

ORIGIN OF INDIA'S NATIONAL SCIENCE POLICY:
M.L. SIRCAR TO M.K. GANDHI, 1875-1935*

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(Received 21 October 1991)

The fact that the national government in free India followed a perceptibly conscious and progressively planned policy towards science and technology (S & T) soon after Independence is not without historical antecedents. The urge to use S & T for national welfare and reconstruction had begun more than a century before the country became free. This paper seeks to string together the early efforts that manifested this urge and sustained it for creating a national opinion in favour of harnessing S & T for development. Viewed in the background of the colonial rule in the country, effort has been made here to study a range of indigenous endeavours that went into the making of a broad opinion with distinct priorities and orientation which influenced and fashioned ultimately the post-Independence policies. One of the major findings of this inquiry is that the long-standing controversy on whether to accept and use indigenous or Western science and technology was finally resolved by the mid-1930s in favour of the latter, whereafter the question was not whether but how to use modern science and technology for the development of the country.

The purpose of this paper is to trace the early origin of India's national science policy. The story begins with Mahendralal Sircar (1833-1904), the founder of the Indian Association for the Cultivation of Science (IACS), and ends with Mohandas Karamchand Gandhi (1869-1948), the charismatic national leader and the hero of India's freedom struggle. The former was one of the first Indians to call for promoting science for national development, and the latter was one of the last to fight, about half a century after Sircar, to hold back the march of Western science and technology on the Indian soil, in an attempt to revive the indigenous sciences and technology and harness them for the progress of the country. In between these two events, effort is made in this study to reconstruct the course of evolution of the indigenous response to science and technology that ultimately contributed towards the formation and evolution of science policy of the national government in free India.

This inquiry thus seeks to answer such questions as: What were the chief factors encouraging the Indian response to modern science and technology as a means of progress? What were the nature and scope of this response? How did Indians look at their own traditional sciences and arts in this connection? And, when it came to choosing between the two — Western and indigenous — how and in whose favour did

* This paper is dedicated to my brother, Mr Dharma Nath Sinha, who first introduced me to the world of science and its subject matter.

An earlier version of this paper was presented at the 40th Annual Session of the Indian History Congress held at Goa in November 1987.

they respond? A study of the group activities as carried out by scientific societies and other organizations, including political parties and academic institutions, together with the efforts by individuals, should be able to provide answers to some such questions.

DEVELOPMENTS UP TO SWADESHI

The earliest stand taken by Indians on the question of popularising and disseminating modern science may be traced to the days of the socio-cultural awakening of the last century or even earlier¹. After Raja Rammohan Roy took initiative in this direction in the 1820's in Bengal², efforts were made to create organized forums like societies for promoting and popularising modern science in other parts of the country too³. For this purpose, an Educational Committee was constituted at Delhi College, Delhi, as early as 1835⁴; the Aligarh Scientific Society was established in 1865⁵; and the Bihar Scientific Society was founded at Mazaffarpur in 1868⁶. Though the basic aim behind the activities of these societies was to acquaint Indians with Western science through translation of Western works on the subject into Indian languages, commentaries and lectures, a clear concern for using science for national regeneration was yet to find a strong advocate.

That was soon found in M.L. Sircar who took up the cause of modern science and clearly visualised its potentialities for the progress of the country⁷. By 1869, he was emphasizing the desirability of a national institution for the cultivation of sciences by the natives of India⁸; by 1875, he had already had in mind a project for science association for Indians⁸; and, finally he succeeded in 1876 in founding the Indian Association for the Cultivation of Science at Calcutta⁹. Sircar realized that science was the most powerful instrument of modern civilization ... [and he] desired that Indians should cultivate science on their own not only for their economic betterment but also for self-regeneration¹⁰. The foundation of this Association was a landmark in the process of cultivating modern science with indigenous support. It differed from earlier societies in that it carried out public demonstration of scientific experiments besides lectures, and initiated research work to help the Indian genius flourish in future. C.V. Raman, one of its creations, came up to the aspirations of the founder of the Association and proved the potentialities of Indian scientists by winning the Nobel Prize in 1930¹¹.

