic Energy Establishment, Canada-India Reactor, and ZERLINA reactor under construction (*The Statesman*, New Delhi, January 3, 1960).

January 3, 1960 — Inaugural address at the 47th session of the Indian Science Congress at Bombay (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 73-74).

January 25, 1960 — Inauguration of the joint conference of the Association of Physicians and Pediatricians, the Cardiological and Neurological Societies and the Indian Association for Chest Diseases at the All India Institute of Medical Sciences, New Delhi (*Hindustan Standard*, Calcutta, January 26, 1960).

February 5, 1960 — Inaugural address at the 40th Annual General Meeting of the Institution of Engineers (India) at New Delhi, (N.M.M.L., New Delhi).

September 15, 1960 — Address inaugurating the Birth Centenary Celebrations of Dr. M. Visveswaraya at Bangalore (N.M.M.L., New Delhi).

September 16, 1960 — Address at the National Tuberculosis Institute, Bangalore, (N.M.M.L., New Delhi).

December 16, 1960 — Inaugural address at the Conference of Indian Industrial Leaders organised by National Productivity Council and International Labour Organisation (ILO) at New Delhi (*The Hindu*, Madras, December 17, 1960).

1961

January 16, 1961 — Inauguration of the India-Canada Reactor at Trombay (*The Indian Express*, New Delhi, January 17, 1961).

February 7, 1961 — Inaugural address to 14th World Health Assembly at New Delhi (*The Hindustan Times*, February 8, 1961).

February 26, 1961 — Opening of the first block of the new building of Maulana Azad Medical College, New Delhi (*The Indian Express*, New Delhi, February 27, 1961).

March 2, 1961 — Inauguration of the Prototype Production and Training Centre set up through Indo-German collaboration, Okhla Industrial Estate, New Delhi (*The Statesman*, New Delhi, March 3, 1961).

March 24, 1961 — Presentation of the first Bhatnagar Memorial Award to Dr. K.S. Krishnan at New Delhi (*The Statesman*, New Delhi, March 25, 1961).

May 14, 1961 — Address to the cadets at National Defence Academy, Khadakvasla (*The Indian Express*, May 15, 1961).

August 27, 1961 — Inauguration of Indian Parliamentary Science Committee in the Central Hall of Parliament House, New Delhi (*The Hindu*, Madras, August 28, 1961).

October 6, 1961 — Visit to the Observatory at Kodaikanal (*The Hindustan Times*, New Delhi, October 7, 1961).

November 23, 1961 — Inauguration of the conference on Medical Education convened by the Medical Council of India at New Delhi (*The Hindustan Times*, November 24, 1961).

December 14, 1961 — Speech at the centenary celebrations of the Archeological Survey of India and the International Conference of Asian Archaeology at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1964, Vol. IV, pp. 179-181).

December 19, 1961 — Inauguration of the Indian Academy of Medical Sciences at New Delhi (*The Indian Express*, New Delhi, December 20, 1961).

December 20, 1961 — Inauguration of the first conference of the Central Technical Advisory Council on Statistics at New Delhi (*The Hindustan Times*, New Delhi, December 21, 1961).

1962

January 3, 1962	Inaugural address at the 49th session of the Indian Science Congress at Cuttack (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 75-82).
July 14, 1962	Speech at the inauguration of the Visvesvaraya Industrial and Technological Museum, Bangalore (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1964, pp. 451-452).
October 14, 1962	Inauguration of the Ceylon Ayurvedic Research Institute, Navinna, Colombo (*The Hindu*, Madras, October 15, 1962).
October 15, 1962	Address to the Ceylon Association for the Advancement of Science, the University of Ceylon, Colombo (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 93-107).
November 4, 1962	Address to the meeting of the National Development Council at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1964, Vol. IV, pp. 152-157.
November 15, 1962	Laying the foundation-stone of the Institute of History of Medicine and Medical Research, Tughlakabad (*The Statesman*, New Delhi, November 16, 1962).

1963

January 6, 1963	Inauguration of the Communication Centre and Electronics Laboratory of the Police Radio Section, Mahanagar, U.P. Police Radio Section, Lucknow (*The National Herald*, Lucknow, January 7, 1963).
March 13, 1963	Inauguration of the Gandhi Medical College, Bhopal (*The Nagpur Times*, Nagpur, March 15, 1963).
April 24, 1963	Inauguration of the "World Health House", a new building of World Health Organisation (WHO), New Delhi (*The Times of India*, New Delhi, April 25, 1963).
July 2, 1963	Opening of the Chest Clinic and laying foundation-stone of T.B. Hospital at Barrackpore. Also foundation-stone of Dr. B.C. Roy Casualty Block of R.G. Kar Medical College Hospital at Belgachia, Calcutta (*The Hindustan Standard*, Calcutta, July 3, 1963).
July 7, 1963	Inauguration of the Institute of Post Graduate Medical Education, Chandigarh (*The Times of India*, New Delhi, July 8, 1963).
July 8, 1963	Inauguration of the Agricultural University, Ludhiana (*The Indian Express*, New Delhi, July 9, 1963).

July 15, 1963 — Visit to the "Flying Lab." - U.S. Weather Plane – at Flying Club, Delhi (*The Statesman*, New Delhi, July 16, 1963).

October 7, 1963 — Inaugural address at the 50th session of the Indian Science Congress at Delhi (*Jawaharlal Nehru on Science*, N.M.M.L., New Delhi, 1986, pp. 83-90).

December 15, 1963 — Laying of the foundation-stone of Central Jalma Institute for Leprosy, Agra (*The Hindustan Times*, New Delhi, December 16, 1963).

