CHANGING ROLE OF THE INDIAN SCIENCE CONGRESS ASSOCIATION, 1914-2014

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DOCTOR OF PHILOSOPHY

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DECLARATION

I declare that the thesis entitled **"Changing Role of the Indian Science Congress Association, 1914-2014"** submitted by me for the award of the degree of **Doctor of Philosophy** of Jawaharlal Nehru University is my own work. The thesis has not been submitted for any other degree of this university or any other university.

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CERTIFICATE

We recommend that this thesis be placed before the examiners for evaluation.

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List of Abbreviations

AAAS	American Association for the Advancement of Science
AHSI	Agricultural-Horticultural Society of India
AIDS	Acquired Immune Deficiency Syndrome
ANZAAS	Australia and New Zealand Association for the Advancement of Science
ASB	Asiatic Society of Bengal
BAAS	British Association for the Advancement of Science
BHU	Banaras Hindu University
BOSA	Board of Scientific Advice
BSIR	Board of Scientific and Industrial Research
CSIR	Council for Scientific and Industrial Research
DNA	Deoxyribonucleic acid
DRDO	Defence Research and Development
DSIR	Department of Scientific and Industrial Research
DST	Department of Science and Technology
FAO	Food and Agriculture Organization
FRS	Fellows of the Royal Society
GMOs	Genetically Modified Organism
GOI	Government of India
HIV	Human immunodeficiency virus
HR	Human Resource
IACS	Indian Association for Cultivation of Association
IIC	Indian Industrial Commission
IISc	Indian Institute of Science
IIT	Indian Institute of Science
INSA	Indian National Science Academy
IPR	Intellectual Property Rights
ISC	Indian Science Congress
ISCA	Indian Science Congress Association
ISI	Indian Statistical Institute
JASB	Journal of the Asiatic Society of Bengal
M.A	Master of Arts
M.Sc.	Master of Science
NCERT	National Council of Educational Research and Training
NCL	National Chemical Laboratory
NWFP	North-West Frontier Province
PRL	Physics Research Laboratory
R&D	Research and Development
RSICs	Regional Sophisticated Instrument Centre
S&T	Science and Technology
SBPC	Sociedade Brasileira para o Progresso da Ciência (Society of Promotion of Science in Brazil)

SIFs	Sophisticated Instruments Facilities
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TIFR	Tata Institute of Fundamental Research
UK	United Kingdom
UN	United Nations
UNESCO	*United Nations Educational, Scientific and Cultural Organization*
UNO	United Nation Organization
USA	United States of America
USSSR	Union of Soviet Socialist Republics
WHO	World Health Organization
WPC	World Peace Council
WWI	First World War
WWII	Second World War

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Chapter 1

Introduction

1.1. Background

The emergence of modern science and technology institutions in India dates back to the British colonial era. Social history of science writings on India have recurrently drawn attention and aided our understanding on the role played by colonial and native actors in the institutionalisation of science and technology institutions, particularly since the Victorian period from 1858. We now have detailed monographs and research studies on colonial science in India and the ways in which eminent Indian scientists[1] and their supporters have created an institutional research infrastructure that led to the emergence of Indian science community during 1876 and 1930s.[2] The emergence of national science communities in India, as well as elsewhere in the world, has been a lengthy social and historical process. Country differences and historical contexts exemplify the diverse experiences in the emergence of respective national science communities. However, such institutional developments serve important national goals. They not only give specific identity, professional recognition and international visibility in the global sphere of science but also serve socio-economic goals to modernise, industrialise and affect the development processes of a country. However, one important element of the establishment of science communities is through their professionalisation, which enable the science communities and groups to advance scientific knowledge frontiers.

Number of actors and activities constitute the process of professionalisation, of which, professional societies and their activities play an important role. An understanding of social history of science institutions particularly professional societies, journals, intellectual associations and other relevant bodies are important for any society or a country for three reasons.are important for any society or a country for three reasons. Firstly, the social and historical context within which such science institutions and professional bodies emerge and get established over a period of time. Secondly, the critical role they play in establishing

[1] Mahendralal Sircar, J. C. Bose, P. C. Ray, C. V. Raman, Ashutosh Mukherjee, Meghnad Saha, J. C. Ghosh and numerous other scientists and their supporters, including British scientists and professionals.
[2] See the works of Krishna (1991, 1997), Pratik Chakrabati (1999, 2004), Kumar (1995, 2006) and others.

certain professional and intellectual standards in laying the foundations of science, specialist groups of scientists and professional cultures. This is an important step towards achieving international professional recognition and some form of visibility in the international sphere of science. Thirdly, the part played by important actors, their intellectual struggle and what response they receive from the society at large. The present study, in a larger context, is concerned with the role played by the Indian Science Congress Association (ISCA), its members and related bodies and activities in the professionalisation of science and the establishment of science communities in India during the period of pre- and post–independent Indian society.

Considering the enormous significance that the scientific and professional societies have on the development of science, it is surprising that not much attention has been given on these issues in the existing literature on social history of science in India. The association of scientific men in scientific societies lay at the core of the development of science in most countries. This provide a common meeting ground for personal intercourse among scientists or professionals and a forum where new ideas or facts could be expressed, deliberated, debated and critiqued. A. V. Hill pointed that in the United Kingdom, the progress of science is viewed as intimately bound with the growth of numerous learned societies, beginning with the inception of the Royal Society in 1662.[3] His report also delineated the scientific societies into two kinds, depending on the nature of its membership, namely general and specialised. Consequently, the societies which drew members from all disciplines of science constituted the general scientific societies whereas those who derived members from a single branch of science were known as specialised scientific societies. These scientific societies play major role in emerging as repositories of scientific information and publication of scientific results. They also influence the transformation of mostly individualistic and critical people into ‘living communities’.[4]

In the present study, the focus is to examine the general science societies with a specific focus on the ISCA. It is pertinent to have a general understanding of the growth of such societies across the world besides India. Any attempt to outline the growth of the scientific societies in

[3] A. V. Hill, Scientific Research in India, London: William Clowes and Sons, August 14, 1944, p. 49 (Deepak Kumar Collection).
[4] Ibid.

India begins with realisation of their conspicuous absence in the Pre-British era. There were pathshalas, tols, maktabs and madrassas during Pre-British rule in India. During this period, societies or professional associations were largely absent. However only aberration to this trend emerged during the rule of Jai Singh, under whom some form of a 'community' of astronomers, astrologers and trained scribes for advancement of astronomical knowledge was witnessed (Kumar, 2003, pp. 11, 12).[5]

The late eighteenth century saw foundation of numerous scientific societies across the world. After the Royal Society of London, one of the earliest scientific society came up in India namely, the Asiatic Society of Bengal (ASB). It was founded by William Jones in 1784. About three decades later, the Swiss Natural Science Society came up in 1815. It formed the proto-type for the German society, *Deutscher Naturforscher Versammlung* which was founded in 1821 and held its first meeting was at Leipzig in 1822. The German society provided a model for establishment of similar societies in Europe and United Kingdom by the late nineteenth century. These include England's British Association for the Advancement of Science (BAAS) founded in 1831, 'Congres Scientifiques' in France (1833), Italy's 'Riunione deli Italiani scienziati' (1839), 'Skandinaviska Naturforskare oh Lakare' of the Scandinavian countries (1839), Hungary (1841), Russia (1863), Poland (1869), and Czechoslovakia (1880).[6] The American Association for the Advancement of Science (AAAS) was founded in1848, followed by Australia and New Zealand Association for Advancement of Science (ANZAAS) in 1888.

Similar proliferation of scientific societies can be seen during the nineteenth century in India. By then, the colonial empire, which had established itself, was concerned by the sole aim of strengthening their administration and control to maximize profit. Besides these scientific and literary societies, numerous School Book and Educational societies came up simultaneously, which were primarily involved with popularisation of science among Indians through translation of European scientific works into vernacular languages. Among the societies, the most critical was the foundation of the Indian Association for Cultivation of Science (IACS) in

[5] Also, See V. N. Sharma, 'Sawai Jai Singh's Hindu Astronomers', *Indian Journal of History of Science*, Vol, 28, No. 2, 1993, pp. 131-155.

[6] Roy MacLeod, 'Introduction' in Roy MacLeod, (ed.) *The Commonwealth of Science: ANZAAS and the Scientific Enterprise in Australasia, 1888-1988*, Melbourne: Oxford University Press, 1988, pp. 35-36.

1876 which aimed at cultivation and advancement of science among Indians. However, during the first twenty-years of its existence its activities remained limited to holding popular lectures, let alone its advancement.

The creation of ISCA in 1914 as the seminal institution can be viewed as a culmination of numerous earlier efforts to establish an institution similar to BAAS. The recurrent desire to establish an organisation similar to BAAS was largely influenced by the persuasive 'colonial agenda', the limited scope offered by the existing scientific societies and the concerns about the appalling state of science teaching and research in India by the ISCA's founders. Together they formed the context for the establishment of one of the most important general scientific society, i.e. ISCA by two English chemists namely J. L. Simonsen and P. S. Macmahon.

The primary aim of the ISCA is to promote and advance science in India. It held its first meeting in Calcutta along with the centenary celebrations of the Indian Museum, under the aegis of ASB. The Asiatic Society served as its foster parent until ISCA could survive on its own. Each year ISCA organises its annual meetings in different parts across the country, in which scientific workers from diverse disciplines participate. Its hundredth meeting was held at Calcutta in 2013. These ISC sessions have increasingly caught media's spotlight and attracted diverse perception among the scientific community in India. The present study tries to understand the historical growth of ISCA and assess its roles in professionalisation of science focusing on formation of the scientific community, institutionalisation, professionalisation and popularisation of science as well as reflecting the socio-economic issues facing the country, during hundred years of its existence, since its inception in 1914.

1.2. Critical Survey of Social History of Science in India

The survey of literature in the domain of social history of science in India, although cover diverse issues, revolve mainly around the relationship between science, technology and colonialism. Satpal Sangwan's[7] (1991) *Science, Technology and Colonialisation: an Indian experience* and Zaheer Baber's[8] (1998) *The Science and Empire* recognised the existence of

[7] Satpal Sangwan, *Science, Technology and Colonization: An Indian Experience, 1757-1857*, New Delhi: Anamika Prakashan, 1991.
[8] Zaheer Baber, *The Science of Empire: Scientific Knowledge, Civilization and Colonial Rule in India*, Delhi:

science in ancient India. Baber's study underlined that socio-economic and political context from the ancient through the medieval period, shaped science in India until the colonial period. Deepak Kumar's, *Science and Empire* (1991)[9] and Science and the Raj[10] (1995, 2006) viewed scientific activities in India within the larger administrative and economic imperatives of the colonial rule. At the same time, they analyses the 'native's' response towards the colonial scientific endeavours as well as efforts made by Indians towards popularisation and advancement of science during the nineteenth century. Raina and Habib (2004) in their book *Domesticating Modern Science*[11] highlighted the efforts of the Indian intelligentsia towards need for change in the social order through progressive nature of science but also indicated that the idea of change had not percolated into society. Kumar (2000) also saw traces of 'constructive imperialism' by 1930s-1940s. Pratik Chakrabarti's *Western Science in Modern India - Metropolitan Methods, Colonial Practices* was critical of the simplistic linear transmission of western science in India. He studied the complexities the transmission of western science into the Indian colony. Through an analysis of numerous individuals and institutions, he worked out various dimensions of transmission.[12] Kapil Raj[13] (2006) emphatically pointed at co-construction of scientific knowledge in India, moving beyond Basalla's western centric view of modern science and his simplistic explanation for its diffusion and imposition elsewhere.[14]

In his book *Science, War and Imperialism - India in the Second World War,* Jagdish N. Sinha assessed the nature of scientific development in India during the colonial rule and primarily focused on the impact of the World Wars, especially WWII had on the development of science and technology in India. According to him, after WWI, numerous important scientific

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Oxford University Press, 1998.

[9] Deepak Kumar (ed.), *Science and Empire: Essays in Indian Context*, Delhi: Anamika Prakashan, 1991. See also Roy Macleod (ed.), 'Nature and Empire: Science and the Colonial Experience', *Osiris*, 2nd Series, Vol. 15, 2000.

[10] Deepak Kumar, *Science and the Raj: A Study of British India*, *Second Edition*, New Delhi: Oxford University Press, 2006 (first published in 1995).

[11] Dhruv Raina and S. Irfaan Habib, *Domesticating Modern Science, A Social History and Culture in Colonial India*, New Delhi: Tulika Books, 2004.

[12] Pratik Chakrabarti, *Western Science in Modern India, Metropolitan Methods. Colonial Practices,* Delhi: Orient Longman Private Ltd., 2000.

[13] Kapil Raj, *Relocating Modern Science: Circulation and the Construction of Scientific Knowledge in South Asia and Europe Seventeenth to Nineteenth Century*, Delhi: Permanent Black, 2006.

[14] George Basalla, 'The Spread of Western Science', *Science*, *New Series*, Vol. 156, No. 37, May 5, 1967, pp. 611-22.

organisations and some universities came up in response to the local needs of the country. He also viewed WWII as a mixed blessing for India's scientific development which catalysed the process of transition from colonialism to nationalism and freedom, initiating a period of national reconstruction of which western science formed the core.[15] Robert Anderson's work *Nucleus and Nation* discussed the co-evolving relationship between science and politics which catalysed the atomic energy program and a larger scientific community in India. Taking into account the scientific elite and decision-making processes, he assessed the debates and tensions between the Indian scientists and political leadership, the influence from international spheres and networks in scientific and industrial planning and self-reliance in India.[16]

Amidst a vast corpus of literature within the domain of history of science in India, institutional history is largely sidelined. Most of the studies on scientific institutions have been published by respective organisations[17][18] or are discussed in the biographies/focused research of scientists. There are very few studies on institutions like the Asiatic Society of Bengal[19] (ASB), Council of Scientific and Industrial Research (CSIR)[20], while most of the others institutions remain largely under-studied. The volume of *History of Science, Philosophy and Culture in Indian Civilisation* focusing on *Science and Modern India: An Institutional History, c. 1784-1947* presents the histories of various Indian scientific institutions, laboratories, research departments, academies, etc.[21]

Thus, within the scope of social history of science, the role of scientific institutions as embodiment of critical history of scientific development remained under-studied. Their

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15 Jagdish N. Sinha, *Science, War and Imperialism, India in the Second World War*, Leiden: Brill Publication, 2008

16 Robert, S. Anderson, *Nucleus and Nation: Scientists, International Networks and Power in India,* London*:* The University of Chicago Press, 2010.

17 See *A Century*, Calcutta: Indian Association for the Cultivation of Science, 1976. Also, see John Bosco Lourdusamy, 'The Indian Association for the Cultivation of Science: A Tortuous Tryst with Modern Science', *Journal of Science Education and Technology* Vol. 12, No. 4, 2003, pp. 381-96.

18 Rajendralal Mitra, A. F. R. Hoernle and P. N. Bose, *Centenary Review of The Asiatic Society, 1784-1884,* Calcutta: The Asiatic Society, 1885.

19 Moni Bagchee, *The Asiatic Society - A Brief History*, New Delhi: People's Publishing House, 1984.

20 V. V. Krishna, 'Organisation of Industrial Research: The Early History of CSIR, 1934-1947', in Roy MacLeod and Deepak Kumar (eds.) *Technology and the Raj: Western Technology and Technical Transfers to India, 1700-1947*, New Delhi: Sage Publications India Pvt. Ltd., 1995. Also, see Shiv Vishvanath, *Organising for science, The Making of an Industrial Research Laboratory,* Delhi: Oxford University Press, 1985.

21 Uma Das Gupta 'Introduction' in Uma Das Gupta (ed.), *History of Science, Philosophy and Culture in Indian Civilisation, Volume XV, Part 4, Science and Modern India: An Institutional History, c.1784-1947,* Delhi: Pearson Longman, 2011.

foundation and progress represent certain inclination, shifting concerns, changing times and social, economic and political pressures. The study of the interactions between the individuals, their scientific practices, the institutions they formed, the linkages between different institutions and the larger socio-cultural and political scenario under which the scientific knowledge is embodied are critical for assessing the nature of scientific development of the country. The institutions form the basis of scientific progress in any country and neglecting them gives an incomplete depiction of the scientific development. Therefore, tracing institutional histories is critical for assessing the nature of scientific development in a country.

The purpose of this brief survey is to highlight the scant research attention on the study of science societies and professional bodies and their role in professionalisation of science and creation of science communities in India. In view of this, the motivations for the present study is derived from the examples of similar scientific society in other countries. These are discussed briefly in Section 1.3.

1.3. Role of Scientific Societies: Experiences from Rest of the World

The studies undertaken on various scientific societies/countries largely dealt with the role they played in Science & Technology (S&T) development. It is pertinent at this point to highlight that to comprehend Indian experience; we need to learn from country level studies that assessed the roles played by similar scientific societies. In this manner, the present study can evaluate the growth and performance of ISCA during the hundred years of its existence. As such, these studies provide an important foundation and motivation for the present study.

According to Howarth, one of the earliest scientific society, the Society of German Natural Scientists and Physicians (1821) aimed at promotion of intercourse between disciplines, discussion of their findings and drawing attention of the public towards science and scientists and their importance.[22] BAAS proposed to support, grow and diversify the community of people interested and involved with science and to strengthen their influence over the direction of science and its place within the society.[23] It has played an important role in the progress of different specialisms of science and in their application for material well-being of the society.

[22] O. J. R. Howarth, *The British Association for the Advancement of Science: A Retrospect, 1831-1931*, London: The British Association for the Advancement of Science, 1922, pp. 6-12.
[23] Ibid.

Its sections gave shape to corresponding specialised scientific societies in Britain.[24] Since ISCA was modelled on the lines of BAAS and their objectives were similar, it is important to assess ISCA's role, with the contributions of BAAS as its reference point.

The study on AAAS underlined its role in mitigating the geographical and academic isolation among scientific men and shaping of scientific community in the United States. The organisation gave shape to a discernible voluntary scientific community. During 1848-1860, the Association led to the growth of various disciplinary societies. It also attempted to balance both 'diffusion' and 'advancement' components of the scientific progress. AAAS's prestige is evident in the attention given by the State and federal governments towards its recommendations, presidency honors and local reception given to visiting savants. It offered a forum for discussion and formulation of professional aspirations and acted as podium for announcement of new policy to public. Kohlstedt observed that by 1850s, the Association became central space for scientific debates. The profile of regularly participating members, reputed series of proceedings, public approval and increasing international recognition attest to its success during 1848 and 1860.[25]

The British Association formed the model for ANZAAS like ISCA and shared similar objectives. MacLeod opined that the Association became one of the greatest tools for the spread of scientific knowledge throughout the colonies. By 1938, it became the principal national congregation for the exhibition of science and its implementation for national advancement in Australian and New Zealand. ANZAAS played a critical role in the advancement of various sciences and shaping scientific community. Though the central concern of the ANZAAS was advancement of science, it also engaged with the social, economic and political implications of science and technology. It played a crucial role in shaping and consolidating public attitude towards uses of technology. It extended discussions and pointed towards the use of research for the betterment of the people of Australia and New Zealand. The Australasian Association was pivotal in application of sciences for serving the

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[24] The annual meetings held in different cities in the United Kingdom resulted in numerous societies like the Edinburgh Geological Society. The meeting held at Glasgow in 1855 culminated into the formation of the Glasgow Geographical Society. The Norfolk and Norwich Naturalists' Society came up after the Association's meeting at Norwich in 1868. See O. J. R. Howarth, *The British Association for the Advancement of Science: A Retrospect, 1831-1931*, London: The British Association for the Advancement of Science, 1922.

[25] S. G. Kohlstedt, *The Formation of the American Scientific Community: The American Association for the Advancement of Science, 1848-1860*, Illinois: University of Illinois Press, 1976.

society. The sessions of ANZAAS reflected its commitment towards social responsibility of science. The sessions were critical for public discussion on health and hygiene, environmental concerns, agricultural progress and discovery of new mineral lobes.[26]

Bothelo's study on Brazilian Society for the Progress of Science (SBPC) observed its role in Professionalisation of Brazilian scientists.[27] The study noted that it has played an important role in expanding and perfecting the national science and technology system and disseminating and popularisation of science within the country. Thus, we see that these studies on various general scientific societies across the world has valuable insights in helping us evaluate the changing role of ISCA over time. The review of these important country level examples has provided the motivation, rationale and objective of the present study.

1.4. Rationale of the Study

As mentioned above, the present study on ISCA is guided by multiple motivations. At the outset, present study is an attempt to address the blatant gap in the existing literature on social history of science. As indicated earlier, residual attention has been given to the study of scientific societies in India. In view of the absence of focused research on scientific societies at present, the current study can be viewed as a significant effort in assessing ISCA's role in professionalisation of science in India. Besides this, the insight derived from studies on similar societies in Britain, United States of America, Australia and New Zealand and Brazil were critical for understanding and evaluating the experience of India. One of the most important reason for undertaking the present study is the recognition of ISCA as an important organisation by most historians of science.