But Sircar was not satisfied only with the establishment of IACS and its immediate goals. He was always in search of a science which could serve the national needs and aspirations more appropriately. Even though there could not be a national science exclusive to India, the question of viability and appropriateness in the socio-economic milieu of the country deserved attention while promoting the sciences. This was perhaps an important reason why Sircar gave up his roaring medical practice in allopathy and became a staunch supporter of homoeopathy¹². For, the latter was not only cheap enough to be within the reach of most Indians, but its holistic approach to the disease was equally in tune with the Indian psyche.

Apart from the endeavours of M.L. Sircar, a national opinion on science and technology was formed and shaped also by the ideas and efforts of others. A large body of literature on the subject appeared in the form of articles in journals, books and

memoranda throughout the second half of the 19th century and thereafter. For the 19th century, mention in this regard may be made of the writings and speeches, besides those of M.L. Sircar, of such men as P.N. Bose¹³, Ramendra Sundar Trivedi¹⁴, Aukhoy Dutt¹⁵, etc. While the English language journals published articles on science relating to subjects like education, economy and health, several journals exclusively devoted to science appeared in Bengali. They included *Vigyan Kaumudi*, *Vigyan Darpan* and *Chikitsa Darshan*¹⁵. A thorough research should be able to explore such literature also from other areas of the country, particularly from Maharashtra and Tamil Nadu¹⁶. The native opinion on the subject may also be culled out from the proceedings, evidence in particular, of the inquiries constituted by the government to investigate into famines, epidemics, irrigation and similar areas.

However, in spite of such a continuous stream of ideas and opinions pouring in throughout this period, the indigenous effort was bound to prove of no avail. Handicapped by the various limitations of the colonial rule and devoid of the administrative powers needed to translate ideas into action, it was difficult for Indians to do anything more concrete at that time. Nevertheless, this literature, and the ideas and demands contained therein, at least served as a means of expressing India's national aspirations and projecting her basic and immediate needs. While this kept the connected issues alive and expanded their scope for the future, sometimes it even affected the administrative decisions in favour of Indians.

But there were a few others, like J.N. Tata (as later P.C. Roy and M.N. Saha), who were determined to realize their dreams of making India prosperous with the help of modern science and technology. In the 1890's, Tata, the noted Indian industrialist, came forward with an offer of Rs. 30 lakh for the purpose of establishing a major research institute to promote advanced scientific research in the country¹⁷. The Government of India, with Curzon, the great imperialist, as the Viceroy, sensed the implications of the offer and objected to the proposal¹⁸. But the great entrepreneur did not lose heart; and though belatedly and years after his death, Tata's dream was realized and the munificence ultimately led to the opening in 1911 of the Indian Institute of Science at Bangalore¹⁹. Tata's example was, without doubt, a landmark towards achieving self-reliance in the sphere of science and technology, and it was, above all, an important victory of the *Swadeshi* that swept the country around that time.

The *Swadeshi* movement brought about a qualitative change in the indigenous endeavour made until then. In the second half of the 19th century, economic nationalism had already realized the significance of science and technology for industrial and economic development²⁰. By the time the *Swadeshi* movement made a formal beginning after Curzon's provocative measures, enlightened Indians were well aware of the wider values of science and technology for national development²¹. The boycott of foreign goods led to a demand for indigenous manufactures, and the boycott of the government educational institutions made it necessary to build a national system of education²². Both these streams of the *Swadeshi* movement were interrelated aspects of the same striving for self-reliance, among others, in the field of science and technology. The economic *Swadeshi* encouraged the application of science and modern technology for industrial advancement under indigenous control²³. For this and

more significant reasons, the National Education movement placed special emphasis on scientific and technical education, research and development. In this connection, the role of Association for the Advancement of Scientific and Industrial Education of Indians (founded in 1904), Bengal Technical Institute, and National Council of Education, Bengal (both in 1906) deserves attention. The Dawn Society (1902) and its literary organ, the *Dawn*, too, made notable contributions²⁴.