1964

January 3, 1964 — Speech at the Conference of Ministers of Irrigation and Power at New Delhi (*Jawaharlal Nehru's Speeches*, Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi, 1968, Vol. V, pp. 137-138).

January 13, 1964 — Donation of a sum of Rs.70,000/- to the Institute of Mathematical Sciences, Madras, for meeting expenses of visiting professors from foreign countries (*The Hindustan Times*, New Delhi, January 15, 1964).

Appendix II

SOME OF THE SCIENTIFIC BOOKS READ OR REFERRED BY JAWAHARLAL NEHRU

1. *Science and the Infinite* by Sydney Klein
2. *Epitome of Domestic Medicine* by Lawrie
3. *The Outline of History* by H.G. Wells
4. *Antiquities of India* by Dr. Barnett
5. *Elementary Algebra*
6. A book on Einstein's Theory
7. Science Primers: Physical Geography and Geology
8. *Population of India* by Prof. Brij Narain
9. *Short Course of Economic Science* by Bogdanoff
10. *The Triumphant Machine* by R.M. Fox
11. *Impact of Sciences on an Old Civilization* by Prof. Soddy
12. *ABC of Relativity* by Bertrand Russell
13. *Life of the Bee* by Maeterlinck
14. *Life of the White Ant* by Maeterlinck
15. *Life of the Ant* by Maeterlinck
16. *Science in the Changing World* by Aldous Huxley
17. *The Science of Life* by H.G. Wells
18. *The New Background of Science* by Sir James Jeans
19. *Indian Defence Problem* by Capt. G.V. Modak
20. *The Shape of Things to Come* by H.G. Wells
21. *Sex Habits* by Suschke and Jacobsohn
22. *The Work, Wealth and Happiness of Mankind* by H.G. Wells
23. *Autobiography* by H.G. Wells 2 Vols.
24. *Last and First Men* by Olaf Stapledon
25. *Freedom and Organization* by Bertrand Russell
26. *Adventures of Ideas* by A.N. Whitehead
27. *Possible Worlds* by J.B.S. Haldane
28. *Science and Education in the U.S.S.R.* by A. Pinkevich
29. *Mysterious Universe* by Sir James Jeans
30. *Flowering Earth* by D.C. Peather
31. *Wind, Sand and Stars* by Antonie de Saint Exupery
32. *Seven Pillars of Wisdom* by E.O. Lawrence
33. *Science for the Citizen* by L. Hogben
34. *Race, Reason and Rubbish* by G. Dahlberg
35. *You Can't be too Careful* by H.G. Wells
36. *Heredity and Politics* by J.B.S. Haldane
37. *Nature of the Physical World* by Sir A. Eddington
38. *Religion without Revelation* by Julian Huxley
39. *Mathematical Recreations* by M. Kraitchik
40. *Interglossa* by L. Hogben
41. *Indigo* by Christine Weston
42. *On Living in a Revolution* by Julian Huxley
43. *Reshaping Man's Heritage* by Julian Huxley *et al*
44. *What Happened in History* by Vere Gordon Childe

45. *The A.B.C. of Psychology* by Charles Kay Ogden
46. *The Universe in Space and Time* by George Van Den Bergh
47. *The Renaissance of Physics* by Karl Kelchner Darrow
48. *The Frontiers of Science* by C.T. Chase
49. *Science in Progress* (George Alfred Baitsell Ed.)
50. *Growth and Form* by Sir D.W. Thompson
51. *The Art of Seeing* by Aldous Huxley
52. Book on *Indian Birds* by Salim Ali
53. *Mathematics for the Million* by L. Hogben
54. *The Social function of Science* by J.D. Bernal

Appendix III

JAWAHARLAL NEHRU IN PRISON

S.No.	*Dates of imprisonment*	*Period* Y.	m.	d.	*Place*
1.	6 December 1921 to 3 March 1922	-	2	26	District Jail, Lucknow
2.	11 May 1922 to 20 May 1922				District Jail, Allahabad
	21 May 1922 to 30 January 1923	-	8	20	District Jail, Lucknow
3.	19 September 1923 to 4 October 1923	-	-	15	Central Jail, Nabha State
4.	14 April 1930 to 11 October 1930	-	5	28	Naini Central Prison, Allahabad
5.	19 October 1930 to 26 January 1931	-	3	8	Naini Central Prison, Allahabad
6.	26 December 1931 to 5 February 1932				Naini Central Prison, Allahabad
	6 February 1932 to 6 June 1932				Bareilly District Jail, Bareilly
	6 June 1932 to 23 August 1933				District Jail, Dehradun
	24 August 1933 to 30 August 1933	1	8	5	Naini Central Prison, Allahabad
7.	12 February 1934 to 12 August 1934	-	6	1	Presidency Jail, Calcutta Alipore Central Jail, Calcutta District Jail, Dehradun
	12 August 1934 to 23 August 1934		Parole		
	23 August 1934 to 3 September 1935	1	-	12	Naini Central Jail, Allahabad Almorah District Jail, Almorah
8.	31 October 1940 to 4 December 1941	1	1	5	Gorakhpur Prison, District Jail, Dehradun Lucknow District Jail, Lucknow District Jail, Dehradun
9.	9 August 1942 to 27 March 1945				Ahmednagar Fort, Bombay Province
	28 March 1945 to 10 June 1945				Bareilly District Jail, Bareilly
	11 June 1945 to 15 June 1945	2	10	7	Almorah District Jail, Almorah
		8	11	7	

(8 Years 11 months and 7 days)

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