For instance, the literature on social history of science has identified ISCA as an important institution. In 1944, Hill observed that ISCA occupied a crucial place in the scientific activity of India.[28] Raina and Habib identified ISCA's foundation as an important stage in foundation

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[26] Roy MacLeod, 'Introduction' in Roy MacLeod (ed.), *The Commonwealth of Science: ANZAAS and the Scientific Enterprise in Australasia, 1888-1988,* 1988, Melbourne: Oxford University Press.
[27] Antonio José Junqueira Botelho, 'The Professionalization of Brazilian Scientists, the Brazilian Society for the Progress of Science (SBPC), and the State, 1948-60", *Social Studies of Science*, Vol. 20, No. 3, 1990, pp. 473-502.
[28] A. V. Hill, Scientific Research in India, London: William Clowes and Sons, August 14, 1944, p. 50 (Deepak Kumar Collection).

of institutions of science, while discussing the university research system in India (Raina and Habib, pp. 200-201). According to Jagdish N. Sinha, ISCA evolved as most important forum, among the scientific organisations that emerged during the War (Sinha, 2008, p. 5). Uma Das Gupta saw in ISCA, the Indian science taking its feet. According to Gupta, the meetings of ISCA embodied the development of science in India (Gupta, 2011, pp. lxii-lxii). MacLeod considered ISCA establishment as the first recognition of Indian Independence by the colonial government (Govil, 2011, pp. 143-155). These observations by social historians of science clearly establishes ISCA's position on the S&T map of India.

Only few scholars went beyond merely identifying ISCA as an important organisation and discussed its role in the development of S&T in India. Vishvanathan viewed ISCA's inception as evolution from specialisation and technicalities, through greater interpersonal conversation among scientific community, political estate and transformation of scientific terminology into a popular dialect (Vishvanathan, 1985, p.13). Inherent in his observation is the scope ISCA provided for greater communication between scientific community within the political circles and the public. The aims of these organisations unlike those in advanced and independent countries of the west touched upon socio-economic issues beyond purely scientific discourse (Sinha, 2008, p. 5).

According to Krishna, the foundation of ISCA was a major step towards professionalisation of science in India. Through its annual meetings held across different parts of India, it unified the largely scattered specialist groups and, therefore, served as a crucial platform for catalysing community consciousness (Krishna, 1997, pp. 243-244). During its early years, ISCA's sectional committees were instrumental in organisation and foundation of various all-India societies and associations representing major disciplines, which also published their journals (Krishna, 1997, pp. 243,244). Chakrabarti observed that the scientists gained a broad platform for exchanging ideas with ISCA's foundation.[29] Govil's study also underlined its role in popularisation of science and emergence of a strong fraternity of scientists (Govil, 2011, pp. 143-145). In *Science and the Raj,* ISCA's formation is seen as steps towards constructive imperialism which urged the imperial government to recognise the claims of science upon

[29] Pratik Chakrabarti. *Western Science in Modern India, Metropolitan Methods. Colonial Practices,* Delhi: Orient Longman Private Ltd, 2004.

public funds (Kumar, 2006, p. 230). Anderson in his book *Nucleus and Nation* mentioned ISCA's annual sessions on numerous occasions throughout the study (Anderson, 2010).

As indicated earlier, historians consider ISCA as an important institution, although its study has not received adequate attention and is primarily restricted to few succinct ones. A. Vasantha and D. K. Banerjee studied the development of chemistry section of the Congress. According to them, the association played a fundamental role in creating a viable scientific community and represented scientists from all fields of science in the country. It provided a forum for chemists to meet their peers during its sectional meetings and evolve a discernible community spirit, which could give systematic direction to scientific research aiming towards specialisation, advancement and professional spirit that lead to the development of specialised societies. Similarly, the volume *Science and Modern India: An Institutional History, 1784-1947* contains histories of thirty-five scientific institutions originating either from colonial science practices or Indian initiatives in science research and organisation during the period of its study. The volume had a chapter dedicated to ISCA and the three Academies of Science. In the chapter, Girjesh Govil recognised it as a pivotal organisation and the annual meetings were viewed as a forum where scientists could meet, present their research, and exchange their scientific ideas for mutual benefit.[30] However, Govil's observations on its origins, increase in number of papers presented at these sessions, membership, organisation, proliferation of sections, foreign participation and Prime Minister's association, are discussed briefly. Although he recognised ISCA had grown into a strong fraternity, the nature of the study is limited and the focus of the chapter is more on the three academies of science (Govil, 2011, pp. 143-155). ISCA published a short history of the Association which threw light on the efforts made by its founders in its establishment, its objectives, its headquarters, its organisation and development and also gives the life histories of the General Presidents' of the annual sessions of the Congress.[31]

The limited study on ISCA necessitates an in-depth focused research on an important scientific society, which has been largely sidelined. The study also holds a significant contemporary

[30] Girjesh Govil, 'Indian Science Congress Association and the Three Academies of Science' in Uma Das Gupta, *History of Science, Philosophy and Culture in Indian Civilisation, Volume XV, Part 4, Science and Modern India: An Institutional History, c.1784-1947,* New Delhi: Pearson Longman, 2011, pp.143, 145.

[31] P. Mukherji, and P. K.Bose, (eds.) *A Short History of the Indian Science Congress Association - With Life Sketches of General Presidents*, Calcutta: Indian Science Congress Association, 1963.

relevance given the media attention its annual sessions receive each year and diverse perception among the scientific community in India. It is worthwhile to study ISCA through these perceptions and identify the role it is playing in the contemporary times. The current study the changing 'roles' of ISCA from the time of its inception until the latest Science Congress.

1.5. Research Objectives

The study endeavours to achieve primarily the following research objectives:

- To understand the context for the foundation of the Indian Science Congress Association.
- To assess the role of Indian Science Congress Association in the emergence of scientific community and professionalisation of science in India.
- To explore the role of the Indian Science Congress Association in articulation of socio-economic issues of India.
- To unfold the perception of the scientific community in the contemporary times, about the annual sessions of the Indian Science Congress Association.

1.6. Research Questions

The study attempts to answer a number of research questions. The major questions through which the research objectives are explored by the present study include:

- What were the scope, membership criteria and nature of Indians' involvement in the scientific societies that existed prior to ISCA? How did these provide the context for the foundation of the Indian Science Congress Association?
- Has ISCA played a role in the emergence of scientific community and professionalisation of science in India? If yes, how has it contributed towards their growth?
- Did ISCA sessions reflect the socio-economic issues faced by India?
- How are ISCA's annual sessions perceived in the contemporary times within the scientific community in India?

1.7. Research Methodology

The scope of the research concerns necessitates us to depend largely on the primary sources and materials for analysis. Consequently, an extensive archival research has been undertaken across various libraries in India and United Kingdom. In Delhi, we have sourced materials from the National Archives, Teen Murti Library, Libraries at NISTADS, NISCAIR, Jawaharlal Nehru University. In Kolkata, the researcher collected materials from the libraries of the Asiatic Society of Bengal and ISCA Headquarters. In London, The British Library, Libraries at the Royal Society and London School of Economics (LSE) were consulted. The Bodleian Library in Oxford was visited for the archives concerning communication between ISCA and BAAS. The Blackett papers and biographical memoirs of numerous Indian and British scientists were studied at the Royal Society, London. The LSE housed the Bernal Papers. While papers relating to various Indian and British scientists, Nehru Papers were consulted at the British Library, London.

Since ISCA inception lay in the colonial period, it is imperative to situate the study in the context of colonialism and understand the nature of colonial science institutions. Here the historiography of emergence of modern science in India becomes critical. Numerous studies discuss the relationship between science, technology and colonialism. They provide the framework for the present work by giving an understanding of the nature of colonial policies towards education and science in India. The studies also underline that administrative and economic imperatives of the colonial government lay at the core of colonial scientific endeavours in India. Thus, the present study derives its basis from the socio-economic and political context and the nature of colonial science policies discussed in various studies on social history of science. These provide the cardinal points for assessing the nature of early scientific societies. These together with biographies and speeches of missionaries like Charles Grant and Wilberforce, Macaulay’s Minute, Charles Wood’s Despatch, Report of the Indian Education Committee (1882), Report of the Indian Universities Commission (1902) help develop the background of the study. It helps in gauging the transformation of colonial attitude of ‘non-interference’ with existing socio-economic and political institutions in India to establishment of institutions, largely with the economic, political and administrative motive for maximising profit of the Empire.

The understanding of the motive of the colonial government provides a lens for understanding the scope of the colonial scientific societies. The proceedings and publications of these societies along with few secondary studies are used as sources for assessing the scope, aims, membership and nature of involvement, and contribution of Indians in the scientific societies. These include *Asiatick Researches, Journal and Proceedings of the Asiatic Society, Madras Journal of Literature and Science, Proceedings of the Madras Literary Society, Proceedings of the Agricultural and Horticultural Society of India Transactions of the Medical and Physical Society of Calcutta, Journal of the Bihar and Orissa Research Society, Journal of the Panjab Historical Society, Annual Reports of the Board of Scientific Advice and Proceedings of the All-India Sanitary Conference*. Biographies and autobiographies of the founders of these societies were used as supplement material.

The literature on social history of science also helps in grasping Indians' response towards colonial policies on education and science. These studies identify Indians who were contributing towards popularisation and advancement of science in India. The biographies of Raja Ram Mohan Roy, David Hare and Henry Derozio gives an understanding of existing scientific institutions and social context of the new experiments towards popularisation of science. In this light, efforts made by individuals like Master Ramachandra, Bal Gangadhar Jambekar and Mahendralal Sircar is explored. The difficulties faced by scientists like P. C. Ray, J. C. Bose and indigenous efforts like Indian Association for Cultivation of Science (IACS), University College of Science and Bose Institute are assessed based on archives and other secondary sources pertaining to these institutions.

The limitations of the colonial scientific societies within the larger background of aims of the colonial government and efforts made by Indians towards higher teaching and research for advancement of science helps in identifying the context and need for the foundation of ISCA. The most important source identified for the study were ISCA's publications especially, the *Proceedings of the Indian Science Congress Association* published annually. These proceedings record all the activities undertaken by the Association throughout the year. Besides few early years' proceedings of the Congress which were found at the Asiatic Society, most of them were housed at the ISCA headquarters in Kolkata. The Proceedings helped in identifying the scientists involved with ISCA as General Presidents, Sectional Presidents, members of the council and executive committee. A study of biographies and autobiographies helped in analysing their role in knowledge production or advancement of science. Enabling a general understanding of the progress made in S&T during the period of the study.

An analysis of ISCA's activities, its sectional and presidential addresses along with the government documents like the *Reports of the Famine Enquiry Committee, Indian Industrial Commission, Planning and Development Department, Five Year Plans* provides a context for understanding its role during the post-Independence era. The nature of scientific teaching, research and socio-economic context which emerge from the study of autobiographies and biographies of few scientists who were active members of ISCA against the background and the way historians wrote the post-Independence history, indicating the larger socio-economic and political context of India as well as the world. Together, these help us in bringing together and forming a comprehensive understanding of historical development as well as evaluating how socio-economic and political context influenced the activities of ISCA and to what extent it responded to the changing socio-economic issues facing the country at large. Like any historical study, the secondary sources or the studies dealing with various aspects of science and technology in India provided the background through which ISCA's activities could be assessed. There were a lack of archives and papers relating to scientists in the post-Independence era, as compared to the volume that exists before 1947. This restricts the scope of analysis of the part it played and its transformation after 1947.

In order to gauges the perception of the scientific community about ISCA and to understand the participation and organisation of these sessions, three annual sessions were personally attended. Informal unstructured interviews of the delegates were taken across various age groups and professional levels to assess the motivation and purpose for attending the session. Apart from those who attended the session, a few who had been members and some who had never attended the Congress were also interviewed to understand the reasons for non-attendance. However, beyond the direct personal interviews, blogs and papers written by scientists as well as some archival sources were used to assess the public views about the Science Congress.

1.8. Organisation of the Study

The thesis comprises of seven chapters through which it attempts to address its research objectives and questions. Although, these chapters should be seen inter-related as they together establish the 'roles' ISCA played during the period of study. After introducing the research in the first chapter, the understanding of the nature of colonial scientific institutions primarily, scientific societies are provided in chapter II, where these earlier colonial societies will be viewed as steps towards the establishment of ISCA in 1914. The next two following chapters endeavours to understand ISCA's role in professionalisation of science, through a study of the part played by the Association in emergence and strengthening of the scientific community which seem to have created the required climate for the professionalisation of science through foundation of institutions, knowledge production and greater recognition of Indian scientists for their contributions in the field of science. These will be discussed in Chapter IV. The following Chapter IV discusses ISCA's role in mirroring socio-economic concerns and its attempt in serving the general needs of the society. These chapters primarily study ISCA role from the time of its inception until the turn of the first decade of twenty-first century. Chapter six tries to understand the perception about the Science Congress within the scientific community in India and extends the study until the most recent 106th Indian Science Congress held in January 2019 at Phagwara, Punjab. The overall discussion and summary of the study is given in chapter seven.

1.9. Chapter Plan

Chapter 1: Introduction

The introductory chapter of the thesis begins with outlining the understanding of the emergence of modern science in India as it emerges through the writings of the social history of science and underlining the significance of scientific societies. It describes the growth of scientific societies across the world during the nineteenth century and also discusses the inception of ISCA. It attempts to identify gap in the existing literature of social history of science, which establishes rationale of the study. The studies undertaken on scientific societies in other countries are also discussed along with underlining the recognition that most studies on social history of science in India give to ISCA. After discussing the rationale and significance of the present study on ISCA, the chapter also defines the scope, objectives and research questions that the present study strives to undertake. The methodology section extensively elaborates on the sources used for the study. After introducing the study, demarcating its rationale and scope, the chapter gives a précis of the subsequent chapters in some detail highlighting the key issues dealt in each of these chapters.

Chapter 2: Foundation of the Indian Science Congress Association: Historical Perspective

The chapter attempt to study the context and the need for the foundation of ISCA. The first section tries to understand the colonial policy towards science education from the eighteenth century until the first decade of twentieth century. The main focus of the chapter is to study the nature of colonial scientific societies, existing before ISCA. It tries to analyse their objectives, scope and membership as well as scope of involvement of Indians. The chapter also discusses those scientific societies, which came up as a result of the efforts of Indians towards popularisation, cultivation and advancement of science in India. It also higlighted the limitations and challenges these Indian endeavours faced. An assessment of all these societies enables us to understand the need for ISCA during the first decade of the twentieth century. It also equips us to understand the limitations in scope of most of the colonial scientific societies, which provide adequate background towards understanding of ISCA's inception. Because of lack of studies on the initial stages of the formation of ISCA, the section on its establishment talks about its inception in great detail followed by a discussion on its objectives and general organisation of its annual sessions and administration.

Chapter 3: ISCA and the Emergence of Scientific Community in India

The chapter endeavours to understand the composition of scientific workers within the colonial background prior to the inception of ISCA. The chapter highlights the initial efforts of Indians towards scientific research, which received recognition world-wide. The reasons for lack of a scientific community in India will also be discussed. Further, the chapter engages with the formation of research groups mostly around university professors during the late nineteenth century. The evolution of these research groups is viewed as lying at the core of the genesis of the scientific community in India. The chapter analyses ISCA's role in shaping and strengthening of the scientific community in India as well as growing 'community' consciousness among them during the pre-Independence era. It endeavours to understand ISCA's emergence as a platform for personal interaction with scientific workers of various institutions and fields in India but, also with international institutions and foreign scientists. Further, it assesses ISCA's evolution as a platform for interface with the government, primarily in the post-Independence era when Prime Ministers began attending every session of the Science Congress.

Chapter 4: Professionalisation of Science in India: Role of ISCA

The preceding chapter endeavoured to assess ISCA's role in emergence of scientific community in India, which lay at the core of professionalisation of science. This chapter largely assesses the role of ISCA and its annual sessions in institutionalisation and professionalisation of science in India. The chapter largely discusses its role during the pre-Independence era, trying to analyse ISCA's initial efforts towards professionalisation. It discusses the role of ISCA and its members in the foundation of university departments, science courses, specialised institutions of science and national laboratories. In addition, ISCA's evolution as a forum for raising concerns about importance given to research institutions over universities. The chapter endeavours to figure out the debates around issues of science funding, encouragement of specific sciences, precedence of national laboratories over universities as well as the 'culture' within the existing scientific institutions. ISCA's role towards organisation of various branches of science with the foundation of scientific societies and academies of science shall be dealt. Further, the chapter undertakes to study the part played by ISCA towards growth of S&T fields, knowledge production, initiation of scientific journals and as well as peer-evaluation system and recognition besides emerging as communication channels for specialists.

Chapter 5: ISCA and Discourses on National Socio-Economic Issues of India

The chapter largely situates ISCA within the greater socio-political context and tries to identify how far were the changing socio-economic issues and larger political and international concerns reflected during ISCA sessions. The chapter tries to establish ISCA's recognition of the important of science and scientists in providing solution to various problems faced by the people. It underlines ISCA's efforts towards inculcating scientific temper and popularising science among the public. It also seeks to evaluates ISCA's receptivity to issues like population, food security, nutrition, public health which continue to face India. The chapter also analyses ISCA's role in engaging with challenges posed by the misuse and ill-thought use of science for development. It clearly illustrates ISCA's stance on use of science for the destruction of science and underlined greater responsibility among scientists to avoid misuse of their discoveries. It assesses ISCA's responsiveness to the Bhopal Gas Tragedy, Genetically Modified crops, nuclear debate, environmental concerns, technology and related issues and challenges as reflected in the ISCA annual sessions. The change seen in deliberation of its annual meeting after 1976 with the inception of the Focal Theme at its session is also studied to understand the extent to which the choice of Focal themes reflected the larger national and international context. The reflection of issues that caught attention in the post-liberalisation era and with the introduction of the Millennium Development Goals in ISCA focal and plenary sessions will also be studied.

Chapter 6: Perception of Scientists about Indian Science Congress

In order to situate the study within the current time frame, the chapter assesses the perception held by the scientific community in India about ISCA mostly from the last decade of the twentieth century. Through an analysis of the views of the delegates who attend ISCA as well has those scientists who have not been its members, the chapter specifies contemporary relevance and role played by ISCA. However, the chapter also provide few references to views of scientists as evident in the archives of the Association as well as personal papers of scientists from 1960s. The chapter seeks to understand the perception of the scientific community largely about the purpose, nature of participation and organisation and structure of its annual meetings. It attempts to understand the dualities which are faced by ISCA sessions in the light of growing criticisms of these sessions it still entails huge participation.

Chapter 7: Summary and Conclusions

The last chapter of the study consolidates the findings that emerges from the analysis offered in the previous chapters. This chapter attempts to draw inferences about the role that ISCA has played during the past hundred years of its existence. It primarily discusses the overall findings of the present study. The chapter hints at the transformation of its role from the last quarter of the twentieth century until the contemporary times, although, it's objectives remained mostly the same during the century of its existence. It also underlines the limitations of the present study and the scope and significance the study adds to the existing volume of literature on history of science in India.

Chapter 2

Foundation of the Indian Science Congress Association: Historical Perspective

2.1. Introduction

The preceding chapter introduced the aims, scope and significance of the study. It began by indicating the importance of scientific institutions primarily, scientific societies. Further, it gave a snap-shot of the historical growth of the general scientific societies across the world, during the late eighteenth and the nineteenth century. Their growth in India from pre-British period until the evolution of ISCA in 1914 was discussed against the background of colonialism in India. The chapter identified the void within the domain of social history of science on the study of scientific institutions primarily ISCA in this case. The motivation for the study was derived from the studies undertaken on similar science societies across the world and significance that the present study held in addressing the gap in the existing literature. Added to these, was a sketchy research on ISCA, despite its importance being recognised by most scholars of history of science. The chapter underlined that there is a lack of focused research on ISCA and its contributions in emergence of scientific community and professionalisation of science in India. The chapter also indicated the contemporary relevance of the study. It also specified the research objectives and questions that the study aims to address. The methodology used for the study was also discussed. It noted that the present research was a qualitative analysis based on primary largely archival sources as well as secondary sources. The larger context and debates around science and colonialism was understood by a historiographical study of the field of history of science. The autobiographical and biographical material pertaining to scientists is also crticial for the study. Lastly, the organisation of the study was underlined through a discussion on the key objectives of various chapters of the thesis.

The present chapter tries to understand the growth of scientific societies in India from the late eighteenth century, beginning with the establishment of the Asiatic Society of Bengal. It also tries to shed light on associations and societies in pre-British India. It largely endeavours to map most of the scientific societies that existed prior to ISCA and attempts to understand their nature and scope within the context of colonialism in India. The chapter brings forth the aims, motivation, scope, membership pattern as well as the involvement and contribution of Indians in scientific knowledge production, within these scientific societies. It also engages with the school book societies, ‘native’ education societies and few scientific societies that were mostly ‘indigenous’ efforts. The chapter also touches upon the challenges these indigenous societies faced within the larger colonial background. The efforts made by an Indian, Dr. Mahendralal Sircar in the foundation of Indian Association for Cultivation of Science (IACS) will be discussed at great length. Also, hinting at the limitations and context in which the institution had to work during the first three decades of its existence. In this background, the chapter also highlights the concerns that motivated and efforts that J. L. Simonsen and P. S. MacMahon put towards the establishment of ISCA. It also aims to underline few earlier attempts made towards the foundation of an institution similar to BAAS in India. After which, the last section discusses its objectives, organisation and structure.