The *Swadeshi* and the National Education Movements together contributed significantly towards promoting and popularizing science. They tried to provide organizational machinery both for scientific education and research, and their technical application. This effort was made under indigenous control and with the support of local resources. As a result, many industrial enterprises, like Bengal Chemicals, came into being and survived thereafter. Apart from this, steps were taken towards prospecting the natural wealth of the country, and some vital raw materials were identified for industrial exploitation also. Indigenous talent and enterprise were encouraged with material support. But what was most important, everything was done with the local and national interest always in mind²⁵.

Unfortunately, an appropriate evaluation of the *Swadeshi* endeavours made outside Bengal still remains to be done. Contributions of J.N. Tata and his successors, for example, deserve a better appreciation²⁶. For "Not only did he grasp the full significance of the Industrial Revolution of India, but his clear mind spelt out the three basic ingredients to attain it. Steel was the mother of heavy industry. Hydro-electric power was the cheapest energy to be generated. And technical education coupled with research was essential for industrial advance"²⁷. This understanding of this pioneer soon resulted in the establishment of the Iron and Steel Company at Jamshedpur (1907), the Tata Hydro-Electric Power Supply Company at Bombay (1910), and the Indian Institute of Science at Bangalore (1911)²⁸. Keeping in view the crippling limitations India was subjected to as a colony at the time, all this was a magnificent achievement of the indigenous effort and enterprise. This inspired others to work in a similar direction²⁹, and broadly underlined the basic goals Indians would strive to achieve in future. Four decades after J.N. Tata's death, the main concern of the national leadership — political and scientific — remained the same as that of Tata: technical and scientific education and research, steel, power generation and industrialization. And when India became free, these subjects were accorded top priority for official initiative³⁰.

However, the *Swadeshi* and the National Education movements started petering out around 1910. Yet, some of the *Swadeshi* institutions survived and they continued to promote technical education. Moreover, the scientific genius that had flourished during *Swadeshi* did not die out altogether. Scientists like P.C. Ray continued their endeavours to promote science for the welfare of the country³¹ and to present the Indian point of view before the colonial government³². In this context, they often looked to India's scientific tradition in the past³³.

Apart from such individual efforts, the Indian National Congress carried forward the mission of the *Swadeshi*. In fact, the Congress had evinced interest in scientific

matters right from 1887³⁴. Its interest in science and technology went on increasing every year and encompassed almost every aspect of the subject³⁵. The party's stand on the subject had immense importance from the point of view of evolving a national opinion with regard to promoting, utilizing and administering science in the country. Initially, however, its response to science and technology was indirect as it came up mainly in the context of economic backwardness and natural calamities, and growingly concerned technical education, and technical and professional services³⁵. But this did not mean that the party leadership did not realize the significance of science and technology in a wider context. As a matter of fact, some of its members, like Brojendranath Seal³⁶, showed remarkable awareness in the matter; and by the time the present century commenced, their concern was more direct and goal-oriented. They talked of "allied sciences"³⁷; and when the government wanted to restrict and control higher education, which also included science education, they did not mince words about their opposition to the move³⁸. But in the face of colonial constraints, they could not do much at the time. Yet, whenever opportunities arose, they used them in favour of promoting science and technology in the local interest. For example, the party enthusiastically welcomed and supported J.N. Tata's offer of establishing an institute for advanced research³⁹. Likewise, it organized in 1901 an Industrial Exhibition at its annual session at Calcutta, which became a regular feature at the Congress sessions in future⁴⁰. Meanwhile, it also joined hands with Indian industrialists, and from 1905 organized annual Industrial Conferences with their help⁴¹. As most of the *Swadeshi* leaders were associated with the Congress, their efforts towards promoting science enjoyed the sympathy and support of the Congress.