2.2. Colonial Science and Education

The sole aim of the East India Company (EIC) was trade. So, when they gained political supremacy over India, Clive adopted a policy of little interference with the existing institutions (Basu, 1982, p. 1). The beginning of the involvement of a British administrator in Indian education could be seen with the foundation of Calcutta Madrasa in 1781 under the patronage of Warren Hastings.[32] Later, Sanskrit College at Benaras (1791), Poona (1821) and Calcutta (1824) were established. These served two primary aims namely, the need to develop a class of Indians well-versed in Sanskrit, Arabic and Persian that could help in colonial administration and cultivate goodwill among the Hindu and Muslim elite classes (Basu, 1982,

[32] In his Minutes of April 17, 1781, he noted a petition of September 1780, made by mussalmans for the establishment of a Madrassa or college presided over by Mudgid O'din, who was considered qualified for instructing young students in Mohammedan Law and in some other sciences taught in mohammedan schools. The petition represented that Calcutta had become the seat of the Empire and it was the wisdom of the government to enable growth and extension of liberal knowledge through such an institution. In his Minute, he proposed a piece of land for its foundation. He also added that rents of few neighbouring villages would be used for the monthly costs associated with Madrassa. See, Minute by Governor General, Warren Hastings, April 17, 1781 (National Archives of India, New Delhi).

p. 1).[33] The orientalists considered Asia as the reservoir of knowledge. Therefore, William Jones founded ASB in 1784, which will be discussed in detail in section 2.3. The first instance when education was remotely linked to the duty of the government could be seen in William Wilberforce's resolution in 1793.[34] However, it faced great opposition and refrain as it was viewed as repeating the folly in India, after losing territories in America, as a result of opening schools and colleges there.[35] Charles Grant reiterated teaching English rather than customs, which was the strongest law in India, could enable social order[36] and economic gains. Indians could learn from people 'intelligent' in agriculture and skillful in application of machinery, fire, water, steam, etc.[37] At the core of their efforts towards English education, lay the spread of Christianity in India and need and duty of 'civilizing' Hindu population (Morris, 1904, pp. 18-28; 324-328).

The Charter Act of 1813 can be viewed as a major departure from the earlier policies of non- or little interference mostly by individual British administrators. The Act set apart an annual sum of one lac rupees for the revival and improvement of literature and encouragement of learned 'natives' in India. The most relevant part of the Act was its use for the introduction and promotion of knowledge of science. It also laid the scope for schools, public lectures and other institutions in this direction.[38] However, the Act did not specify the medium of

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[33] The courses of study at Calcutta Madrassa and Sanskrit Colleges sought to include Arabic, Persian and Mohammedan theology and laws, literature and religion of the Hindus respectively, to qualify them for public service primarily as assistants to European judges. See Report of the Indian Education Committee, Calcutta: Government of India, 1883, p. 253.

[34] He viewed diffusion of 'blessings of useful knowledge for religious and moral improvement of East-Indian fellow-subjects', as the duty of the Legislature. See William Wilberforce, Substance of the speeches of William Wilberforce, especially on the clause in the East-India; bill for promoting the religious instruction and moral improvement of the natives of the British dominions in India, on the 22d of June, and the 1st and 12th of July, 1813, *The Pamphleteer*, Vol. 3, No. 5, 1814, p. 47.

[35] J. C. Marshman's quote in B. D. Basu, *The History of The Education in India Under the Rule of East India Company*, Second Edition, Calcutta: Modern Review Office, 1944, p. 5.

[36] Charles Grant wrote a paper titled 'Observations on the State of Society among the Asiatic Subjects of Great Britain particularly with respect to moral and of means of improving it' in 1972. It drew a very dark picture of the moral conditions of the Hindu society which he ascribed primarily to their religion (Morris, 1904, pp. 18-28).

[37] During this time, numerous missionary schools came up. Before the coming up of universities in Madras, missionaries founded the first institution called the Madras Christian College where the natives could receive liberal education. Institutions like Oriental Seminary in Calcutta, Parental Academy, Bishop's College, General Assembly's Institution, Dr. Duff's College, Baptist College at Serampore came up under the superintendence of different religious bodies and other missionary societies. See Dispatch from the Court of Directors of EIC to Governor-General of India in Council, 19th July 1854, p. 26.

[38] The Law Relating to India and East India Company, Charters from the Crown, 1813 (National Archives of India, New Delhi).

instruction or any detailed direction for use of the sum allocated. This officially inaugurated a debate among the Orientalists, Anglicists and Utilitarians. James Mill believed that the aim of education was promotion of 'useful learning'. Although he did not favour the use of English as the medium of learning rather, was convinced that the vernacular language was better means of instruction (Stokes, 1959, pp. 54-57; Basu, 1982, pp. 1-4).

The efforts towards English education by Indians could be seen in the establishment of the Hindu College and Calcutta Book Society in 1817. Ram Mohun Roy raised his concerns against the foundation of Sanskrit College in Calcutta. In his letter to Lord Amherst in 1823, he opined that it would merely add 'grammatical niceties and metaphysical distinctions', which had little or no practical importance for the society. His letter can be viewed as first instance of the need for embracing western science, emphatically put forth by an Indian. It underlined the importance of learning mathematics, natural philosophy, chemistry, astronomy along with other useful sciences. These according to him, could be accomplished by employing talented European men, necessary books, instruments and other apparatus at the college. As a result, Hindu College established in 1817 and Sanskrit College in 1824 were housed in the same building and aided by the government.[39]

The debate on the medium of instruction initiated by the Charter Act got settled with Macaulay's minute in which he observed that a single shelf of good European library was worth the whole 'native' literature of India and Arabia.[40] He added that the entire population could not be educated with limited resources. But it could help develop a class of interpreters 'Indian by blood and colour, but English in taste, intellect opinions and morals' who could initiate downward-filtration of knowledge to the masses through vernacular dialects and also help government in administration by occupying subordinate positions.[41]

[39] Ram Mohun Roy's Letter to Lord Amherst, 1823 quoted in Nalin C. Ganguly, *Builders of Modern India*, Calcutta: YMCA Press, 1934, pp. 100-101.
[40] He said that a single shelf of a good European library was worth the whole 'native' literature of India and Arabia.
[41] See Minute by Honourable T. B. Macaulay dated the 2nd February 1835 (National Archives of India, New Delhi)

The Hunter Committee reviewed the courses taught in colleges across provinces[42], before universities came up in 1854. It observed that sciences that accorded with the 'fairy tales of Hindu imagination' were taught in most oriental colleges. However, in Agra and Delhi which derived most of their funds from private liberal donations, taught more practical subjects. They gave importance to vernaculars through which science, philosophy and mathematics were taught. The need for organisation of the public works necessitated trained assistant engineers and overseers for the Survey and Revenue Department and the new Engineering Institution in 1823.[43] The first lecture in 'modern science' in Elphinstone College was held in 1836, followed by surveying and civil engineering classes started in 1844. The professors of Botany and chemistry were appointed in 1846. In Madras, missionaries founded the first educational institutions.[44] Thus, the scientific disciplines remained restricted to professional courses like medicine and engineering. However, mathematics formed part of a number of colleges' curriculum. The encouragement of professional courses in law and engineering[45] could supply skilled Indians to assist in government's administration.

The Despatch on education (1854) which asserted need for universities could be seen as a milestone in the history of education in India. However, modelled on London universities, they merely conducted examinations and issued degrees to the affiliated institutions. It created an Education department for directing education and importance of professorships, scholarships and grant-in-aid was underlined. Law, civil engineering and vernacular professorship in Sanskrit, Arabic and Persian, not teaching tenets of Hindoo and

[42] These included Hindoo, Hooghly, Dacca, Krishnaghur and Berhampur Government Anglo-Vernacular Colleges, Sanskrit College, Mohammedan Madrassa and the Medical College in Bengal; Elphinstone Institution, Poona College and Grant Medical College in Bombay; Medical College, Presidency College in Madras, Delhi, Agra, Benaras, Bareilly and Thomason College in North-West Provinces. See Despatch from the Court of Directors of the East India Company to Governor-General of India in Council, 1854, p. 26.
[43] See Biographical sketch of Bal Gangadhar Shastri Jambhekar in Ganesh Gangadhar Jambhekar, Centenary Memorial Volumes I-IV in Honour of Acharya Bal Gangadhar Shastri Jambhekar, Memoirs and Speeches of Acharya Bal Gangadhar Shastri Jambhekar, Poona, 1950, p. vii.
[44] Report of the Indian Education Commission under the Presidentship of W. W. Hunter, Calcutta: Government of India,1883, pp. 258-262.
[45] Thomason College in Roorkee originated from a class which was started in 1845 to train Indian youths inorder to assist public works projects. The Ganga Canal project increased the need for well-trained staff engineers which led to the establishment of 1848. See Imperial Gazetteer of India, volume 21, London: Clarendon Press,1908, p. 325.

Mohammedans, were identified as subjects of primary importance,[46] but H. H. Wilson criticised the establishment of universities. He believed that Indians could hardly value the degrees or titles conferred and could not derive precedence among Europeans.[47] The universities of Calcutta, Madras and Bombay were established by 1857. The Punjab and Allahabad University were established in 1882 and 1887 respectively.

With the foundation of universities, the diverse collegiate institution gave way to a more uniform one. There was a marked increase in non-government colleges run by missionaries. Number of colleges were funded by the Indian kings, chiefs or societies founded by Indians. Except for purely oriental colleges, the scope of most of these colleges were uniform which aimed at granting education that could enable Indians to joins professional careers and government services. The subjects across all colleges included history, philosophy, mathematics, physical science, logic, psychology, chemistry, geography, natural sciences, physiology for preparing candidates for F.A., B.A. examinations. In its B.Sc. course, Bombay university by 1882 had few other subjects from which the candidate had to choose one like botany, zoology, geology, etc.[48] The M. A. degree is confined to Mathematics, pure and mixed and Natural and Physical Sciences as far as sciences were concerned. However, the number of successful candidates in M.A. examination were forty from all the three university with a maximum of thrity-two from Calcutta alone, while there were 266 and 793 successful candidates in B.A. and F.A. examination.[49] The craze for degrees and undergraduate courses as against post-graduate courses will be discussed in the next chapter in trying to analyse the limited number of trained scientific workers in India.

The aim of the Enquiry committee in 1882 presided by W. W. Hunter, with few Indians was to enquire into the existing system of Public Instruction at all levels of education and make recommendations. However, special branches like working of Indian universities and technical

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[46] Despatch from the Court of Directors of the East India Company to Governor-General of India in Council, No. 49, dated the 19th July 1854, pp. 18-42 (National Archives of India, New Delhi).
[47] Observations of H. H. Wilson before the Select Committee of the House of Lords on the establishment of Universities in 1954 (National Archives of India, New Delhi).
[48] Report of the Indian Education Commission under the Presidentship of W. W. Hunter, Calcutta: Government of India,1883, pp. 262; 269, 270
[49] Ibid. p. 272.

institutions in medical, law and engineering were exempted from its investigation.[50] Thus, the Report threw no light on these institutions, which could have been beneficial. The post-graduate teaching in Chemistry started at Presidency College under Calcutta University in 1885. The enquiry committee on Indian Universities was set up in 1902. The committee made recommendation for transforming universities into 'teaching universities' undertaking advanced courses of study by appointing lecturers and equipped libraries and laboratories. It also made recommendations for more practical laboratory training and re-structuring of the courses for B. Sc. and M. Sc. It also added that D.Sc. degree would be granted after spending few years in original investigation.[51]

2.3. Mapping Colonial Scientific Societies

The colonial policy on education clearly brings to light the colonial interests that lay at its core. The neglect of sciences was clearly visible. This section aims to understand the nature of colonial scientific societies that existed during the colonial period within the larger backdrop of colonialism. These societies are seen as steps that led towards the foundation of ISCA. The discussions on scientific departments and scientific institutions are deliberately sidelined. The focus has been to map scientific societies mostly, general scientific societies to understand the context and the need for ISCA's foundation.

2.3.1. Pre-British Societies

There is a general absence of societies during pre-colonial era which could provide a platform for scientific workers (Kumar, 2006, p. 55). There were centres of education like pathshalas under gurumahasya[52], tols or seats of sanskrit learning, maktabs and madrasas or schools and college of muslims along with large number of village schools which gave elementary

[50] Ibid. p. 4.
[51] Report of the Indian Universities Commission, 1902 presided over by T. Raleigh, Simla: Government Central Printing Office, 1902, pp. 57, 66-67 (National Archives of India, New Delhi).
[52] Dr. Mahendralal Sircar was born on 2nd November 1833 in Paikara in Bengal. He received basics of vernacular education in a pathshala under gurumahasaya. He was instrumental in the initial growth of homeopathy in India. Later, in 1876, he established the Indian Association for Cultivation of Science (Ghose, 1909).

education to trading classes, children of petty landlords and well to do cultivators.[53] The genesis of some form of a society of astronomers and trained scribes was seen during Jai Singh's reign. Kumar viewed the 'virtual colony of astronomers', as the most important aspect of his reign which came up decades earlier than the Asiatic Society of Bengal (Kumar, 2003, pp.11,12). The 'astronomer prince of India' had a large group of scholars of astronomy trained in Hindu, Muslim and European traditions of astronomy, around him. Among the Hindu astronomers were Jagannath Sam-rat, Kevalarama, Nayansukha Upadhyaya and Krparama.

There was little difference between astronomers and astrologers in Jai Singh's India. The astrologers around him were Harilal and Yasagara. Jai Singh also employed astrologers on daily wages to work in his observatory in Jaipur. It was believed that there could have been team of astrologers also at Delhi, Agra, Mathura, Ujjain and Varanasi, although their names are not known. There were a number of trained scribes mostly called *jyotisis.* Their names were Tularama, Laksmidhara, Tikarama, Lokamani and Gangarama. These Hindu astronomers helped Jai Singh in erecting instruments and taking data at his observatories, writing books and commentaries, translating books from other languages and collecting or copying books for the royal library (Sharma, 1993, pp. 131-148). Jai Singh had evolved a group of scholars or delegation around him, whom he sent to foreign lands for collecting astronomical works, instruments, etc. It is clear from Kumar's observations that he had sent his scholars to Central and West Asia and invited European scholars to his court. The results of which were compiled in *Zij-I-Muhammad Shahi* (1728) which is considered one of the most important astronomical works of medieval India. He also sent a delegation to Lisbon led by Jesuit missionary Emmanuel de Figeurado, who brought de la Hire's *Tabulae Astronomicae.* Kumar further observed that Jai Singh had also planned to send another scientific delegation to Europe but he couldn't achieve as he died in 1743 (Kumar, 2003, pp.8,9). This clearly suggests some form of a society involved with furthering astronomical knowledge emerged during the early seventeenth and early eighteenth century at Jai Singh's court, much before other educational or scientific societies came up in India. The earliest scientific society, Asiatic Society of Bengal came up at least 40 years after Jai Singh's death in 1784.

[53] Report of the Indian Education Commission under the Presidentship of W. W. Hunter, Calcutta: Government of India, 1883, p. 8.

2.3.2. Asiatic Society of Bengal

The establishment of ASB was viewed as the institutionalisation of western science in India (Vishvanathan, 1985, p. 8). It was seen as the beacon of scientific research in India (Kumar, 2018, pp. 1,2). William Jones[54] presented a 'Discourse on the Institution of a Society for Inquiring into the History, Civil and Natural, the Antiquities, Arts, Sciences, and Literatures of Asia'. Through a resolution, the Asiatick Society was formed in 1784. Jones identified three main branches of learning namely history, science and art.[55] Therefore, the objective of the Society according to the original resolution was 'enquiry into the history and antiquities, arts, sciences and literature of Asia'. Jones elaborated the objectives of the Society:

> You will investigate whatever is rare in the stupendous fabric of nature, will correct the geography of Asia by new observations and discoveries, will trace the annals and even the tradition of those nations who from time to time, have peopled or desolated it, will bring to light the forms of government with their institutions civil and religious; you will examine their improvements and methods in arithmetic and geometry, in trignometry, mensuration, mechanics, optics, astronomy and general physics, their system of morality, grammar, rhetoric and dialectic, their skill in chirurgery and medicine, and their advancement whatever it may be in astronomy and chemistry. To this you will add researches into their agriculture, manufacture and trade, and whilst you enquire into their music, architecture, painting and poetry, will not neglect those inferior arts by which the comforts and even the elegances of social life are supplied or improved.

The scope of its enquiry was paraphrased as 'bounds of its investigations will be the geographical limits of Asia and within these limits, its enquiries are extended to whatever is performed by Man or produced by Nature'. The precise sentence mentioned above did not figure in Jones works. However, it could be seen as correctly representing his meaning. It was noted that Jones wanted to add Egypt and Abysinia as well.[56] However, after the change of its name to ASB or even before, most investigations especially in Part I were confined to the

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[54] Jones came to India in 1783 as a judge at the Supreme Court at Fort William in Bengal. He was devoted to oriental researches and called for cooperation of the leading men of the time for the formation of an institution where united efforts could be taken for the study of oriental literature and science.

[55] According to him, history comprehended with accounts of natural production along with genuine records of empire and states; science embraced whole circle of pure and mixed mathematics and ethics and law as far as they depended on reasoning and art included beauties of imagery and charm of inventions displayed in modulated language or represented by colour, figure or found.

[56] The countries like China, Armenia, Turkistan also received occasional notice. In the second volume of *Asiatick Researches* in 1799, Jones published some accounts of the second classical text of Chinese, the *Shi-Kins*. See Moni Bagchee, The Asiatic Society, A Brief History, New Delhi: People's Publishing Home, 1984, p. 42.

Bengal Presidency, with hardly any literary paper from Madras and Bombay.[57] The colonial motive seemed absent in the 'magnificent' objective of the Society but in practice, there was a difference (Kumar, 2018, p. 2).

Initially, there were no rule laid for its membership. The only condition was voluntary desire, love for knowledge and zeal for its promotion.[58] Although the membership rules were so liberal, its membership showed slow but steady growth. The members on the rolls of the Society with 30 founder members in 1874, increased from 89 at the close of 1799 to 323 at the end of 1883.[59] Kumar opined that the societies were primarily largely manned by Europeans. It was evident that founder did not expect 'natives' to join the society, as rules for their membership were absent and left for a later date. The membership of Indians was not discussed until 1829. Finally, rules for eligibility of all nationalities to become members of the society was officially laid down.[60]

The exclusion of Indians was evident from its rules and the first to join the Society as a clerk in 1803 was Babu Ramacomal Sen.[61] The 'natives' were assigned the subordinate tasks of 'data exploration and application of existing technological knowledge (Krishna et. al, 1997, p. 238). The Associate membership[62] was initiated in 1835 to absorb 'competent' Indians.[63][64]

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[57] See, Annual Address to the Asiatic Society of Bengal by the President H. Beveridge in Calcutta on February 4th 1891, MSS EU C176/231, pp. 9,10 (The British Library, London).
[58] William Jones, 'Discourse on the Institution of a Society for Inquiring into the History, Civil and Natural, the Antiquities, Arts, Sciences, and Literatures of Asia' in Asiatick Researches or Transactions of the Society Instituted in Bengal for Enquiring into History and Antiquities, the Arts, Science and Literature of Asia, Volume, The First, Printed Verbatim from the Calcutta Edition, London, 1788, pp. ix-xvi). Also, see Rajendralal Mitra, Centenary Review of the Asiatic Society of Bengal, From 1784 to 1883, Part I, History of The Society, Calcutta: Asiatic Society of Bengal, 1885, pp. 2-8.
[59] Rajendralal Mitra, Centenary Review of the Asiatic Society of Bengal, From 1784 to 1883, Part I, History of The Society, Calcutta, Asiatic Society of Bengal, 1885, p. 83.
[60] Ibid. p. 8.
[61] All financial business of the Society at that time was handled by Messers Palmer and Co. Sen worked for the Society for nearly forty years and later held the position of a 'Native Secretary" although, in reality, his duties were that of a Treasurer.
[62] The rights accorded to the associate members were similar to those of ordinary members except for voting rights in the meetings of the society.
[63] Rajendralal Mitra, Centenary Review of the Asiatic Society of Bengal, From 1784 to 1883, Part I, History of The Society, Calcutta: Asiatic Society of Bengal, 1885, pp. 9-11.
[64] Two Indian scholars namely, Radhakanta Bahadur and Prof Bapudeva Sastri[64] were elected as honorary members of the Society for their contribution towards the oriental scholarship. The first Indian to be elected as Vice-President was Ramgopal Ghose in 1853. He was followed by Babu Ramapasad Roy, Jadava Krishna Singh and Kumar Harendra Krishna Bahadur in 1859, 1866 and 1868 respectively (Mitra, 1885 pp. 85-92).

The first Indian to become the President was Rajendralal Mitra[65] in 1885. During a hundred years of its existence, only these five Indians held different capacities in the Council of the Society. As subscription was high and society was not a government institution, few 'native' gentlemen took prominent part in Society's meetings primarily as members. It was suggested that they could be allowed to speak in their mother tongue at these meetings or a meeting could be devoted to Sanskrit studies.[66]

Kumar traces the roots of professional and scientific colonial literature to *Asiatic Miscellany* (1785) which became the *Asiatick Researches* (1788-1839) and later the *Journal of the Asiatic Society of Bengal* (Kumar, 2018, p. 2). The reason for delay of the publication of the first volume of the Asiatic Researches was discussed by Jones.[67] Regardless of these disadvantages, he asserted that a larger number of civil servants from different departments as compared to the non-official cadre of Europeans contributed literary and scientific researches for the advancement of the Society. Beveridge's address in 1891 noted that contributions from across Asia were hardly possessed but there were rich contributions from India. The early scientific work in India was by amateur scientists mostly army and civil employs who undertook scientific work in their spare time (Visvanathan, 1985, p. 10).[68]

Until 1828 most scientific papers were concerned mathematics, followed by zoology. It was believed that the natural history papers were expensive and the 'native's' taste for it had not been awakened yet.[69] The first scientific paper published by an Indian in the Journal of ASB was by Ashutosh Mookerjee in mathematics, followed by P. C. Ray in Chemistry and J. C. Bose in Physics in 1884 and 1895 respectively (Roy, Sen, 2010, p. 62). However, Part I of the

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[65] He became the Native Secretary in 1857 and Vice-President of the Society in 1862 (Mitra, 1885 pp. 85-92)

[66] See, Annual Address to the Asiatic Society of Bengal by the President H. Beveridge in Calcutta on February 4th 1891, MSS EU C176/231, p.11 (The British Library, London).

[67] Jones noted the reason for the delay of the first publication of the Society. He emphasised that the Europeans in India were 'men of business in civil or military state, constantly occupied either in the affairs of the government, in administration of justice, in the department of revenue and commerce or in liberal professions and very less time is available for study which is not connected with the business'. He appealed there was a need of combined efforts for research and publication of valuable knowledge available in Asia (Jones in Asiatick Researches, Vol 2, 1799, pp. iii-iv).

[68] Also, see Annual Address to the Asiatic Society of Bengal by the President H. Beveridge in Calcutta on February 4th 1891, MSS Eu C176/231, p. 11,12 (The British Library, London).

[69] See, Annual Address to the Asiatic Society of Bengal by the President H. Beveridge in Calcutta on February 4th 1891, MSS EU C176/231, p. 12 (The British Library, London).

Journal was most popular as it was believed that ASB made its actual reputation through antiquarian and philological research and could maintain its ground only through these researches.[70] It's president's address in 1896 discussed the number of original papers during 1836-1895 in the Society's publication by Indians.

> Taking the number of papers in Part I of the Society's Journal dealing with languages, Philology, etc., it would appear that in the earlier years very few natives were able to contribute to its original work; for only 2 out of 275 original papers were by natives (roughly rather less than 1 percent). During 1856-65, their contribution rose to 12 percent and 18 percent by the next decade. In the period 1876-85 and decade from 1886 to 1895, this percentage was 22. Clearly, the spirit of original research amongst natives in India have been gradually springing up. There are considerable strides, more progress in this direction should be made before an entirely satisfactory result.
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> The figures showing the proportion of papers contributed by native gentlemen to the Natural and Physical Science Section of our journal are the least satisfactory. Three papers of 409 printed in this section in 1836-1845 were by natives. During 1856-65 and 1876-85, there were no papers by natives in this section. although 110 and 164 papers were contributed in the period by European members. One paper in this section came from a native during 1866-75. An improvement is noticeable in the last period from 1886-95 for out of total 169 papers, 14 papers were by natives' primarily, only 3 authors are for carrying on research in natural and physical science. Upto the last year or two, the only subject in Part II of our Journal was Mathematics. However, within the last two years, papers in Chemistry and Physics written by natives.[71]

Asiatic Society was seen as the sole organ of scientific research in India. It stimulated research in geology, meteorology, zoology and botany (Kumar, 2018, p.2). Apart from these, the Society's Transactions and Journals constituted the principal channels of communication for studies in mathematics, physical sciences, mineralogy, geography, ethnology, chemistry, etc. It was believed that every branch of scientific activity owed its origins to the ASB which made important contribution in every field (Bagchee, 1984, p. 42). Bagchee also added that ASB advised the government on matters of scientific interest. There is a consensus among scholars that a number of departments blossomed and multiplied into a number of institutions like the Geological Survey, Meteorological Department, Linguistic Survey, the Indian Museum, etc. (Visvanathan, 1985, p. 10; Kumar, 2018, p. 2; Bagchee, 1984, p. 43).

Mitra added that the Society worked under dual disadvantages since its inception. Firstly, the problem of expatriate scientific workers in India as well as inability of Indians to publish their work in a foreign language. The 1891 report of the society showed 'fairly good' financial

[70] Ibid.

[71] Notes, Education A, August 1899, Nos. 57-58, Report on the IACS (National Archives of India, New Delhi).

position of the Society when compared with other learned societies.[72] Beveridge added that many believed that the society had fallen from its former stature. He disagreed with these views but, he did believe that the lines of the Society were too extended and there was a need for concentrated efforts and limited scope.[73] Hill believed that ASB may be considered as the mother of ISCA (1914) and grandmother of National Institute of Sciences of India (later named as Indian National Science Academy) in 1935.[74] Saha in his presidential address to the Society in 1946, emphasised that the Society like a Banyan tree had spread its aerial roots which developed into independent scientific institutions which had little contact with the mother body. He added that the Society had been redacted to a trunk which needed infusion of new life (Vishvanathan, 1985, p. 14). Kumar agreed that the Society came under criticism and quoted Corbyn's observation which underlined that the Society's meeting had lost its lustre and was 'falling off', which led to the foundation of other societies (Kumar, 1995, p. 5).

2.3.3. School Book and Vernacular Education Societies

While the societies mentioned above were mostly European efforts. The inception of school book and native education societies saw greater cooperation between Indians and Europeans for popularsing education and science among Indians. Raja Ram Mohun Roy[75] in Bengal propagated dissemination of western system of scientific education, which inspired David Hare.[76] Hare believed in an education that enabled synthesis and acculturation between the East and the West. As a result, he got involved with the foundation School Book Society (1817) followed by the School Society. He also started, the Simla, Arpuli and Pataldanga School for free education to poor students (Mitra, 1877, pp. vi-xxii; p. xviii). The school society was established for the improvement of schools and dissemination of useful education.

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[72] See Annual Address to the Asiatic Society of Bengal by the President H. Beveridge in Calcutta on February 4th 1891, MSS EU C176/231, p. 5 (The British Library, London).
[73] Ibid p. 9.
[74] A. V. Hill, Scientific Research in India, London: William Clowes and Sons, August 14, 1944, p. 50 (Deepak Kumar Collection).
[75] Raja Ram Mohun Roy was born in 1772 at Radhanagar which then was situated in the Burdwan district. He founded the 'Atmiya Sabha' for improving the moral conditions of the countrymen in 1815 and also launched numerous progressive movements against idolatry, superstitions, ritual of Sati, etc.
[76] David Hare was a watch-maker born in 1775 in a village in Scotland. In 1800 he came to Calcutta and became pre-occupied with the study of the Indian society while residing in Calcutta.

Radhakant Deb[77] was the 'native' secretary of the society and wrote and distributed books to teachers and students free of charge. The schools established by Female Juvenile Society for establishment and support of Bengali Female Schools in 1819, Ladies Society for Native Female Education in Calcutta and other schools in its vicinity, also took examinations conducted by the School Society (Bhattacharjee, 1986, pp. 72, 73). Prasanna Kumar Tagore associated with School Book Society since 1824, became the member of Committee of Public Instruction in 1837. He voiced for education in mother-tongue with a sound modern knowledge of English (Bhattacharjee, 1986, pp. 89, 90). Henry Derozio was known to have instilled rational, scientific and free enquiry amongst his students. This led to the foundation of the Young Bengal which administered and ran various associations.[78] When demands were raised for vocational training in medicine and engineering, the government set up medical college in 1835. While, the Young Bengal privately established the Mechanical Institute in 1839 which was short-lived (Bhattacharjee, 1986, pp. 102-109).

There were reservations amongst orthodox Hindus that education in English language, western literature and sciences at missionary and other schools would convert to Christianity. and begin to question rituals and customs. Elphinstone encouraged the formation of the Bombay Native School Book and School Society in 1822 as part of the purely Christian organisation i.e. the Bombay Education Society. He believed that it was necessary for few Indians to be taught English language and literature who could communicate it to their countrymen in their vernacular languages, in place of a uniform English education. The Society translated European works and opened few vernacular schools in 1824. The inhabitants were reluctant to send their children to English schools on the fear of conversion to Christianity. The native secretary, Bapu Chhatre was appointed to popularise the education.[79] Radhakant Deb made efforts towards removal of apprehensions of guardians in sending their children to the schools. As a result, eighty-five of 166 pathshalas, ascribed allegiance to the School Society in Calcutta. Many orthodox inhabitants feared that their kids would reason faith, which they

[77] Radhakant Deb was born in 1784. A tutor taught him Persian and Sanskrit at home. He received education in English at the Cunningham's Calcutta Academy.

[78] These include the Academic Association, Epistolary Association, Society for Acquisition of General Knowledge, Bengal British Society and Hindu Theophilanthropic Society (Bhattacharjee, 1986, New Delhi, pp. 107-109).

[79] Ganesh Gangadhar Jambhekar, Centenary memorial, Volumes I-IV, 1950, p. 41-41.

implicitly accepted if they sent them to David Drummond's school (Edwards, 1884, p. 5). Also, Master Ramachandra[80] reported of the conflict between the new and the old system. He noted that he came out with a monthly magazine at four pence a month which published notices of English science and exposed the dogmas of ancient philosophy and attacked Hindu superstitions openly. It was condemned and they were called 'infidels and irreligious' (Natesan, pp. 247-264). Henry Derozio who had a magical impact on his pupils and held free discussions on religion and various social norms during Academia Association meetings were charged by the Committee of the Managers and had to resign in 1831 (Edwards, 1884, pp. 72-77).

Initially, the admission to Hindu College was restricted to classes of Hindus.[81] Radhakant Deb seemed conservative in numerous other instances.[82] Kavirajas had kept themselves aloof from western science. The preface of the transalation of Shusruta Samhita showed that its transalation into English by kavirajas was criticised by a section of the community which believed that since Ayurveda was an eternal part of the Vedas, it shouldn't be rendered into a *mlechha basha* and made accessible to all public at large across all caste and creed (Bhishagranta, Calcutta, 1911, p. 3). Concerns were also raised by orthodox Hindus when dissection of human body as part of anatomy class was to be initiated at the Calcutta Medical College. It was underlined by the 'natives' that they would allow cadaver-dissection only when approval was reaped from the sanskrit texts (Bose, 1994, p. 32). During the Mutiny days, Master Ramachandra[83] faced a threat to life because of the Hindu and Muslim vengeance against the converts of 'European' religion (Natesan, pp. 253-254).

Henry Derozio's appointment at Hindu College in 1828, can be viewed as a critical moment in India's intellectual history. The establishment of Academic Association allowed free

[80] For detailed study on Master Ramachandra, See Raina and Habib, *Domesticating Modern Science, A Social History of Science and Culture in Colonial India*, Delhi: Tulika Books, 2004, pp. 1-42.
[81] See Presidency College, Calcutta, Centenary Volume, 1955, Alipore: Superintendent Government Printing, pp. 1-4.
[82] He along with Ram Comal Sen and Prasanna Coomar was also one of the strong supporters of resignation of Derozio. On the grounds of a threat to religious and ethical beliefs, he wanted to terminate the service of Kailash Chandra Basu and Gurucharan Singha in 1848 and 1850 respectively (Bhattacharjee, 1986, New Delhi, p. 70-77.
[83] Master Ramachandra was an Indian Mathematician born in Panipat in 1821 (Natesan, Madras, p. 247)

discussions[84] during its meetings. It was followed by print discussions through twelve to fourteen newspapers, which advocated diverse views held during its own meetings as well as those of other debating societies, which primarily were offshoots and auxiliaries of the parent society. Increasingly, liberal education was emphasised with the need for the Hindu women to be taught. He started a daily newspaper, East Indian[85] after resigning from the Hindu College. Derozio's mother, after his death in 1831 proposed to instruct few ladies in subjects like English, French, Reading and Writing, Geography, History, Arithmetic, Elements of mathematics and Physical Science along with needle-work and domestic economy. The dozen of native schools supported by Hindus was a result of Derozio's influence and teaching (Edwards, 1884, pp. 31-41,142, 179).

Bal Gangadhar Shastri Jambhekar joined the English school of the Bombay Native Education Society in 1826. He acquired mathematical knowledge on his own, by reading the Marathi translations of Dr. Hutton's mathematical works by Captain Jervis, as little mathematics was actually taught. Through his efforts, he became a mathematics tutor within fifteen months. At the age of 17, he also convinced Dr. Jervis that he could become the secretary of the society.[86] During 1830-32, he translated Neeti Katha and Sara Sangraha (Cathecism of General Knowledge) in Marathi. Later, established the first Anglo-Vernacular Weekly, Bombay Darpun in Western India, which intended to encourage and aimed at diffusion of the pursuit of English language and literature through both English and Marathi for a wider reach among the people. It opened a field for free and public discussions for prosperity and happiness of the inhabitants.[87] He taught mathematics at Elphinston College and remained the only Indian

[84] During these meetings, the principles and practices of Hindus were openly ridiculed. The Hindu religion was denounced for their ignorance and superstitions which they believed was the cause of the state of the Hindu society (Edwards, 1884, pp. 72-77).

[85] The Eurasians were not allowed to join the Forest School at Dehradun and Engineering College at Roorkee. Derozio started this paper on his own funds. It was the recognised organ of Eurasians and also advocated the claims of East Indians and had their interests in view.

[86] He also translated Goldsmith's History of England which was being prescribed in the schools as text-books. He also became the Native Secretary of the Oriental Translation Committee of the Bombay Branch of the Royal Asiatic Society which was founded in 1831.

[87] It was to contain commercial advertisements, extracts from English newspapers and native papers of Bengal as well as notices of important events in the country, Europe and other parts of the world. It will be receptible for communication from Europeans and "natives" connected with the inhabitants, religion and literature of India and short treatises in Arts and Sciences and learning and knowledge of Europe especially which could be important for application to the country. The paper established itself and became an influential organ of 'native' opinion in

professor until 1841. He was the first Indian to act as Superintendent in-charge of three divisions of the Presidency, along with two leading educationists of the day. On the sick furlough of his college professor to Europe for two years, he acted as the professor of mathematics and astronomy. He published books in Marathi on algebra, geography, Marathi, grammar, etc. He was an elected member of Bombay Geographical Society, established as a branch of Royal Geographical Society of London in 1831. He edited Dig-Durshun, a monthly periodical in the 1840 which published short papers for general readers on variety of subjects connected with Geography, History, Natural Philosophy, Chemistry and Chemistry with occasional illustrations in lithography. However, it wasn't known as to how long did it continue. He vigourously pleaded for education of women. He was the first social reformer of Western India.[88]

Madhusudan Gupta who was a kaviraja played a critical role in the initiation of the dissection in the College, as he supplied the evidence from the ancient texts of human dissection. He was the first Indian of high-class Pundit to undertake dissection of human anatomy at the Calcutta Medical College. He worked as a demonstrator and finally became a certified doctor in 1840 (Bose, 1994, pp. 1-39). Master Ramachandra received his education at the English Government School, though no special attention was paid on Mathematics. After the re-organisation of education Department in Bengal Presidency, the school was raised to a College where he secured a senior scholarship for Rs. 30 each month. In 1844 he was appointed as a lecturer of European science in the oriental department through the medium of vernacular. A vernacular translation Society was instituted and under its auspices Ramachandra translated and complied works in Urdu on Algebra, Trignometry, etc. which were introduced as class text-books to acquaint students with English and Science so that they were equipped to delve into more reasonable and experimental theories of modern science. In 1850, he published his mathematical work on Problems of Maxima and Minima in Calcutta. His work was widely appreciated at the universities in Europe[89]. In 1858 he was appointed as a teacher of

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the country circulation of 300 by 1832. The Oriental Christian Spectator for March 1833 cammed it a 'highly respectable and useful paper in Marathi and English'.

[88] Ganesh Gandhar Jambhekar, Memoirs and Writings of Acharya Bal Gangadhar Shastri Jambhekar, Poona, 1950, pp. 33-60.

[89] When he discussed about his idea of the book, the reviewers in Calcutta called it "empty phantasms of my brain". However, J. E. Drinkwater-Bethune bought 36 copies of the book and sent it to England. It was sent to De

mathematics in the Government Engineering College at Roorkee. In the same year, he became the Head-master of the government school in Delhi (Natesan, pp. 247-264).

Mahendralal Sircar fought with medical professionals and played a critical role in growth of Homeopathy in India. He proposed the foundation of the Indian Association for the Cultivation of Science in 1869, amidst strong views for a technical institute, IACS was founded in 1876. With the foundation of the Indian National Congress, national education was gaining momentum. Satish Chandra Mukherjee founded the Dawn Society in 1902. It was believed that the standard of education couldn't be raised by 'pompus syllabuses' prescribed in the university calendars which encouraged cramming. The Dawn Society aimed to supplement education imparted in schools and colleges through its literary, moral, religious and industrial sections that could succeed in training students in all faculties, providing 'whole education' as against university education.[90] The Society published a magazine for the student community alongside holding lectures in order to awaken spirit of enquiry among students.[91][92]

2.3.4. Literary and Scientific Society, Madras

In 1804, Sir James Mackintosh founded the Literary Society of Bombay which became the Bombay Brach of the Royal Asiatic Society of Great Britain and Ireland (Sen, 2017, pp. 199, 200). Later in 1818, the Literary and Scientific Society of Madras was founded by Chief Justice of Madras, Sir John Henry Newbolt in 1818. It was associated with the Royal Asiatic Society of Great Britain and Ireland in 1830. The Society's journal, Transactions of the Literary Society (renamed in 1833 as Madras Journal of Literature and Science) was modelled on the Journal of the Asiatic Society of Bengal. It was published under the auspices of the

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Morgan who was one of the most famous English mathematicians who not only saw the merit but also thought that encouragement of the merit would promote native effort towards restoration of the native mind in India. As a result, a London edition of the book was published with De Morgan's preface appreciating the work, for greater circulation in Europe. He published the second book on A New Method of Differential Calculus in 1861 (Natesan, Madras, pp. 247-264).

[90] Sir Goroo Das Banerjee's Speech from *Bengalee* of August I, 1905, Reprinted in Part IV of The Dawn and Dawn Society's Magazine, 1907, p. 2-5.

[91] Report of the Dawn Society for 1904, Reprinted from the *Indian Mirror, August 6, 1904* in Part IV of The Dawn and Dawn Society's Magazine, 1907, p. 6-8.

[92] Kumar views these as 'Native's' response. For details See Deepak Kumar, Science and the Raj, 2006, New Delhi: Oxford University Press, pp. 57-64.

Madras Literary Society and the auxiliary of the Royal Asiatic Society. The absence of the journal in the presidency earlier, led to transfer of literary laurels to other Presidencies. It acted as a channel for communication for those interested in the cause of literature and science. However, the core aim was to furnish knowledge about the resources of India and to report useful information about habits, culture of its inhabitants. The journal was seen as a vehicle for conveying discoveries, researches and observation relating to the literature, arts, sciences and natural history, etc. in India to the world. The Journal also published the meteorological registers as the need for accurate and extensive information about the climate of the Presidency was felt. The primary aim for the Society was to be informed about the mysteries of nature, promotion of researches of science, advancement in progress of literature and knowledge about India. The journal also had the articles of the Asiatic Societies of Calcutta, London and Paris. The journals published researches on geology, meteorology, flora, fauna, culture and history of the Presidency extensively by the community of the Presidency.[93]

The society meetings were held once in every three to four months. Most early members, office-bearers of the society were Europeans, who mostly presided and chaired its sessions.[94] Even the papers were mostly presented by Europeans with very few by Indians, even those were mostly edited by Europeans.[95] These were related to diverse fields, which included desideratum and enquiries related to the Madras Presidency including fields of language, literature, history, antiquities, architecture, landed tenure and agriculture, art and architecture and natural history.[96] The first Indian to be admitted to the society was Kavali Lakshmayya who worked with Cole Mackenzie. The publication of the journal ceased in 1894 after which the society gave up its scholarly activities and restricted itself to functioning as a lending library.