Thus, even though the *Swadeshi* could not continue as a movement for long, its legacies did come to exist in scientists like P.C. Ray and J.C. Bose, in several organizations and establishments we have just referred to above, and most of all, in the very spirit of *Swadeshimism* that inspired the coming generations of Indian leadership to fight for self-reliance and independence not only in the field of politics and economy but also in scientific matters.

EFFECTS OF THE FIRST WORLD WAR

The diminishing interest in science and technology soon after *Swadeshi* was once again revived by the First World War. The War exposed India's weakness in the spheres of economy, transport and communications, and defence. It exposed her extreme industrial backwardness and dangerous dependence on foreign countries for various essential commodities like medicines, chemicals and dyes⁴². The experiences of the War made it necessary to look into the question of industrial backwardness of the country. This eventually led to the appointment by the Government of India of the Indian Industrial Commission in 1916. The Commission examined all aspects of industrial backwardness and made recommendations for improvement. In the process, it touched upon many aspects of science and technology too⁴³. For educated Indians, the inquiry provided an opportunity to express their grievances and put forward their demands before the British Indian Government in the matter⁴⁴. Of the national leaders, Pandit Madan Mohan Malaviya was one of the important Indian members on the

Commission. As such, his views merit special attention in so far as national stand on science and technology is concerned.

Though Malaviya was one of the signatories to the final report, he differed with it on many fundamental issues, and expressed his strong opinion in a separate "Note" appended to the main report⁴⁵. In his "Note" and in course of the proceedings of the Commission, Malaviya attacked forcefully some of the basic assumptions and prejudices of the British about the potentialities and achievements of Indians in the spheres of industry and enterprise, agriculture, science and technology, etc. He refuted the notion existing among the Westerners that India did not have a tradition of industry and of science and technology, and that she did not have potentialities for progress in these areas. He drew attention to India's past achievements in these fields, and tried to show how a process of deindustrialization had been effected by the British in this country. Further, he questioned the view that the West had provided the great tradition of technology, and declared that Britain was incapable of providing a model for the industrial progress of India. For that he found Japan and Germany a better model to look forward to⁴⁶.

Malaviya traced the roots of India's backwardness to her conversion into a colony of Britain. Thus, for him a recovery of history was a precondition for the recovery of industry in India. He called for a better appreciation of the natural wealth of the country, and expected encouragement to indigenous talent and enterprise. He asked for the Indianisation of scientific services, and demanded adequate facilities for scientific and technical education and research, especially in such areas as engineering, applied chemistry and agriculture⁴⁷. Malaviya's views broadly represented national opinion on the subject; and his "Note" may be regarded as the first major document on what could be called India's national policy on science.

Unfortunately, Malaviya's concern for industrialization and promotion of science and technology for economic development of the country could not produce any significant impact immediately. The report of the Commission itself was shelved for ever; and his party, the Congress, did not support his views and the cause he fought for. However, this was not unexpected, as he had demanded not only a basic change in the policy behind the colonial control, but virtually asked for the scrapping of the whole system itself. This obviously was the greatest weakness of his move. For, any radical change of this sort envisaged to satisfy national aspirations was not possible so long as the country remained a colony. Malaviya on his own, however, continued to work for promoting science and technology for the progress of the country. At Banaras Hindu University, one of his creations, science and technical education, and research and development were given due prominence and the University soon made its mark in the field⁴⁸.

There were also many others who made efforts to promote science in the national interest. Besides efforts at the various universities, some new institutions and organizations came into being and they tried to work for the country in their own way. The foundation in 1916 of the University College of Science at Calcutta was an important event in this regard. The work of P. C. Ray and his team there soon received

international recognition, and the emergence of an Indian School of Chemistry under P.C. Ray was further consolidated⁴⁹. Likewise, the foundation of the Scindia Steam Navigation Company by Walchand Hirachand and others in 1919 was another important *Swadeshi* endeavour towards self-reliance⁵⁰. As a matter of fact, after the War, Indian businessmen fast came closer and forged an alliance to promote their industrial interest on modern lines. For this, while they tried to influence the government policy in their favour on the one hand, they consolidated their own solidarity against foreign control and competition on the other⁵¹. The former led to official protection to some of the industries⁵²; the latter resulted in the organization in 1927 of the Federation of Indian Chambers of Commerce and Industry (FICCI)⁵³. This strengthened the cause of India's industrialization and prepared the background for further thinking and action. Obviously, this was against the wishes of the colonial government and was very much in tune with the needs of the country. These developments gradually contributed towards moulding national opinion in favour of industrialization, which became a national issue in the years to come and a sector of prime concern for the free Indian government.