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[93] J. C. Morris (ed.), *The Madras Journal of Literature and Science*, Volume 1, October 1833 to December 1834, Madras: Printed at the Vepery Mission Press, 1834, V-VII.

[94] Robert Cole and C. P. Brown (eds.), The Madras Journal of Literature and Science, Volume IX, January 1839 to June 1839, Madras: Printed at the Atheneum Press, 1839, pp. 194-197.

[95] J. C. Morris (ed.), *The Madras Journal of Literature and Science*, Volume 1, October 1833 to December 1834, Madras: Printed at the Vepery Mission Press, 1834, V-VII.

[96] The Proceedings of the Madras Literary Society and auxiliary of Royal Asiatic Society held in Society's room at the College on Thursday August 8, 1833 gives details about the attendees of the meeting. A similar trend is attested to by the Madras Journal of Science and Literature January-June, 1839.

Besides this, numerous literary and scientific societies came up in India. The Students' Literary and Scientific Society, Bombay was founded on June 13th, 1848. Most of its original founding members except, the President were Indians. Even in 1856, its membership largely remained restricted to mostly Indians. Among its members were barrister, education visitor, interpreter, professor, teacher, clerk, etc. (Sen, 2017, p. 201). At its sessions essays on literary, scientific and social subjects were discussed. It was considered that initially the Society would be open only to those connected with Elphinstone Institution and would exclude political discussions. Its vernacular branches were organised to promote diffusion of knowledge among uneducated masses by reading and discussing essays on literary, historical and social reform subjects, lectures on chemical and physical sciences with experiments and by publication of a monthly periodical societies. From the second session, it was involved with the opening of girls' and boys' schools.[97]

The Bihar and Orissa Research Society published, Journal of the Bihar and Orissa Research Society. Its papers centred around religious customs, traditions, cultures, histories, myths, folklores, legends and traditional ways of curing ailments, contributed by both Europeans and Indians. The honorary members in the meeting of 26th February and 8th April, 1916 were all Europeans. But, the attendees and the ordinary members of the society included both Europeans and Indians.[98] The Panjab History Society was proposed by three Europeans namely, Dr. Vogel, J. P. Thompson and Whoolner. They realised the importance of Punjab for historical research and discussions. The first annual meeting was held in the Old Senate Hall, Lahore on December 27th, 1910. It was attended by fifty members and visitors. The total members of the society numbered 136. Its Treasurer as well as other members of the council included both Indians and Europeans. The papers contributed at the meeting were primarily historical in nature. Only two, out of eleven papers were contributed by Indians.[99]

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[97] Proceedings of Students' Literary and Scientific Society, Bombay for the years 1854-1855,1855-1856, 1856, Bombay Gazette Press, Bombay, pp. vi-xi; pp. 5-20).

[98] Journal of the Bihar and Orissa Research Society, June and December 1916 (National Archives of India, New Delhi).

[99] Journal of the Panjab Historical Society, Volume I, 1910 (National Archives of India, New Delhi).

2.3.5. Agricultural and Horticultural Society of India

William Carey with other Europeans including Joshua Marshman, founded the Agricultural and Horticultural Society of India (AHSI) on September 14, 1820. The central purpose of the society was the development and promotion of agriculture and horticulture in India. The Society also envisaged improvement and advancement of land through superior mode of cultivation, launch of new and beneficial plants and advancement of husbandry implements. The Council of AHSI planned to import horticultural seeds from across the world, maintain experimental gardens for collection and regular distribution of useful plants, and a school for raising up a body of intelligent gardeners, distribution of prizes for implementation of horticultural procedures. It published a journal in English and a miscellany in Bengali containing practice papers reflecting on tropical production like cotton, tobacco, tea fibre, etc. Its English journal was initiated in compliance with the Honourable Court and its copies were sent free of cost to the Indian House since 1841. Among other objectives enumerated by the council were maintenance of requisite secretariat establishment for undertaking these tasks, offer prizes for encouraging the production of new articles which are likely to prove useful at a future day, collecting valuable information in an useful and practical form on important Indian agricultural staples[100] and import of agricultural seeds, namely cotton, tobacco, flax, Carolina paddy and other cereals for public distribution to other than members for the benefit of the Country generally. At the beginning of the nineteenth century, the local Court of Directors of EIC had directed the culture of fibres in India.

The society was supported by the colonial government. The society's income came from subscription of the members and government donations. It sought for additional pecuniary aid to assist the general operations of the society and especially, import of seeds on an extensive scale for increasing production[101], developing agricultural resources for meeting the demands of the public officers for dissemination of seeds throughout the country for public benefit.[102]

[100] In the schedule of prizes now before the public. there is one for Rs. 1000 for "Rhea" fibre and two premia of Rs 500 each for the best pays on the relateris cost and production of the various old seeds of India suitable for export and on the culture of the Date trees in Bengal, its present condition and capabilities of improvement.
[101] Home, Public, no. 41 12 October 1855 (National Archives of India, New Delhi).
[102] Home, Public, no. 40, 12 October 1855 (National Archives of India, New Delhi).

Lord William Bentinck and Earl of Auckland were patrons of the Society.[103] The AHSI was allowed to import seeds of superior stock from different parts of the world for development of agricultural resources in India free of custom duty.[104] The society requested similar exemptions on customs duty on the import of madderseed and annual consignments of seeds of cotton, tobacco, field crops of various kinds, vegetables.[105] The Government also granted the society the land between the Alipore Bridge and the Kidderpore Bridge.[106] The AHSI also met the demands of the government. The society served as the deficit ministry of agriculture till 1900. The Government decided to depute secret officers to South America to collect its seeds and plants and convey it to Calcutta, Madras and Ceylon. The AHSI was instructed to look upon the conditions and locality for cultivation of quinine-yielding chinchona trees[107] which were utilised to cure malaria which was a major threat for Europeans in India.

The Proceedings of the monthly meeting of the society provide important information about the nature of work undertaken by the Society. The garden report giving an account of seeds and plants contributed to the garden was read. The society also organised exhibitions for showcasing these. A number of papers regarding the success and failures of various agricultural experiments done in different parts of the countries were read. Even non-members sent their observations about their experiments in tea cultivation, etc.[108] There were reports regarding the seeds and plants imported like, Liberian coffee and plants from Hongkong.[109] The proceedings also included recommendations for import of vegetable seeds from America, vegetable and flower seeds from France and flower seeds from Germany.[110] Numerous improved quality of fruits and vegetable like ginger, potato were imported which were unknown to the Indian society and attempts were made to acclimatise these through modern cultivation techniques under the leadership of Carey at AHSI along with varieties of wheat and

[103] Home, Public, no. 41, 12 October 1855 (National Archives of India, New Delhi).
[104] Home, Public, no. 18 16 March 1836 (National Archives of India, New Delhi).
[105] Home, Public, no. 8/10 9 September 1859 (National Archives of India, New Delhi).
[106] Home, Public, no. 6 6 October 1864 (National Archives of India, New Delhi).
[107] Home, Public, no.14/15, 29 July 1859 (National Archives of India, New Delhi).
[108] Revenue, Agriculture and Commerce, Agri-Horticulture, Part B no. 22 June1875 (National Archives of India, New Delhi).
[109] Revenue, Agriculture and Commerce, Agri-Horti no. 23 June 1876 (National Archives of India, New Delhi).
[110] Revenue, Agriculture and Commerce, Agri-Horti no. 73-74 January 1877 (National Archives of India, New Delhi).

maize.[111][112] The Society also took to profitable and better quality cultivation of a number of cash crops like tobacco, cocoa, cotton and sugar cane.[113] Percy-Lancaster introduced a number of plants and institutionalised the concept of hybridisation in India.[114]

In the initial years, the affairs and membership of the society were handled largely by the Europeans. But towards the last quarter of the nineteenth century there were some natives among the elected members of the society.[115] The contributions made towards the society hint at the mutual coordination between some scientific societies, institutions and surveys whose reports, proceedings and findings were gifted to the society. Though the society contributed towards the advancement of agricultural and horticultural knowledge, its experiments and findings seemed to be in sync with the colonial interests.

2.3.6. Calcutta Medical and Physical Society

In a meeting on March 1, 1823 medical gentlemen unanimously resolved that an association designated as the Medical and Physical Society of Calcutta, would be formed for the advancement of professional knowledge. The president and the members of the managing committee were ordered to report the resolution and objectives of the society to the government and seek permission to circulate letters intimidating the same to the medical officers of the Bengal Presidency.[116] Kumar identified the Society as an important scientific society which collected original papers in medicine, surgery and others fields related to it. It

[111] Grafts of fruit plants were procured and cultivated. Maize seeds were brought from America. Ginger rom Jamaica and potato from England. There were reports of good quality potatoes in North India from Society’s tubers. 32 varieties of wheat were brought from Europe and Egypt.

[112] The Society introduced maize from America, wheat from Europe and high yielding rice from Carolina and tobacco from Virginia. Potato, tomato, cauliflower, cabbage, turnip, carrot and all of the European vegetables from England and Europe. The experiments with regard to winged paddy, sunflower seed, tea fertilisers, windmill, Carolina paddy, tobacco trials in Oudh, encouraging indegenous wheat varieties as compared to english wheat, utilisation of tallow oil seeds over oil cakes, indian rubber, aloe fibre certainly had commercial incentives. See Revenue, Agriculture and Commerce, Agriculture, Part B, No. 13, July 1872; No. 22 June1875; No. 2, November 1876; No. 73-74 January 1877 ; No. 8 December 1880 (National Archives of India, New Delhi).

[113] A number of cash crops were brought from Mauritius and America introduced in India. Egyptian cotton was grown improvement of quality of cotton awarded Rs. 1000 for its quality by Manchester Cotton Supply Association. Mexican cotton seeds procured. tobacco seeds from Cuba, Hungary and Columbia. Rhea seeds from Scotland and England. introduced bougainvillea and ornamental plants cocoa from West Indies.

[114] In 1907 a new hybrid named cooperanthas was raised by crossing cooper and zephyranthes.

[115] Proceedings of the Agricultural and Horticultural Society of India 1872, 1875, 1876, 1877 and 1880 (National Archives of India, New Delhi).

[116] Home, Public, no. 41, 6 March 1823 (National Archives of India, New Delhi).

also aimed to form a select and extensive medical library for its members (Kumar, 2018, p. 3). The objectives and membership of the society were primarily local. The members of the Medical and Physical Society were mostly surgeons from Bengal, with some from Madras and Bombay as well. Some of its members were members of the Medical Board of Bengal and Bombay.

In 1829, there were 284 members with four corresponding and six honorary members. All members except Ramcomel Sen (Baboo), were Europeans among the corresponding member members.[117] In 1835, the membership of Society increased to 344. But, it showed a similar trend where almost all the members of the society were Europeans surgeons from Bengal, Bombay and Madras. While all honorary members were Europeans, among the twenty-one corresponding members there were few Indians including Ram Comel Sen and Madhusudan Gupta.[118] Its office-bearers, members of the committee of management and of papers in 1828, 1829 and1830 were all Europeans.[119] All the office-bearers were Europeans in 1834 and 1835.[120] The papers read covered numerous diseases and their links with the environment. They also dealt with the climate and medical topography of various places. In 1829, of the thirty-three papers, thirty-two were by Europeans and one by Baboo Ram Comel Sen in 1829.[121] Most of the papers were contributed by the Europeans except a few on indigenous drugs.[122] Kumar proposed that the Society broke the social isolation of doctors and without government aid could published Monthly Circulars and Selections regularly (Kumar, 2018, p. 3).

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[117] Transactions of the Medical and Physical Society of Calcutta, Volume Fourth, Calcutta: Messrs Thacker and Co, St Andrews Library, 1829.

[118] Transactions of the Medical and Physical Society of Calcutta, Volume Seventh, Calcutta: Messrs Thacker and Co, St Andrews Library, 1835.

[119] Transactions of the Medical and Physical Society of Calcutta, Volume Fourth, Calcutta: Messrs Thacker and Co, St Andrews Library, 1829.

[120] Transactions of the Medical and Physical Society of Calcutta, Volume Seventh, Calcutta: Messrs Thacker and Co, St Andrews Library, 1835.

[121] Transactions of the Medical and Physical Society of Calcutta, Volume Fourth, Calcutta: Messrs Thacker and Co, St Andrews Library, 1829.

[122] Transactions of the Medical and Physical Society of Calcutta, Volume Seventh, Calcutta: Messrs Thacker and Co, St Andrews Library, 1835.

2.3.7. Agriculture and Horticulture Society of Punjab

On May 6th, 1851, the Agriculture and Horticulture Society of Punjab was founded at a meeting of European inhabitants of Lahore, presided by Sir Henry Lawrence and attended by seventeen gentlemen of the civil and military service of the province. Like AHSI, the society of Punjab received a pecuniary grant from the government and its objectives were also similar to AHSI. The Society's objects included firstly, improvement of existing modes of cultivation and irrigation through introduction of system of manure, improvement of agriculture implements used and introduction of new ones, improvement of breed of cattle, horses, sheep, etc., introduction of agricultural products from other parts of India and abroad which could add to the means and resources of the people with development of articles of vegetable produced as items of commerce in Punjab. Secondly, improvement of vegetable cultivated commonly and introduction of new kinds from other parts of the globe and introduction and cultivation of ornamental flowers. Thirdly, introduction into all parts through local nurseries of better kinds of fruits, timber and ornamental trees and fourthly, formation of one or more gardens on an extensive scale ignored to conduct experiment.[123]

The society also distributed prizes to members, non-members, Europeans or natives for their contribution towards or exhibit of fruits, flowers, vegetables, agricultural produce and implements. The society struggled initially as a result of constantly changing office-bearers, subscribers falling, lack of enthusiasm and aptitude of the leadership of the society. The zeal and ability of E. B. Browne, professor at Lahore College and personal interest taken by the Lieutenant-Governor by affording official and extra-official support, helped the society to achieve desired results. The society gained considerable degree of local importance by 1863 its membership rose to hundred. Its members included gentleman of scientific reputations as well men of great practical knowledge. Its meetings were attended by distinguished guests. Through its advancement and contributions, it worked towards spread of agriculture and horticulture in Punjab. Apart from AHSI, there were numerous local agri-horticulture societies across India. Few among which were in Punjab, Satkhira, Bijnor, Madras and Nagpur.[124]

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[123] Foreign Department, General A, File No. 41 – 43, July 1863.
[124] Foreign Department, General A, File No. 41 – 43, July 1863.

2.3.8. Aligarh Scientific Society

After the Revolt of 1857, the need for understanding and learning western knowledge led to growth of numerous societies. Of these, Aligarh Scientific Society (1865) and Bihar Scientific Society need special mention. The Aligarh Scientific Society aimed to dispel ignorance and darkness, which had retarded the advance of the country. It tried to do so by introduction of western learning of arts and sciences through vernacular language. The objects of the Society included translation of European works of literature or science, publication of journals and rare and valuable oriental books and holding lectures on scientific and useful subjects through scientific experiments. It also preached introduction of technology in agriculture and steam for industrial purposes. The aims of the Society were considered secular as it totally kept religion out of its purview.[125]

In 1865 it started a weekly newspaper and later in 1866 it published the Aligarh Institute Gazette with the slogan that permitting liberty of the Press was the duty of the government and preserving it was the part of free people. Since its inception, the paper began criticizing the education policy of the government and pleaded for Vernacular University for the North-Western Province. As a result of which, government's attitude towards the Society stiffened. Its members were Indians, mostly government servants, zamindars and vakils. As the society derived its strength largely from those who depended on the goodwill of the government, its weakness was inherent. When the government began to discourage the activities of the Society, majority of its active members became neutral.[126]

2.3.9. Bihar Scientific Society

The Bihar Society (1868) was established by Imdad Ali Khan who believed that vernacular languages had to be medium for imparting education in European sciences among Indians. Its primary aim was translation of European works in regional languages. This required government aid as a result of which, the Society sent various solicitations to the Government. However, it started translating European scientific works from the donations received from its

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[125] Arshad Ali Azmi, 'The Aligarh Scientific Society 1864-1867', *Proceedings of the Indian History Congress*, Vol. 31, 1969, pp. 414-20.
[126] Ibid.

members. It translated works on Algebra, Arithmetic, Astronomy, Botany, Geography, Geology, Natural Philosophy, Political Economy, Surveying, Trignometry, etc. in urdu. By 1877, nineteen works on mathematics were translated. As a result of shortage of funds, no further translations were undertaken. However, a printing press was established for printing the translated works.[127]

The Society founded schools at Muzaffarpur, Gaya with their branches in Sitamarhi and Chapra. In his visit to the school at Chapra, the Commissioner of Patna S. C. Bailey in 1871 had said that it was the best vernacular school he had visited and that the school should be aided by the government. During its periodical meetings, lectures in Chemistry and Physics were exhibited with experiments. The lectures in social sciences were arranged during its quarterly meetings. Its bi-monthly new paper in Urdu Akhbar-ul-Akhbar which included educational articles for improving the intellectual, moral and social condition of the people. The Society encouraged foundation of other societies. It became popular among the intellectual sections of the people. Its objects were approved by a number of Europeans, as a result a number of influential Europeans also joined the Society. However, their number still remained low. In 1871 there were about 500 members of the Society of which only forty-three were Europeans. After founder's retirement in 1975, the Society declined and later became dysfunctional after the last lecture was delivered in 1977.[128]

2.3.10. Bombay Natural History Society

The Bombay Natural History Society was founded on September 15, 1883, by eight men interested in conservation, which they believed should be based on research. Among its founder members were two Indians, Dr. Atmaram Pandurang and Dr. Sakharam Arjun, while others were Europeans.[129] They proposed to exchange notes on wildlife, exhibit specimens and encourage research interests during its monthly meetings. The first volume of the Journal of

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[127] V. A. Narain, 'The Role of Bihar Scientific Association in the Spread of Western Education in Bihar, *Proceedings of the Indian History Congress*, Vol. 31, 1969, pp. 421-24.
[128] Ibid.
[129]These include, A. T. Aitken, Dr. G. A. Maconochie, Dr. D. MacDonald, Col. C. Swinhoe, Mr. J. C. Anderson, Mr. J. Johnston.

the Bombay Natural History Society was published in 1886, under the editorship of its Honorary Secretary, Mr. Phipson.

In 1912, the Society envisaged to undertake a systematic mammal survey of India, Ceylon and Burma for which the Government of India sanctioned Rs 7,500. W. S. Millard, Secretary of the Society wrote to the GOI for increasing the grant to Rs 15000, so that a third collector could be appointed for the task, without which the survey would take several years to complete. He told the Government that he feared that collectors from other nations especially America could forestall their objectives. But, the Government was unable to increase the grant.[130] In 1911, R. C. Wroughton, member of the society organised a survey of mammals along with other members spread across India, Burma and Ceylon to provide specimens. This could be seen as the first collaborative natural history study which resulted in the collection of about 50,000 specimens in twelve years. The scientific results from the Mammal Survey was published in the Journal of the Society.[131]

2.3.11. Indian Association for the Cultivation of Science

The efforts made by Indians towards populatisation of science in India through translation of European works and English as well as vernacular education, has already been discussed. Mahendralal Sircar received education from the Hindu College and Calcutta Medical College. He realised that introduction of science in the curriculum science could not strike a deep root in India. The creation of mass interest in science was critical for training scientists for undertaking original researches. He sought inspiration from the Royal Institution of Great Britain and BAAS. In the Calcutta Journal of Medicine, where he first proposed the establishment of Indian Association for Cultivation of Science (IACS), he wrote[132]

We want an Institutions which will combine the character, the scope and objects of the Royal Institution of London and of BAAS. We want an institution which shall be for the instruction of the masses, where lectures on scientific subjects will be systematically delivered and not

[130] Education, Museum A no. 1-6, November 1912 (National Archives of India).
[131] Ibid.
[132] Indian Association for the Cultivation of Science (1976) “A Century” Calcutta: Indian Association for the Cultivation of Science.

only illustrative experiments performed by the lecturers, but the audience should be invited and taught to perform them themselves. And we wish that the Institution be entirely under native management and control.

The proposal widely appreciated by the enlightened section of the Society. He further published a prospectus in the Hindoo Patriot dated January 3, 1870 and invited contributions towards the project. The paper in its editorial columns supported the venture of Dr. Sircar and regularly published notices and reports of activities of the Association. The first subscription account was opened on January 24, 1870 which received contributions from a number of natives. Apart from the natives, the proposal was supported by Europeans like Father E. Lafont and Lieutenant Governor of Bengal, Sir Richard Temple who helped the Association in its developments in various ways.

However, the establishment of the Association was not without struggles. The Indian league had been agitating for the establishment of technical college that could provide technical education as well as create employment opportunities. A vigouruos press campaign for attracting support for the scheme had also been started, in the course of which Sircar's plan for the cultivation of science was criticised as premature and intended merely for the mental pleasure it afforded. Suggestions were made for the amalgamation of both the projects into a single institution undertaking teaching as well as instructions in the mechanical arts. The Government was approached for its encouragement and patronage and the records show that Sir Richard Temple was sympathetic to technical education scheme. But, he supported the object and plan of the Association.

The founding of IACS (1876) at Bow Bazar, Calcutta was a milestone in the history of modern science in India. The objective of the Institution, according to Dr Sircar was 'to cultivate science in all departments with a view of its advancement by original research and its varied application to the arts and comforts of life'.[133] The initial funds for the establishment was generated by Indians. The motive was to develop a national institution solely managed by Indians without interference from the government. Though initially the motto was to develop

[133] Home, Education Part A nos. 57 August 1899 (National Archives of India, New Delhi).

an institution that combined the features of the Royal Institution and the British Association. But Sircar believed that the time was not ripe in India for an institution similar BAAS, therefore the Royal Institution became its model. But, he hoped about their combination in future.[134] Till 1899, all the members of the Association were life-members. The affairs of the Association were managed by the committee of management.[135] The funds promised from the subscribers were utilised for the building at Bow Bazar, Vizanagaram Laboratory, Lecture Hall and purchase of scientific instruments and apparatus along with books and periodicals. The Association sought investments from influential and well known natives of Calcutta and nearby places.[136]

Until 1899, the Association primarily delivered lectures in several branches of science and arranged honorary lectures for diffusion of scientific knowledge among native community. The subjects included physics, chemistry, astronomy, geology, botany and biology. As most colleges in Calcutta lacked facilities for experimental instructions in Physics and Chemistry. The F. A. and B. A. students were coached at the Association on payment of fees. But, the lectures and practical demonstrations held at the Association were of a higher standard than required. By 1899, a number of students attending the lectures and demonstration at the Association passed the M.A. examinations in various science subjects in Calcutta University.

The Association's income came from unvested funds and periodic subscriptions which was insufficient for whole-time lecturers and professors. This hampered Association's primary objective of stimulating original scientific research[137]. Sircar faced numerous difficulties in establishing and maintaining the Association, as a result non-compliance with plan of establishment of a technical institute. Had he not been in opposition, it would have flourished and rendered valuable service to the cause of science. Though, confident about the intellectual capacity of Indians, Sircar was thoroughly disappointed with their apathy and indifference

[134] Indian Association for the Cultivation of Science, *A Century*, Calcutta: Indian Association for the Cultivation of Science, 1976.
[135] It consisted of President, two or more Vice-Presidents, a Secretary, two Assistant Secretaries and no less than 11 members, all elected at the annual meetings
[136] Home, Education Part A nos. 204 August 1899 (National Archives of India, New Delhi).
[137] John Bosco Lourdusamy, The Indian Association for the Cultivation of Science: A Tortuous Tryst with Modern Science*', Journal of Science Education and Technology*, Vol. 12, No. 4, Dec., 2003, pp. 381-396.

towards encouragement of higher branches of science work, and fostering original research required endowments and fellowships.

The Association had a struggling early history. But, its importance was realised by the natives and it was maintained solely on native funding. Its lecture hall was one of the best known at that time and its laboratory was utilised by many scientific workers like C. V. Raman for their research. Amongst all the scientific societies discussed, the Indian Association for the Cultivation of Science stands out for its objectives catered to the cause of cultivation and advancement of science in India. It aimed at promotion and cultivation of all branches of science at a mass level. It was conceived and managed by natives unlike the earlier societies which were a European invention and were primarily manned and managed by the Europeans. Although the founder of the Association couldn't see the success of the Association during his life, but it certainly was a major step towards the cause of science in India. For the first twenty-five years, the Association merely popularised science through its popular lectures merely a portion of what a science society does.

2.3.12. Board of Scientific Advice

The Board of Scientific Advice (BOSA) was appointed for organising and coordinating the scientific work undertaken in various scientific departments of the Government of India. The aim of the scientific departments was to investigate underdeveloped resources and promote development of industries. The need for a central authority was felt by the Governor-General in Council, so that the work of science departments was systematically distributed to avoid dissipation and duplication of energy because of lack of inter-departmental cooperation. It was reiterated that limited funds restricted necessitated practical research for exploration of undeveloped economic resources is primary in India.[138] Therefore, BOSA with the heads of all scientific departments was constituted. Its function was to review the work of all scientific

[138] It also highlighted that before 1897 undue importance had been given by the Indian Agriculture and scientific departments to pure sciences and its economic application was neglected. The resolution affirmed the need for greater emphasis on the economic side of scientific inquiry and emphasis on collaborating works of different scientific departments on the basis of a well-considered plan. The various departments are closely related and are not self-contained. The authority would enable greater mutual assistance and cooperation among various departments for effective research. The Board aimed to ensure that the importance and precedence of the economic and applied science over pure and abstract science. Although the importance of pure science is recognised as a basis of paving way for applied science by the Council. See Constitution of a Board of Science Advice for the furtherance of scientific work in India, Nature, Vol. 67, No. 1746, London: Nature Publishing Group, 16 April 1903, pp. 568, 569.

departments and advice with the focus largely on the economic side and act as a referee for the organisation of scientific inquiry in India. It will assess the proposals of each department and its function will be confined to examining and criticising the proposals. The Board acted as an intermediary between the science workers and the government where it first analysed the past year work of various departments and then passed the proposals for the coming year and after acceptance of the government largely prescribed an annual programme of research. The Board was also to be assisted by the Royal Society of London.[139][140] The annual reports reviewed the results of investigations undertaken by all scientific departments and scientific officers of imperial and provincial government on varied scientific fields of economic importance like applied botany, chemistry, geology and zoology along with their publications.[141][142] The Annual Report of 1906-1907 also contained a programme for scientific research to be undertaken under different fields during the year 1907-1908. All the members of the BOSA during 1906-1907 as well as 1914-1915 were English[143][144]

According to Curzon's quote in Baber's book, the Board was seen as the greatest and noblest that anywhere devolved upon the British race (Baber, 1998, p. 217). However, context and the aims of the constitution of the Board, clearly pointed that colonial imperatives behind scientific research in India, were largely based on their economic interests. It had little to do with the cultivation and advancement of pure sciences in India and certainly not among Indians. The BOSA can largely be seen as a government institution with the aim of undertaking selective scientific research in India which aimed at economic application of research in agriculture, industries largely for increasing revenue of the government. MacLeod opined that the history of the Board reflected the containment of British scientific activity in

[139] However numerous difference arose between the Board and the Royal Society over the fundamental versus applied science and over Indians capability of engaging in pure sciences. It was aggravated by the time that the society would take to evaluate the proposals of the Board (Baber, 1998, p. 217).

[140] See Constitutions of a Board of Science Advice for the furtherance of scientific work in India, Nature, Vol. 67, No. 1746, London: Nature Publishing Group, 16 April 1903, pp. 568, 569.

[141] Annual Report of the BOSA for India, Calcutta, Superintendent Government Printing, 1904 (The British Library, London).

[142] Annual Report of the BOSA for India, Calcutta, Superintendent Government Printing, 1905 (The British Library, London).

[143] Annual Report of the BOSA for India, Calcutta, Superintendent Government Printing, 1908 (The British Library, London).

[144] Annual Report of the BOSA for India, Calcutta, Superintendent Government Printing, 1916 (The British Library, London).

India within the government with largely limited scope and held away from the Indian society (MacLeod, 1975, pp. 343-384). Baber highlighted that the Board was dissolved as a temporary economic measure in 1923, primarily in the context of larger political developments during 1920s in India and was superceded by organisations like ISCA and others (Baber, 1998, p. 218).

2.3.13. Calcutta Mathematical Society

The Calcutta Mathematical Society was founded by an Indian, Ashutosh Mookerjee[145] in 1908. He was the founder President of the Society and retained the post till the time of his death. Unlike most of the societies mentioned above, the founder President, Vice-President, Secretary and Treasurer were mostly Indians, except C. E. Cullis who was the founding Vice-President. The objectives of the Society were the advancement of mathematics in both pure and applied fields through lectures, improvement in mathematical studies, greater interaction between mathematicians, publication of journals, bulletins, etc. along with greater coordination between different institutions within India as well as abroad reviewing their contributions and discussing modern topics. The publication of the society, Bulletin of the Calcutta Mathematical commenced in 1909.

2.3.14. All-India Sanitary Conference

The First All-India Sanitary Conference was held in November 1911, was the first instance of a conference where all professionals and non-professionals associated with sanitary and public health met at Bombay. The conference was presided by S. H. Butler and had 29 delegates mainly government officers from various provinces like Ceylon, Madras, Bombay, United Provinces, Bengal, Punjab, Burma, Eastern Bengal and Assam and Central Provinces, including four Indians. The President emphasised on the utility of the conference which gave an opportunity for workers who largely toil in isolation, from across India to compare experiences, exchange ideas and friction of mind with mind and personal intercourse. The

[145] Vice Chancellor of the Calcutta University since 1906.

conference addressed issues of urban and rural sanitation, town-planning, drainage, epidemics and food supplies, through an emphasis on research work and hygiene.[146]

Figure 2.1. Members of the Second All-India Sanitary Conference, 1912 at Madras

Source: Picture from Proceedings of the All-India Sanitary Conference taken at The British Library, London.

The Second All-India Sanitary Conference was held in Madras and the number of delegates increased to seventy-one out of which there were about twelve Indians and members from Bihar, Orissa, Hyderabad and Mysore apart from those from the provinces mentioned above joined. The President on the conference underlined the utility of the conference in sanitary awakening of India and dawning of an age of greater attention to public health. As a result of greater volume of papers, they were read under sections of medical and sanitary engineering and the number of days of the conference was increased to five days. Apart from these exhibitions of sanitary work models and excursions to Madras Drainage Works, King Institute and Conjeeveram Waterworks were undertaken.[147]

[146] Proceedings of the First All-India Sanitary Conference, Simla: Government Central Branch Press,1912 (The British Library, London).

[147] Proceedings of the Second All-India Sanitary Conference, Simla: Government Central Branch Press, 1913 (The British Library, London).

The choice of Lucknow for the Third Conference was made as a move away from Presidencies chosen for last two conferences and because of its proximity to Benaras, Haridwar and Allahabad, which were important pilgrimage centres and had greater scope for sanitary discussions. The conference continued for nine days with 129 delegates including delegates especially from Portuguese India, visitors and 23 Indians and about hundred papers were read in 1914. The President of the session underlined that the attendance of the conference had doubled and provincial sanitary conferences were held in Punjab, Bihar, and Orissa during 1913. The programme included inspection tours to Allahabad, Benaras and Hardwar to evaluate conditions of drainage and sanitation along with two popular lectures in the evening of the third day of the conference and lantern exhibitions which enabled exhibition of local peculiarities, difficulties and also for exchanging views.[148] However, there is no evidence of such conferences being held after the Third Conference held at King George Medical College in Lucknow in 1914 which happened after a gap of one year with no conference being scheduled for 1913.

Simonsen also opined that Sanitary Conference or Conference of Agricultural chemists were those which accorded only opportunity for scientific discussion. But he highlighted that there were purely official and irregular conferences promoted by the Government.[149] Although these Sanitary conferences saw participation from various provinces of government officials and scientific workers from various research institutes, they largely remained restricted to the issues concerning public health, hygiene and sanitation. However, the proceedings of this conference are similar to the proceedings of ISCA.[150]

2.4. Establishment of the Indian Science Congress Association

The need for transcending excessive specialisation and technicality of modern science, greater communication between the scientific community and the political estate along with transforming science abstruse jargon into popular dialect were viewed as reasons for the

[148] Proceedings of the Third All-India Sanitary Conference, Simla: Government Central Branch Press,1915, pp. 1-18 (The British Library, London).
[149] Presidential Address by John Lionel Simonsen during ISCA session in 1928. See, Proceedings of the Fifteenth Indian Science Congress, Second Circuit, Calcutta: Asiatic Society of Bengal, 1928, p. 2-5.
[150] Ibid.

foundation of the Congress (Vishvanathan, 1985, p. 13). It was argued by the twentieth century the scientific research had progressed enough for time ripe for a professional body of scientists for discussion and criticism of each other's work and coordination of activities for popularisation of science (Gupta, 2011, pp. lxii-lxiii). The geographical and academic isolation of scientific investigators in science organisations, educational institutions and research institutes across various parts on India, desired interaction among themselves was increasingly felt (Govil, 2011, pp. 144,145). ISCA's inception cannot be viewed as a single event in history. Rather, there had been efforts for organisation of an institution similar to BAAS at least twice before ISCA actually came up in 1914. The first attempt was made by the Calcutta Journal of Natural History which proposed to form an Indian Association for Advancement of Natural History (Kumar, 2018, p. 3). Mahendralal Sircar's proposal for IACS also envisaged an institution that was modelled on the Royal Institution and the British Association. However, later he realised that time was not ripe for an institution similar to BAAS. Therefore, IACS was modelled on the Royal Institution, though he hoped for a combination at a later date.[151] The efforts saw light after ISCA was proposed in 1911.

The return of Indian scientists like P. C. Ray and J. C. Bose, after completing their degrees abroad and their appointment as university professors in 1880s and genesis of research groups around them provided the background for ISCA. The credit for the genesis of ISCA was attributed to two British chemists, John Lionel Simonsen and P. S. MacMahon, who were appointed as professors of chemistry in India in 1910. They were concerned about the scientific teach and research in India which they believed could be improved with the foundation of an organisation similar to BAAS. J. L. Simonsen was appointed as the professor of chemistry at the Presidency College, Madras[152] and devoted a large part of his time to scientific work.[153] In addition to his interest in scientific research, he was also greatly involved with the problems of teaching in science particularly in the branch of chemistry and of administration of the scientific institutions. As a result, he decided to establish an organisation

[151] See A Century, Calcutta: Indian Association for the Cultivation of Science, 1976.
[152] Appointment of Mr. John Lionel Simonsen, D. Sc. to be a member of Indian Educational Service to hold the post of Professor of Chemistry at the Presidency College, Madras (National Archives of India).
[153] During the First World War he also acted as Controller of Oils and Chemical Adviser to the Indian Munitions Board. From 1919 to 1925 he was the chief chemist at the Forest Research Institute and College at Dehra Dun. In 1925, Simonsen became the Professor of Organic Chemistry at the Indian Institute of Science, Bangalore.

in India similar to BAAS. In his initiative, he was joined by another British chemist named P. S. MacMahon, who was also appointed as the Professor of chemistry at Canning College in Lucknow in the same year. He was also deeply disappointed with the appalling state of teaching and research in chemistry, as well as lack of proper laboratory training in Indian university as both of them headed from highly equipped British laboratories. Both of them realised that the scientific research in India might be stimulated by an annual meeting of scientific workers arranged on the lines of the meetings of BAAS. Therefore, they decided to propose ISCA.[154]

The founders of the Indian Science Congress were immensely concerned with the position of scientific teaching and research in India in 1910-1911. The status of scientific teaching and research can be viewed as an important reason for the absence of professional bodies for advancement of science. Simonsen pointed that there was a complete absence of direct teaching in the universities. They were merely examining bodies before the Curzon education reforms. He opined that scientific research in Indian universities was practically non-existent during the first decade of the twentieth century and was restricted to a very few individuals like Alfred Pedler, P. C. Ray, J. C. Bose. The research remained confined to various scientific services. He stated that Prof MacMahon and he witnessed an un-stimulating research environment when they joined college in Lucknow and Madras respectively. Both of them heading from large English laboratories, saw a complete absence of scientific intercourse, lack of scientific activity and scientific atmosphere in both Lucknow and Madras. He also opined that apart from the meetings of ASB, there were very few scientific discussions promoted by Government of India like the Sanitary conferences and conferences of agricultural chemists.[155] In a letter to the Secretary, Government of India, D. Hooper, Secretary and Treasurer, Indian Science Congress, Asiatic Society of Bengal wrote.[156]

> In a country so large as India, the distances between the various centres of education and research are so great that it is impossible to arrange that meetings of scientific societies, where such may exist, shall attract other than local members. There is, consequently, a tendency for

[154] ISCA, *The Shaping of Indian Science: Indian Science Congress Presidential Addresses*, Volume I, 1914-1947. Hyderabad: ISCA Press, 2003, pp. 210-226.
[155] Ibid.
[156] Education, General no. 2379 November 24, 1913 (National Archives of India, New Delhi).

> those employed in scientific investigations to lose sight of contemporary works of others in their own subject, and that much valuable time may be wasted by duplication of researches in more than one centre in India.

It was believed that men of science engaged individually or in small groups in the vast and diverse field of science needed close association for maximum efficiency and success. It was feared that the existing isolation and scattered efforts impaired the strength of their services to the state. Beneficial results could be achieved by an instructive interchange of ideas between scientific men. It was presumed that they may not just mutually communicate their ideas but also state the advances made in their respective fields and indicate the need for development of special departments for solving glaring problems.[157]

Therefore, they decided to arrange an annual meeting of scientists that could enable personal intercourse among scientific works to exchange ideas among them[158] and promote research in science as well as showcase the importance of scientific research to general public[159] and wherever necessary will press upon the needs of the attention of the Government[160]. This could enable the votaries of science to give a profitable direction to their research, enable teachers and investigators to obtain an intimate acquaintance with the practical needs of the country, foster active cooperation between Europeans and Indians in the spread of scientific education and what is of greatest importance in our present condition by establishing the importance of science to commercial as well as agricultural community.[161] All these thought led Simonsen and Mac Mahon to formulate their idea and issue a circular letter in 1911 to obtain the views of other scientists in this regard.[162]

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[157] Asustosh Mookherjee's Presidential Address at the First session of the Indian Science Congress held in the premises of the Asiatic Society of Bengal. The Address titled 'About Science Congress' gave details of the foundation of the Indian Science Congress.

[158] Education, General, no. 32a September 1914 (National Archives of India, New Delhi).

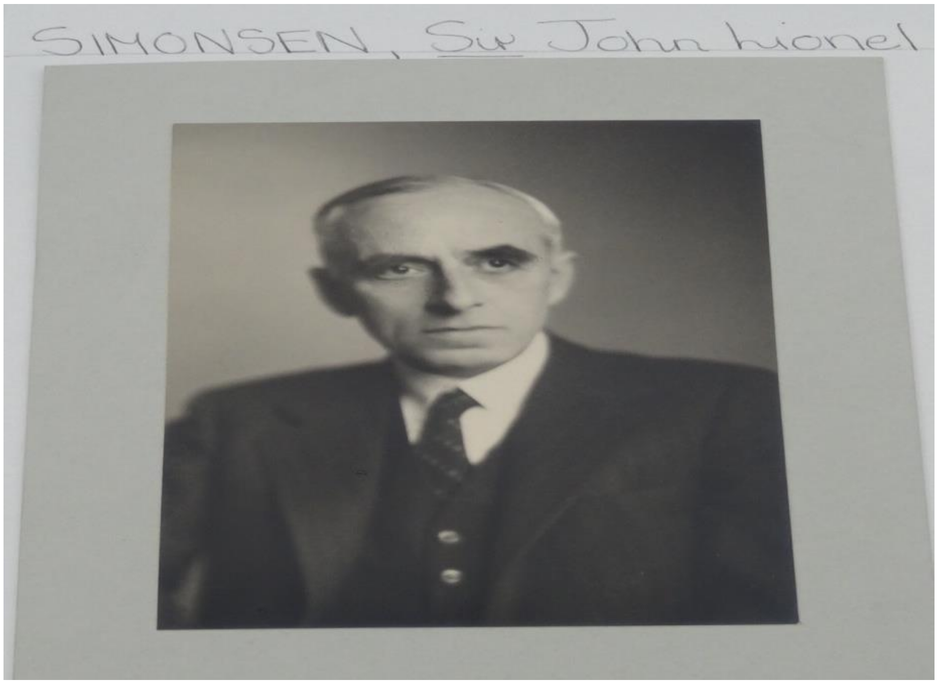
[159] ISCA, Indian Science Congress Association, *The Shaping of Indian Science: Indian Science Congress Presidential Addresses*, Volume I, 1914-1947, Hyderabad: ISCA Press, 2003, pp. 210-226.

[160] Asutosh Mookerjee's Presidential Address at the First Meeting of the Indian Science Congress.

[161] Ibid.

[162] The circular letter was sent to seventeen foremost men of science which included Dr. N. Annandale, Dr. J. C. Bose, Col. S. G. Burrard, Sir S. H. Butler, A. Chatterton, B. Coventry, Major A. T. Gage, H. H. Hayden, D. Hooper, A. Howard, S. W. Kemp, Sir C. P. Lukis, Dr. Mann, Dr. P. C. Ray, Leonard Rogers, Dr. M. Travers and Dr, Gilbert T. Walker. See Presidential Address by John Lionel Simonsen during ISCA session in 1928. See, Proceedings of the Fifteenth Indian Science Congress, Second Circuit, Calcutta: Asiatic Society of Bengal, 1928, p. 2-10.