Unfortunately, while the Indian business class was striving to harness science and technology for industrialization after the First World War, the Indian National Congress, once a champion of science and modern technology, turned indifferent to the subject after Mahatma Gandhi came at the helm of affairs. In the circumstances, it fell on the scientific associations and organizations to defend and promote their cause. After the War, many of the existing universities showed greater interest and initiative in the subject and tried to cater to the local needs to an extent. But a far more significant development was the emergence of scientific associations in the meanwhile. The largest and most influential of them, the Indian Science Congress Association, established in 1914, progressively served, along with many other specialized associations⁵⁴, as a forum where Indian scientists voiced their views and concern not only on the technical but also on other aspects of science and technology like dissemination, application, and, most of all, administration and control⁵⁵. In this context, they took a still wider view and emphasized the necessity of ending the country's material backwardness and illiteracy as a precondition for any scientific advancement. Many of them also called for reviving India's traditional arts and industries. Their ultimate goal was to progressively free science and technology from colonial control, so that it could be utilized not as a tool of exploitation but as a means of progress for the country⁵⁶. From this standpoint, through these forums they succeeded in gradually eroding to an extent the colonial bias from the minds of many of the British scientists and bureaucrats who participated in the proceedings of these associations. Gradually, these supporters of the Empire started talking in terms also of self-sufficiency and welfare of India⁵⁷. This had significant consequences for the promotion and planning of science and technology for the country's development in the closing years of the Raj. During these years, British attitude towards India became flexible and positive; and the subsequent scientific exchanges between India and Britain on the eve of Independence provided India a wider perspective to make use of science for national development after 1947⁵⁸.

GANDHI, CONGRESS AND SCIENCE

As regards the National Congress, the cause of *Swadeshi* was once again espoused by the party under their new leader, Mahatma Gandhi, but its scientific element was missing this time. The Mahatma showed an indifference and even hostility towards modern science and Western technology, and looked at machine as an evil⁵⁹. Under his leadership, the Congress diverted its attention from modern science and industrialization to traditional industries and *khaddar*⁶⁰. Interestingly, Gandhi served the cause of modern science in a very indirect manner. His success in transforming the freedom struggle into a mass movement and his great emphasis on rural reconstruction brought into focus the enormity of the material problems the country was faced with. This aroused varying reactions in different circles.

Hundreds and thousands of Indians, including scientists like P.C. Ray, agreed with Gandhi and endeavoured to bring about rural reconstruction with the help of traditional indigenous technology of cottage industry and *khaddar*. They found in it a clear rationale, for it was viable and pragmatic in the contemporary politico-economic circumstances and capable of making India self-reliant and independent⁶¹. Gandhi's find — the problem of uplift of rural India — was so great that it became difficult even for the government to evade it. The latter found in it an alibi to shift its priorities from industry to agriculture, and the Royal Commission on Agriculture was appointed in 1926.

But as Gandhi's programmes failed to show encouraging results, a general disillusionment became obvious. A section of young members within the Congress gradually became convinced that the enormous problems of the country could not be solved by *charkha* and *khaddar* but only by science and modern technology. Disillusioned by Mahatma's economic and social programmes, they looked to the successful socialist experiments in the USSR; and soon realized that the destiny of India lay in socialism, science and heavy industrialization⁶². This eventually led to the constitution in 1938 of the National Planning Committee (NPC) by the Indian National Congress. Set up with the purpose of planning for India's reconstruction with the help of modern science and technology, this Committee later on presented in its reports a model for development, which provided also a basic framework for the progress of science and its technical application in independent India⁶³.

A similar understanding was perceptible in many other corners too. A Science News Association to popularize science and technology in the national interest was established in Calcutta in 1934. It brought out from the next year a journal — *Science and Culture* — which soon became a vanguard of national opinion on science and technology in the wider context of all-round national reconstruction and the country's freedom. Meanwhile, individuals like G.D. Birla⁶⁴, a leading businessman and a Gandhian, and M. Visvesvaraya⁶⁵, the noted engineer and a technocrat, came out with their own ideas and plans for the country's industrialization.

But compared with Gandhi's programme of rural reconstruction based on traditional indigenous technology, all these developments set an altogether new trend,

facilitating the formation of a national opinion in favour of exploiting modern science and technology, and not the traditional ones, for the progress of the country. They inaugurated a new era of science in India, distinct and important enough to be taken up in a separate paper.

CONCLUSION

The developments up to 1935 suggest that the indigenous concern for promoting and harnessing science and technology in the interest of the country was not uniform, and, sometimes, it was incoherent and ambiguous. Fallen in abject poverty and backwardness after long years of foreign exploitation, Indians were often left confused and indecisive in the matter. In the absence of resources and administrative powers needed for any plan of action, they could not go beyond a limit to realize their goals and aspirations. Their endeavours, therefore, remained confined mainly to highlighting their problems and persuading the government to take note of them while initiating administrative measures. This included the Indianisation of scientific and technical services. But whenever an opportunity arose and the national fervour rose high, as during the *Swadeshi*, Indians made attempts to create an institutional and organizational base for promoting and harnessing science and technology for the progress of the country. Of course, these attempts did not succeed, but in whatsoever they did, they served as a stepping-stone and guidance for the future. In the process, the question of appropriateness came up — the question of choice between Western and Indian science and technology; and, quite often, the indigenous opinion was divided. But India's growing exposure to the global forces of change, as also her own enormous problems, gradually discouraged the occasional efforts to revive her traditional science and arts. After a century since Rammohan Roy welcomed Western science, Gandhi fought, through 1920s and 30s, his last battle to stop its spread in India and revive the indigenous science and technology for the progress of his people, but he lost it. This virtually doomed the fate of traditional science and skill. Now it became clear that, whether liked or not, modern science and Western technology had come to stay⁶⁶, and, hereafter, it was not the question of whether but of how and where to exploit it⁶⁷. An expanding body of indigenous opinion, therefore, called for heavy industrialization and wanted to use modern science and technology in a big way in it and in every other area of life. This conclusion shaped in future the nature and scope of the national opinion on science and technology, and affected the course of related developments ahead⁶⁸. This opened up a new chapter in the field of harnessing science for national progress and went a long way to create a basic understanding and a broad framework for the policy-makers of free India to build upon and elaborate.