Figure 2.2. Photograph of John Lionel Simonsen (1884-1957)



Source: Picture taken at the Archives of the Royal Society, London

The proposal reiterated the lack of scientific organisation. It hinted at isolation of the scientific workers which deprived them of help from scientific reference libraries and removed them from the European research environment from which they derived their inspiration. It was proposed that the difficulties that science suffered in India could only be ameliorated and impetus for research work could be provided with the establishment of central organisation similar to BAAS. It claimed that the scientific workers across the country could be brought in touch through such a society and it shall also direct attention to all fields and activities of theoretical as well as applied scientific research. The society could bridge the gap between science and society and present to general public the aims, purpose, ideals and value of science as an instrument for social and economic improvement.[163]

The letter also enumerated the objectives of the society which were similar to those of BAAS which has been elaborated in the next section. Apart from the objectives, it was reiterated that

[163] P. S. MacMahon and J. L. Simonsen, Circular letter for proposed Indian Association for the Advancement of Science circulated to seventeen noted men of science for an informal plebiscite on the question in autumn of 1911. See, Proceedings of the Fifteenth Indian Science Congress, Second Circuit, Calcutta: Asiatic Society of Bengal, 1928, p. 2-10.

the primary aim was to afford a medium of communication between scientific workers across the country. In order to achieve this, an association had to be established that shall hold annual meeting in populated Indian towns where papers would be read and discussed and the proceedings of these would be published in the Annual Report. On these lines, he accorded for support of those associated with science in India for the establishment of the Indian Association for the Advancement of Science whose most important aspect was to enable cooperation among scientific workers in India.[164]

The proposal for formation of a Scientific Association met with an overall general consensus. The opinions elicited for close acquaintance between scientific workers with practical needs of the country, cooperation between European ad Indians in order to spread scientific culture in India and making the commercial classes realise the value of science for industrial regeneration were largely favourable. But alongside there was a difference in opinion regarding the feasibility of such an organisation and to the extent to which it could perform the enumerated objectives.[165] There were concerns expressed regarding the time ripe for such an organisation as they believed that there was lack of sufficient work being done to justify annual meetings in various towns. There were also some practical concerns put forth like the heavy official duties on the investigators involved in scientific work, climatic conditions and long distances that needed to be traversed for attending the annual meetings held in different parts of the country.[166] They considered the opinions raised and also acted upon the advice of Sir Thomas Holland and proposed for the formation of the provisional committee that would arrange the first meeting of Science Congress in Calcutta.[167] It was decided that the meeting would be held under the aegis of ASB simultaneously with the centenary celebrations of the Indian Museum which was likely to be attended by a number of distinguished scientific men under special facilities accorded by the Government of India.[168]

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[164] Ibid.
[165] P. S. MacMahon and J. L. Simonsen, Letter to the Provisional Committee some months after the proposal was circulated. See, Proceedings of the Fifteenth Indian Science Congress, Second Circuit, Calcutta: Asiatic Society of Bengal, 1928, p. 2-10.
[166] Asutosh Mookerjee's Presidential Address at the first meeting of the Indian Science Congress held in Calcutta.
[167] MacMahon, P. S., Simonsen, J. L. letter to the Provisional Committee some months after the proposal was circulated. See, Proceedings of the Fifteenth Indian Science Congress, Second Circuit, Calcutta: Asiatic Society of Bengal, 1928, p. 2-10.
[168] Asutosh Mookerjee's Presidential Address at the first meeting of the Indian Science Congress held in Calcutta.

It was decided that at the congress papers dealing with different specialism of science will be read and discussed along with a public lecture in order to demonstrate the utility of the society and discussion a practical scheme for making it a permanent feature in the future of scientific development in India. The letter gave the duty to determine the scope and constitution of proposed association and its relation to existing societies in India to the committee. In order to arrange for the first annual meeting of the Indian Science Congress, they invited seventeen foremost men of science to form a committee.[169] The invitees for the first provisional committee comprised of fifteen English[170] and two Indians.[171]

It was decided that a committee meeting will be held in Calcutta on November 2nd, 1912 in the premises of the Asiatic Society in order to make arrangements for the first Science Congress. The agenda for the committee meeting included election of Chairman; Date of the Science Congress; Allocation of proceedings; arrangements for place of meeting and matters connected to it; financing of the Science Congress and public facilities in the way of cheap railway fares for visitors to Science Congress. The agenda of the committee meeting suggested December, 8th -12th, 1912 for the Science Congress. Regarding the proceedings of the Congress it was proposed that three days will be devoted to reading and discussing six papers, two in the morning each day, leaving the afternoon free for visits to places of industrial and scientific interest. On the last day, a popular lecture might be delivered. To take care of the finance a small admission fee (eight annas per diem or one rupee) for the whole series was proposed. It also called for suggestions on the meeting to be held in January 1913, subject of the public meeting and other methods for financing the Congress admitting free public admission to all meetings.[172] The meeting was chaired by Mr. Hayden and attended by Messrs,

[169] MacMahon, P. S., Simonsen, J. L. letter to the Provisional Committee some months after the proposal was circulated. See, Proceedings of the Fifteenth Indian Science Congress, Second Circuit, Calcutta: Asiatic Society of Bengal, 1928, p. 2-10.
[170] These included Dr. N. Annandale, Sydney G. Burrard, Sir S. H. Butler, A. Chatterton, B. Coventry, Major A. T. Gage, H. H. Hayden, D. Hooper, A. Howard, S. W. Kemp, Sir C. P. Lukis, Major Leonard Rogers, Dr. M. Travers and Dr. Gilber T. Walker and Dr. Mann.
[171] P. C Ray and J. C. Bose were invited to form the first Provisional Committee of the Indian Science Congress.
[172] A letter by J. L. Simonsen and P. S. McMahon to the provisional committee inviting them for a committee meeting to be held on November 2nd 1912 informing them about the agenda of the meeting and requesting their suggestions if they are unable to be present in the meeting. See, Proceedings of the Fifteenth Indian Science Congress, Second Circuit, Calcutta: Asiatic Society of Bengal, 1928, p. 2-10.

Tomkins, Hooper, Kemp, Christie, McMahon and Simonsen. Sir Asutosh Mookerjee, Col. Burrard, Dr. Mann and Mr. Howard sent letters of apology for their absence.[173]

MacMahon explained the sequence of the proposal of the Science Congress and the decision to hold Science Congress annually in Calcutta under the management of Asiatic Society. It was resolved that this be circulated among all members of informal committee for signature and forwarded to Secretary of the Asiatic Society for their consideration.[174]The ASB readily accepted the proposal and became the foster-parent of ISCA. The Committee also sought support from the government[175] and reiterated similar demands for the next meeting[176]. The members who had promised to attend the session included both Europeans and natives and belonged to different parts of the country.[177]

> It has therefore been decided, to hold the proposed Congress in Calcutta, and a large no of scientific men In India have signified their readiness to attend. A list of their names is attached, and it will be seen from this that the greater number are govt servants who would preferably find it necessary to obtain the permission of their Local Government to visit Calcutta for the purpose of attending the Congress. I am therefore directed to ask if the Government of India can see their way to interesting themselves in the matter and extending their practical sympathy to the Congress by permitting officers to visit Calcutta on duty during the period.

Although the intention was to have the first meeting in Calcutta from 8th to 12th December, 1912 or January 1913, but this could not be materialised. The first meeting was scheduled between January 15th-17th, 1914 simultaneously with the centenary celebrations of the Indian at the premises of the Asiatic Society. H. E. Lord Carmichael who was the Governor of Bengal was the Patron, and session was presided by Asutosh Mookerjee with D. Hooper as the Secretary and Treasurer. The Science Congress meeting spanned over three days which was attended by about 105 members. It was supposed that the number of members attending the meeting swelled as a result of the centenary celebrations of the Indian Museum. The total number of papers presented under sections viz. chemistry, physics, geology, zoology, botany

[173] Minutes of the First Committee Meeting held on November 2nd, 1912 regarding Science Congress, Calcutta 1912-1913. See, Proceedings of the Fifteenth Indian Science Congress, Second Circuit, Calcutta: Asiatic Society of Bengal, 1928, p. 2-10.
[174] Ibid.
[175] Education, General no. 2379 November 24, 1913 (National Archives of India, New Delhi).
[176] Education, General no. 1318 June 26, 1914 (National Archives of India, New Delhi).
[177] Education, General no. 2379 November 24, 1913 (National Archives of India, New Delhi).

and enthnography were thirty-three.[178] The composition of the office-bearers, list of members, chairmen of the sections and the presenters of papers at the session attest to the involvement of both Europeans and natives.[179] The photograph of the First Indian Science Congress held in 1914 at Calcutta can be seen on the cover of the thesis.

The number of papers presented during the first session and the nature of its authorship threatened the future proceedings of the Congress. This rendered support to the critics who had earlier suggested that distance would prevent the holding of the meeting. It was realised that the future meetings could be made successful by gaining government recognition so that the local government granted travel allowances to the attendees of the meetings. In this regard, they approached BOSA and got active support from Sidney G. Burrard and Sir Henry Hayden. As a result, the Government of India authorised the local government to permit officers to attend the annual Science Congress meetings. Sir Burrard even went on to induce the Indian railways companies to grant concessional rates to non-government servants who wished to attend these annual meetings. But, due to the exigencies of the First World War this concession was withdrawn later. Still each year the membership and number of papers contributions increased over the years. Prof. MacMahon and Simonsen continued to with the secretarial work of the Association until 1921.[180] The growth of ISCA since its inception shall be discussed in detail in the next chapter.

Since its inception, ASB nurtured and managed the affairs of the Association. The Society's Treasurer and Secretary were ex-officio members of the executive committee of the Association. Initially, confirmation from the council of society was required for the appointed of the Congress secretaries. The society also acted as its treasurer. It contributed towards the cost of its publication, undertook its secretarial work and provided financial aids as well. Until its silver-jubilee, the Proceedings of the Association were published by the Asiatic Society in association with ISCA. ISCA continued to enjoy the hospitality of the parent organisation for twenty-five years.

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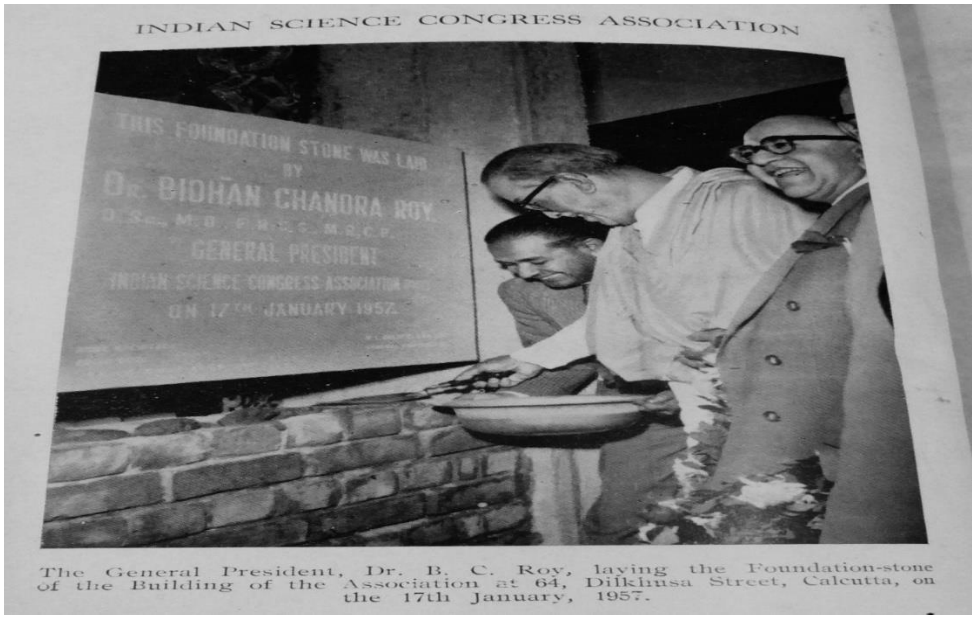
[178] Education, General, no. 32 A, September 1914 (National Archives of India, New Delhi).

[179] Ibid.

[180] Mukherji, B. and Bose, P. K. (eds.), *A Short History of the Indian Science Congress Association: With life-sketches of General President, 1914-1963*, Calcutta: Indian Science Congress Association, 1963.

Figure 2.3. Dr. B. C. Roy laying the Foundation stone of ISCA Office in Calcutta on 17th January, 1957



Source: Picture taken from the Proceedings of the Indian Science Congress Association, 1957.

The growth of the activities of ASB made it difficult for the Asiatic Society to continue to look after it. As a result, the headquarters were first shifted to Calcutta University and then to Presidency College, Calcutta. Its headquarters were again shifted to the buildings of the Asiatic Society of Bengal in 1947. But there were growing needs felt for permanent habitation of the Association during 1948-1949 and Dr. B. Mukerji's repeated demands enabled the creation of a 'building fund' out of its savings in 1952 by the executive committee and funds were requested from the government for building the headquarters.[181] After repetitive demands of B. Mukherji, the foundation stone of ISCA Office was kept in 1957 by its General President, Dr. Bidhan Chandra Roy during the Forty-Fourth session of the Science Congress. On December 8 1961, he formally opened the building.

[181] Ibid.

2.5. Structure and Organisation of the Indian Science Congress Association

The objectives proposed by the founders of the Association was similar to those of BAAS. Ashutosh Mookerjee, ISCA's first president spelled out the objectives of the Association during his presidential address in 1914. It aimed 'to give a stronger impulse and a more systematic direction to scientific enquiry, to promote the intercourse of societies and individuals interested in science from different parts of the country, to obtain a more general attention to the objects of both pure and applied science, and removal of any public disadvantage which may impede its progress'.[182] The objectives of the Association have not undergone any major change since 1914. There have been minor changes and the scope of the Association has been enlarged. The objectives of the Association[183] are:

To advance and promote the cause of science;

To hold annual Congress at a suitable place in India;

To publish proceedings, journals, transactions and other publications as may be considered desirable;

To secure and manage funds and endowments for the promotion of Science including the rights of disposing of, or selling all, or any portions of the property of the Association;

To do and to perform any or all acts, matters and things as are conducive to, or incidental to, or necessary for, the above objects.[184]

The Indian Science Congress Association[185] has its registered office in Kolkata. ISCA organises its annual session in different places in the country, usually during the first week of January every year. These meetings are arranged in collaboration with an educational institution. The decision of the venue is made by the executive council based on the invitation by the host institution. The opening proceedings of the session were attended by members of the government and the scientific community. The General President of the session gave a presidential address. Followed by the deliberations of various sections representing various

[182] Presidential Address given by Ashutosh Mookherjee at the First Session of ISCA. See Proceedings of the First Indian Science Congress in Journal and Proceedings of the Asiatic Society of Bengal, Calcutta: Asiatic Society of Bengal, 1914.

[183] According to the Memorandum of the Association of the Indian Science Congress Association, registered under Act XXI of 1860: No 21093/139 of 1953-1954.

[184] The objectives are verbatim to the objectives stated in the Memorandum of the Indian Science Congress Association, 1851.

[185] Indian Science Congress Association was registered under Act XXI of 1860: No 21093/139 of 1953-1954.

disciplines of science, presided by their sectional presidents. ISCA invited papers from different specialisms of S&T that are selected and presented under different sections during these sessions. These sessions are open to all those who are interested in attending it, provided the individual has enrolled as a member of ISCA. The choice for the section to be attended and highest qualification has to be indicated for its membership. The student members have to submit an additional certificate attesting their affiliation by their head of the institution.

The joint meetings, symposia were arranged by various sections of the Congress individually and jointly with other sections. The popular lectures and social functions were held during the evening. Since Independence, the annual sessions of the Congress began to be inaugurated by the Prime Minister of India. It's deliberations largely remained the same until 1976, when the Focal Theme was introduced, which largely centred around the topics of national relevance. The reading of large volume of papers gave way to more special lectures under each section along with joint meetings and symposia. Large number of plenary sessions were organised around the focal theme. The lectures by Nobel Laureates and a number of noted scientists were arranged during the sessions along with group discussions and symposiums. The Nobel Laureates lectures are an important feature of the Congress. ISCA published an account of its activities annually in the form of Proceedings having four parts, along with few other publications like Everyman's Science. The affairs of the Association are managed by the executive committee elected by the members of the organisation each year. The office bearers like the General President, two General Secretaries and a Treasurer were also elected by the Committee. The Sectional Committee elected the Sectional Presidents and Recorders.[186]

2.6. Conclusions

The chapter began by assessing the colonial policy towards science and education in India, which clearly attest to centrality of colonial imperatives. It underlined a general absence of scientific societies and associations during pre-British, when largely *tols, pathshalas, maktabs, madaras* existed. This absence certainly indicates a lack of 'culture' of forming societies in India. However, an exception is seen in the formation of some form of a community of

[186] For a detailed account of the membership, finance, election, duties and regulations regarding the organisational structure and the criteria and procedure of paper selection of the Indian Science Congress Association, please see the *Regulations and Bye-Laws* of the Indian Science Congress Association.

astronomers during Jai Singh's reign which came up decades before the Asiatic Society. An analysis of the scope, objectives, locale, involvement of India vis-à-vis Europeans in these societies clearly indicate them largely being 'European enclaves' serving ruler's agenda towards better administration and profit maximisation. Their objectives were embedded within the larger colonial interests be it, the quest for oriental knowledge, knowledge about their culture, tradition and habits of Indians for better administration and political control or the encouragement of scientific fields that would be economically beneficial for the colonial government. Most of these societies were discipline-centric and regional and hardly aimed towards cultivation and advancement of science among Indians.

Apart from these, there were School Book Societies, School Societies, Native Education Societies along with few other societies, which began as a collaborative effort between Europeans and Indians for popularisation of western learning through vernacular languages. Also, numerous scientific societies by Indians evolved primarily after the Revolt of 1857. It is pertinent to mention Aligarh and Bihar Scientific Society. They can be viewed as one of the early efforts by Indians that moved beyond mere translations for popularsing science and moved towards initiating lectures through scientific experiments and also propagated scientific knowledge for development of agriculture and industries. However, these societies were short-lived. The difficulties faced by indigenous institutions become more apparent in the case of IACS's early history. The reason for its slow growth and inability to grow beyond holding few popular lectures explains the fate of an institution which kept itself totally aloof of the colonial government's funding and involvement. Although, the scientific societies discussed in the chapter can be viewed as steps, IACS certainly emerges as most concrete step towards cultivation and advancement of science among Indians. The foundation of ISCA needs to be seen in the context of the scope, limitations and locale of these scientific societies. Along with several efforts made towards the foundation of an organisation similar to BAAS in India. The efforts of the founders and their concerns about the state of scientific teaching and research in India were primary propellers. ISCA's wider objectives and its inception needs to be seen through growing recognition and importance of scientific research in India and genesis of research groups around university professors which will be discussed in detail in the following chapter.

Chapter 3

ISCA and the Emergence of Scientific Community in India

3.1. Introduction

The preceding chapter began by assessing the nature of the colonial science and education. As trade was their prime concern, the early colonial administrators refrained from interfering with the social and educational institutions existing in India. However, later colonialism influenced the growth of scientific institutions. As most of the colonial scientific societies were European endeavours, they were largely manned and controlled by European officers. Initially the involvement and contribution of research by Indians were limited. The scope and objectives of most of these colonial scientific societies largely fell within the colonial agenda of greater profit from their colonial enterprise. The previous chapter also mapped most scientific societies that existed prior to ISCA, underlining the efforts of the Indian middle class to popularise, cultivate and advance science among Indians. The fore-runners of propagating science in India like Master Ramachandra, Madhusudan Gupta, Bal Gangadhar Jambhekar, Mahendralal Sircar, were also discussed. The scientific societies which were largely Indian endeavours provided scope for popularising science and inculcating interest in scientific learning. The real concrete step towards cultivation and advancement of science among Indians could be seen in the foundation of IACS by Dr. Mahendralal Sircar. Being an institution devoid of government aid, it's scope remained restricted to taking few lectures, until C. V. Raman started his experiments in 1908. The objectives of most of the societies before the inception of ISCA remained restricted to certain region and discipline. Thus, ISCA's establishment by 1914 on the model of BAAS with objectives similar to those of BAAS can be viewed as an important institution, with wider scope and locale.

In order to understand ISCA's role towards professionalisation of science which will be discussed in detail in the following chapter. It is imperative to understand the reasons that restricted it in India until the late nineteenth century. The reasons that hindered and propelled the professionalisation of science and emergence of scientific community in India will be discussed in the following sections which will provide the required context for exploring ISCA's role since its inception. It is pertinent to indicate the nature of scientific institutions and scientific workers in India, which provide the ground for an assessment. Further, the chapter assesses the role of ISCA's leading members and its activities towards evolution of a scientific community in India. Through, its various sections the present chapter tries to analyse how ISCA catalysed community consciousness among scientific workers and contributed towards shaping of a scientific community in India. It also attempts to assess ISCA's role beyond evolving as a meeting-ground for all scientific workers in India but also, fostering communication between foreign and Indian scientists. The chapter also reflects on the role of ISCA in recognising the aspirations of the scientific community and also in impressing the needs of science and scientists upon the government. It also endeavours to understand how ISCA evolved as an interface between the scientists and the government and strengthened the role of scientific community in India.