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42. Gadgil, D.R., *The Industrial Evolution of India in Recent Times-1860-1939*, First published 1924; Fifth edn: Oxford, Delhi, 1972, especially Ch. XV, XVI, XIX.
43. *Indian Industrial Commission 1916-18-Report*, op. cit.
44. *Ibid*, especially the appendices and the minutes of the evidence.
45. Note by the Hon'ble Pandit Madan Mohan Malaviya, in *The Indian Industrial Commission 1916-18-Report*, op. cit., pp. 292-355.
46. See Malaviya's "Note", op. cit., and his cross-examination during the evidence before the Commission. Malaviya's views expressed in the "Note" have been discussed in greater detail by Shiv Visvanathan, *Organizing for Science*, Oxford, Delhi, 1985, Ch. III.
47. Malaviya's "Note", op.cit.
48. Sundaram, V.A., *Benar is Hindu University 1905-1935*, BHU, Benaras, 1936, pp. II-III, XXXIX, 4, 8-16, 18-23, 68-9, 74-7, 78-9, 583-626.
49. *Acharya Prafulla Chandra Ray*, op. cit., Ch. I, III and IV.
50. Khandolkar, G.D., *Walchand Hirachand: Man, His Times and Achievements*, Walchand & Co., Bombay, 1969.
51. Ray, Rajat K., *Industrialization in India*. Oxford, New Delhi, 1979, Second impression 1985, Chs. 5 and 6.
52. *Ibid*, pp. 240-45. For a detailed account of tariffs, see Adarkar, B.N., *The History of the Indian Tariffs 1924-39*, Office of the Economic Adviser, Delhi, 1940.
53. Ray, op. cit., pp. 305-7.
54. Some of the other scientific associations that were formed after the First World War were: Indian Botanical Society (1921), Indian Chemical Society, and Mining and Metallurgical Society (both in 1924), Indian Psychological Society (1925), Indian Ceramic Society (1928), Indian Bio-Chemical society, and Indian Physical Society (both in 1934), and the Indian Science News Association (1935).
Of the other scientific organisations which helped form a national opinion on scientific matters, the important ones were: United Provinces Academy of Sciences (founded in 1930 at Allahabad), Indian Academy of Science (in 1934 at Bangalore), and National Institute of Sciences of India (in 1935 at Calcutta).
55. See their proceedings.
56. *Ibid*, especially the *Proceedings of the Indian Science Congress*, as for example, Presidential Address by P.C. Ray at the 1920 session.
57. See their addresses from the professional forums like the Indian Science Congress.
58. A.V. Hill Papers (Churchill College, Cambridge); and Bhatnagar Papers: Acc No. 361, S.No. 14 (NAI, New Delhi).

59. For Gandhi's basic views on the subject, refer to his *Hind Swaraj or Indian Home Rule*, Navajivan Publishing House, Ahmedabad, 1911; reprinted 1938. Also see M.K. Gandhi, *Modern v. Ancient Civilization*, edited by Anand T. Hingorani, Bharatiya Vidya Bhavan, Bombay, 1970, especially pp. 22-27, 55-56, 71, 73-76, 98-99, 109-10.
60. INC Resols at the annual sessions: No. 1, 1921; XI, 1923-24; II, 1924.
61. P.C. Ray's General Presidential Address at the Indian Science Congress in 1920. Also refer to *Acharya Prafulla Chandra Ray*, op. cit., p. 26.
62. For the views of Jawaharlal Nehru (a rising young leader of the Congress at the time), see Zaidi and Zaidi, op.cit., Vol. XI, pp.95, 97; and the *Selected Works of Jawaharlal Nehru*, Vol. 8, Orient Longman, New Delhi, 1976, pp. 806-8.
63. See Report: *National Planning Committee* by Shah, K.T. (ed.), Vora & Co. Bombay, 1949; and the reports of the specialist sub-committees of the NPC, and other related publications edited by Shah and brought out by the same publisher. Also refer to Sinha, Jagdish N., op. cit.
64. Birla, G.D., *Indian Prosperity — A Plea for Planning* (A speech delivered at the Annual Session of the Federation of Indian Chambers of Commerce and Industry, held at Delhi on 1 April 1934).
65. Visvesvaraya, M., *Planned Economy for India*, Bangalore Press, Bangalore, 1934.
66. Viewed in the background of India's past achievements in the field of science and technology, this was a disturbing situation, no doubt. Of course, one is reminded of G.Basalla's findings (*The Spread of Western Science*, *Science*, 156, 1967) here, but there is still need for an indepth study of the problem from the nationalist point of view, which should explain the whys and hows of the failure of the indigenous science and technology to revive and develop, and its long-term consequences for the progress of science and technology in India and her socio-economic progress as a whole.
67. When the Second World War broke out, India was left with no other choice but to go for industrialization and to make use of modern science and technology also in all other spheres of life.
68. After 1935, the National Planning Committee and the *Science and Culture* in particular played an important role in tilting the national opinion in favour of modern science and technology, both in terms of their promotion, planning and administration, and their application for reconstruction and development.