This sections tries to understand the emergence of scientific community and professionalisation of science in India as occurring simultaneously. The professionalisation and institutionalisation of science during the late nineteenth century was seen as the second scientific revolution. It was seen as a result of fusion of maturing of scientific disciplines and of bridging of gap between science and technology and moving towards science as a social component rather than being restricted to private objective (Beer, Lewis, 1963, pp. 764-784). Millerson (1964) views professionalisation as a dynamic process (Jackson, 1970). The study follows Ben David's (1971) observation who sees emergence of effective scientific communities as critical for growth of professionalisation and advancement of scientific knowledge. Krishna also noted that although sociologists had mapped modern science, adequate attention had not been given to processes involved in the emergence of scientific community (Krishna, 1991, p. 89). It is important to study the role played by actors and agencies towards the professionalisation of science, which provide pathway towards the emergence of science community or specialist professional groups. The scientists within a country constitute a national scientific community, which lay within the larger world scientific community. The relatively similar scientific education at elementary level and similar institutional and intellectual setting for research form the scientific community (Schott, 1991,

p. 442). The formation of associations is viewed critical for professionalisation. Numerous sociologists have defined and identified the characteristics of professionalisation. However, the present study views institutionalisation of science as an earlier stage in its professionalisation and views introduction of specialised knowledge of science, emergence of full-time engagement, practical training, professional autonomy and a sense of collective responsibility to the field and community interest along with recognition through rewards. The next chapter tries to assess ISCA's role in promoting these characteristics.

3.2. Actors and Institutional efforts behind Professionalisation of Science

3.2.1. Scientific Research in Colonial Period

Colonialism played a part in the institutionalization of science but did not lead to professionalization of science and creation of national science communities (Gaillard, Krishna and Waast, 1997, p.11). In parallel to the colonial science enterprises, there were a number of professionalized science institutions and science societies created a climate of professionalization. Therefore, it was important to understand the obstacles in the emergence of scientific communities in India, through the colonial context of science administration, its scientific endeavours and composition of the scientific officers in the government services during the colonial rule. The education policy has already been discussed at great length in the previous chapter. The lukewarm approach of the colonial government towards pure sciences was evident in the resolutions for the constitution of BOSA. It noted that before 1897, undue importance had been given to pure sciences. Although the resolution recognised its importance, it underlined that limited resources mandated focus on economically beneficial applied sciences which could enable utilisation of undeveloped resources for agricultural and industrial progress.[187]

The non-development and late development of universities and higher training centres, were also important reasons that hindered professionalisation of science (Gaillard, Krishna and Waast et. al, 1997, pp. 26,27). Another reason was miniscule grants by the government to

[187] See Constitutions of a Board of Science Advice for the furtherance of scientific work in India, Nature, Vol. 67, No. 1746, London: Nature Publishing Group, 16 April 1903, pp. 568, 569.

colleges and universities in India, in comparison with those in America and English.[188] These lay at the core of the limited professorships in natural and physical sciences and un-equipped laboratories in science departments.

J. C. Bose and P. C. Ray joined the Calcutta University as Professors of Physics and Chemistry in the late 1880s. Ray's autobiography suggested that lack of funds made it difficult for private colleges to afford science departments. As a result, their students attended classes at the Presidency college on payment of nominal fees, as it was the only institution that undertook systematic lectures with illustrated experiments. IACS also arranged open lectures in Physics and Chemistry (Ray, 1958, p. 63) The conditions of laboratories could be gauged by the observations made by other scientists. S. N. Bose noted that J. C. Bose's early experiments on electric waves were done in an ill-equipped laboratory which was unsuitable even for undergraduate teaching. He also added that Bose made his research apparatus himself (Gupta, 1964, p. ix). The character of university science lectures was evident from C. V. Raman's biography. It noted that during his M.A. at Madras Presidency College, Raman[189] attended barely a lecture. There was an obsolescence in the universities' curriculum and lectures were mostly repetitive. The scope for scientific research was evident also evident in Raman's appointment in the Finance Department, even after having an aptitude for science (Pisharoty, 1982, pp. 10-12). These clearly illustrate the nature of scientific teaching and research in India, until the early decades of the twentieth century in India. This could be seen in line with the observations of ISCA's founders which has been discussed at length in the previous chapter.

It is interesting to note that higher degree and research in science had not attracted much Indians. As a result, even in better-equipped laboratories like IACS, classes largely remained empty. Although, there were numerous students at the graduate level only a few enrolled for higher studies and were interested in science beyond examinations (Ray, 1958, p. 213). The craze among young Indians for degrees was restricted to their aim for securing government

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[188] Report of the Indian Universities Commission, 1902 presided over by T. Raleigh, Simla: Government Central Printing Office, 1902, p. 5. (National Archives of India, New Delhi).

[189] Raman was born on 7th November, 1888. He passed the F.A. (First Year Arts) examination in 1902 conducted by the University of Madras with a high rank and won a scholarship for higher studies. He joined the Presidency College in Madras in 1903 and received a B.A. degree with Physics as his main subject.

jobs and professional careers.[190] Education in India was restricted to 'passing examinations' and 'craze for degrees'.[191] The importance attached to passing university examinations was attested by greater attendance in those subjects from where the examinations questions were to be framed and massive dependence on abstracts and keys than books.[192] In 1902, Committee recommended change in examinations pattern which could discourage cramming. Anyway, Universities prior to Curzon's University Reforms were merely degree-giving institutions, the committee in 1902 recommended converting them into 'teaching universities'.[193]

The real picture of scientific learning can be gauged through Ray's observation, he believed Sircar requested the Government to discourage private college students to attend lectures at Presidency College, because of which classes at IACS remained empty. This reflected Indian youth's mindset who were least interested in attending lectures not prescribed for examinations. From 1880s, chemistry gained recognition and made gigantic strides. Thus, need for practical and laboratory teaching was felt by Alexander Pedler. He wrote to the Director of Public Instruction stating the need for an additional Professor (Ray, 1958, p. 63). The science courses were becoming popular. But, vague idea among students and their guardians was that physics and chemistry could help them start industries or bring them livelihood without solely depending on government services. M.Sc. was not instituted in the Calcutta University until the 1890s. However, while preparing for M.A. degree, students who took chemistry usually attended law lectures. When Ray asked the students for making such a choice as there was no correlation between chemistry and law. His students told him that they chose chemistry because they had to read fewer books as against cart-load books for arts courses and for that they did not mind the 'drudgery' of laboratory work. Although, Ray did acknowledge that some confessed their liking for the subject.[194]

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[190] Ray believed that mass production of graduates was in sync with the mentality of securing degrees just for the sake of jobs. The most sought after professional careers were law and engineering as medical was expensive.

[191] P. C. Ray in his autobiography pointed at the 'colossal waste of energy and national intelligence', as a result of the scheme of university education. He underlined that the university education and primarily the degree was considered as an academic hallmark by students and their guardians as a passport for securing government jobs or a professional career in medicine, law and engineering, etc. According to him, Calcutta and Madras University had become factories of 'mass-production of graduates' (Ray, 1958, p. 213)

[192] Report of the Indian Universities Commission, 1902 presided over by T. Raleigh, Simla: Government Central Printing Office, 1902, p. 20. (National Archives of India, New Delhi).

[193] Ibid. p. 71.

[194] Ray quoted that he had once asked a Bachelor of Law who had left the court and was a candidate for M.A. in Chemistry, the reason for such a move. The reason given by him was "Sir, if I have the M.A. degree, then I shall

These problems were inherent in the scheme of university education followed by the colonial government. Ray felt the need for transforming universities into centres of research. He added that students had to be filtered and only those interested in research should be enrolled in the universities (Ray, 1958, p. 245-254). He was against the undue importance given to foreign language over vernacular in teaching of science (Ray, 1958, pp. 237-244). Though, Indian middle-class translated scientific works in vernacular languages. The pre-occupation with English and neglect of vernacular language delayed advancement of science in India. Thus, lack of natural science education and institutional support for higher teaching and research led Indians to undertake higher studies and research abroad which was considered superior and provided better research facilities. Ray saw this as a 'glamour of foreign degrees showing slave mentality and inferiority complex' (Ray, 1958, p. 254). An inter-play of these factors restricted the number of Indian scientific workers. These along with composition of government services which were primarily reserved by Europeans would explain the absence of community consciousness among scientific workers in India.

3.2.2. Reservation for Europeans in Government Scientific Services

The reservation for Europeans for graded services in the Government and discrimination and doubts about the capability of India even to the extent that intellectually or academically lower grade English were given positions superior to Indians can be viewed as one of the core reasons for the lack of community consciousness among scientific workers in India. At the outset, the graded services were intended to attract competent men from English universities.[195] Therefore, the colonial scientific services and societies were mostly manned by Europeans. The Trignometrical Survey was entirely reserved and manned by royal engineers with military rank. He underlined the aloofness, isolation and drain of knowledge from India upon the retirement of Europeans[196] The extent of reservation for Europeans was also seen in the organisation of Indian Medical Service. The Assistant Director of Public Health NWFP,

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have the letters M.A., B.L. suffixed to my name and my claims to Munsiffship will be stronger". Ray in anguish remarked in his autobiography 'Oh Chemistry! to what purpose you are being diverted' (Ray, 1958, p.73).

[195] Report of the Indian Education Commission under the Presidentship of W. W. Hunter, Calcutta: Government of India, 1883.

[196] See Ray's presidential address in the Proceedings of the Seventh Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1920, pp. 1-10.

Lt. Col. H. G. Stiles Webb in 1923, opined that the recruitment ratio of 2 Europeans to 1 Indian fixed in 1915 was too low. He put forth a ratio of 3:1 i.e, 3 Europeans to 1 Indian.[197]

It was largely seen that the European government employees merely fulfilled their duties allocated by their employers. These officers were British residents, who would return to England after superannuation. They were usually known as 'Indian Nabobs' who earned fortunes during their appointment in India (Basu, 1944, p. 3) Also, the climatic conditions in India, strenuous field work along with other duties allocated to them limited scope for their involvement with scientific research. The records of the Geological Survey of India showed that full number its officers were almost never at work. A number of officers went back to Europe on sick leave for several months because of ill-health.[198] Thus, most of the scientific workers in India were primarily English government officers largely pre-occupied with their duties allocated by the government. As mentioned earlier, it was one of the reasons identified for lesser contributions towards Proceedings of ASB by government officers.

As hinted by Ray, problem of expatriate scientists was also raised in the book *Scientific Communities in Developing Countries*. It was believed that these scientists spent few years in India and returned to England after performing their duties as a scientific soldier upon retirement. The book also discussed that during their colonial service and stay in India, they lived in relative isolation from local culture and social structures. They developed no commitment towards developing a community consciousness and professionalisation of science in India. It noted that scientists like William O' Shaughnessy returned to his home-country, post-retirement after a long career in India, causing complete drain of knowledge and experience which could have been utilised by Indians (Gaillard, Krishna and Waast et al., 1997, p. 29). The lack of association with the indigenous needs of science of these expatriate science workers in various government services who formed the majority of scientific workers in India and their return to England upon retirement can be viewed as a major reason for the absence of a scientific community in India.

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[197] Response of the Assistant Director of Public Health, North-Western Frontier Province to the Chairman of the Royal Commission on the Superior Civil Service, Camp Delhi, Dated, Peshawar, November 2nd 1923, Paper No. (N. W.) 236, No. 877 (The British Library, London).
[198] See Records of the Geological Survey of India, Vol VII, Part 1 Calcutta: Superintendent Printing, 1874, p.1.

3.2.3. Discrimination and Doubts about the capability of Indians

The reservation of graded services by Europeans on the claims that Indians were not adequately qualified for it and restricting their upward mobility within these services can be viewed as a cause for limited number of Indian scientific workers. The discrimination against Indians is evident in the Report of the Commission of Education presided by Hunter in 1882. However, it underlined that the promotion of Indians to the graded services increased after they proved themselves qualified for higher work in the Education Department. Citing the example of Bengal, it observed that out of a total of thirty-nine officers, seven 'native' officers were directly promoted to the first class after they showed eminent capability. The report also showed that the number of natives in graded services was smaller in other provinces.[199] Even the figures provided by the Report for Bengal doesn't really propose a satisfactory picture. The discrimination in the recruitment of Indians in the government scientific services and occupation of the higher cadre of the services by British have been highlighted by various scholars (Kumar, 1983, pp. 63-82; Krishna, 1997, p. 239). In order to clarify this further, cases of individual scientists like P. N. Bose, J. C. Bose and P. C. Ray are studied. All these three scientists returned to India after finishing their education abroad with an acclaimed distinction. But their entry to the government services in India attests to the hardships Indians had to undergo for absorption in the services.

Pramatha Nath Bose was the first Indian directly appointed to the imperial service of the government. However, the larger picture around his appointment need to be seen. 1870s saw increased agitation against the discrimination of Indians in Civil Service. While in London, in 1879 he along with an Indian delegate of the Indian Association of Calcutta, Anand Mohan Bose strongly criticised the colonial government on Indian subjects. Although he had applied to the Secretary of State for India for a suitable appointment in the Government of India, after completion of his studies. He believed that his appointment in the higher cadre of service at Geological Survey of India after six months of the application, was the government's attempt to get rid of him as a 'potential source of nuisance' in England and not because of his merit (Bagal, 1955, p. 29-33). Ray noted that the history of admission of Indians into the higher

[199] Report of the Indian Education Commission under the Presidentship of W. W. Hunter, Calcutta: Government of India 1883, p. 315.

services was that of good intentions and large promises, but poor performance (Ray, 1958, p. 63). J. C. Bose after a brilliant career in Cambridge and London struggled immensely to enter the higher services provided, he accepted the condition that he would draw two-thirds of the salary of a similarly ranked British official (Ray, 1958, pp. 64,65). He was appointed as a junior professor of Physics after his return from Cambridge in 1885 (Ray, 1958, p. 123). Ray waited for a year after his return from Edinburgh, for a temporary assistant Professor post at the Presidency College with a monthly salary of Rs. 250, which was the maximum initial salary local government was entitled to offer. Ray complained Croft who was then the Director of the Public Instruction, and about the injustice. He added that a British chemist of his qualifications would have been immediately appointed to the Imperial branch of the service (Ray, 1958, p. 65).

Indians were also restricted from entering imperial services by absorbing Europeans with no or inferior academic abilities into the services. The excerpts from biographies of P. C. Ray and S. N. Bose adequately displayed such discrimination. An Irish professor appointed as an additional professor of Chemistry at Presidency College in 1904. He noted that although he was junior to Ray from who he could learn so much but he was considered Ray’s senior as noted that he was junior to Ray but he was officially regarded as his senior although he was appointment to the Indian Education Service (Ray, 1958, p. 130). This could also be seen to the excerpts from Gokhale's speech on in 1911 cited in Ray's autobiography.

> There is a gentleman here in Calcutta, named Dr. P. C. Ray, a most distinguished man of science, a man who has been honoured by French and German savants, a man adored by his pupils, a man who has been doing original work for last 20 years or more. But he is still in the Provincial Service whereas young men, fresh from college, without any original work to their credit, men who are admittedly his inferiors, are brought out as members of the Imperial service. This sort of thing hurts not merely the men who are actually affected by it, it hurts the students studying under them. In the Education Department, it affects the student's as well (Ray, 1958, pp. 130-131)

Ray also highlighted the lack of academic distinction among eighty per cent of the officers belonging to the Indian Trigonometrical Survey.[200]. In 1921, S. N. Bose was appointed a reader at the Dacca University. He pointed that his colleague a professor of physics, W. A.

[200] P. C. Ray, 'Presidential Address', Proceedings of the Seventh Indian Science Congress, January 12-17, 1920, Calcutta: Asiatic Society of Bengal, 1920.

Jenkins had no research experience and was barely ‘passable’ in physics. He was appointed as a professor on the merit of being a good football player.[201]

Ray stated, that as per rule, Indians of even approved merit could only enter the subordinate branch of the Service. He pointed that as a result of increased agitation against the exclusion of the Indians, under the instruction of Secretary of State Government, Lord Dufferin appointed the Public Service Commission. It was asked to devise means for extending employment to Indians. Thus, two distinct services vis-à-vis Imperial and the Provincial were created. The former was reserved for the British and latter for Indians, former's salary was twice that of the latter. Ray viewed these recommendations, as merely a compromise (Ray, 1958, p. 65). This is evident from an excerpt from Ray's autobiography which cited Gokhale's Speech in 1911.

> Invidious distinction based on racial and political consideration found echoes both in Provincial and Imperial Councils... In the Education Department, Indians were on terms of equality with their English colleagues before the creation of Provincial Service. The scale of salary was two-thirds, no doubt but in other respect, they were on equal terms. But they have now been put into a distinctly subordinate position... Thus, we find men of most distinguished attainments in Provincial Service simply because they are Indians, men who passed their examination yesterday, and who have so farmed earned no distinction by their work in Imperial Service, simply because they are Europeans. (Ray, 1958, p. 130).

At the Indian National Congress Meeting held in Calcutta in December 1896, A. M. Bose observed that the exclusion of natives from higher services in education even after their efforts had won international recognition (Ray, 1958, p.125-126) From the last decade of the nineteenth century, we see Indians joining the Imperial Services but, their numbers were few. It is in this background, Ray in his presidential address at ISC’s Nagpur session in 1920 strongly voiced for greater Indianisation of the scientific departments. On the basis of government reports, he tried to work out the actual number of Indians employed in ten government scientific service in the imperial grade. There were 18 Indians as against 195 Europeans. It showed a wide disparity between their salaries. He strongly voiced for the potentiality of talent among Indians. He added that self-contained India as proposed by Indian

[201] Jagdish Mehta, “Satyendra Nath Bose, 1894-1974, Elected F.R.S. 1958”. Biographical Memoirs of Fellows of the Royal Society, Volume: 21, 1975, pp.123-124.

Industries Commission required experts, specialists and workers from within Indians for industrial awakening.[202]

Figure 3.1. Composition of Government scientific departments until 1920

	Officers (imperial Grade)		Average pay of	
Name of the service	Europeans	Indians	Europeans	Indian
Botanical survey	2	0	1,000	0
Geological survey	16	0	1,010	0
Zoological survey	3	1	970	700
Agricultural service	38	5	1,000	460
Forest service	9	1	1,040	660
Medical and bacteriological Service (on civil employment)	24	5	1,220	520
Indian munitions board	11	1	780	300
Meteorological department	10	2	970	770
Veterinary department (civil)	2	0	1,100	
Educational service[1]	34	3	910	490
Indian trigonometrical survey[2]	46	0	—	

Source: P. C. Ray's Presidential address at the ISCA session in 1920 in the Proceedings of the Seventh Indian Science Congress, Calcutta, Asiatic Society of Bengal, pp. 1-10.

The discrimination against Indians wasn't restricted to their entry in the services. There are numerous instances to attest doubts that were constantly raised on their capability. There are instances which attest that even after Indians had been absorbed in the services, Europeans doubted their potential. P. N. Bose's work during 1886 was reported which clearly showed the nature of doubts about their capability, Indians were subject to.

> Mr. King reported on Mr. Bose's work as still exhibiting the want of observation and study that had been found fault with in the previous seasons; I may, however, add, that since going to the field this season Mr. King has written less unfavourably of Mr. Bose. I only hope he has not been beguiled.[203]

We see a greater doubt in the capability of Indians among Europeans in J. C. Bose's appointment as a professor in the imperial grade. It was only on Viceroy's involvement that Bose was appointed by the Director of Education of the Government of Bengal temporarily as he refused to join the Provincial Service. He was told that his appointment could be confirmed only if he was successful. His appointment was also not liked by the principal of the

[202] P. C. Ray, 'Presidential Address', Proceedings of the Seventh Indian Science Congress, January 12-17, 1920, Calcutta: Asiatic Society of Bengal, 1920.
[203] The Records of the Geological Survey of India, Calcutta: Superintendent Press, 1887, p. 3

Presidency College. His biography also underlined that his appointment was immensely doubted in the higher quarters as they believed that the efficiency of an Indian might be low.[204] In 1902, after sixteen years of service, his case was quoted as an exception case based on the recognition for his scientific investigations and he was considered for a full pay admissible to European officers.[205] Indians had to face discrimination even for an upward mobility especially for occupying important positions in government establishments after they have had served for several years. Saha underlined that as a result of the British policy of reserving important posts of government establishments for non-Indians. Even after 23 years of service, P. N. Bose's efforts were not recognised by the Geological Survey of India. Bose was superseded by T. H. Holland as the Director of the Survey in 1903, who was a junior to him by ten years. Bose felt the injustice of supersession and retired from the Survey in the same year (Bagal, 1955, p. xiv). The Assistant Director of Public Health, H. G. S. Webb's response to recruitment ratio in 1915 also clearly showed the discrimination. He opined that the recruitment of more Indian would unfavourably affect the popularity of the Indian Medical Service which recruited only the best educated, cultured and intellectual Europeans. He also added that Indians were largely depended on them for professional and general conduct and bearing.[206]

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[204] The Director was of the opinion that Bose being a young Bengali would not be able to deliver lectures efficiently and maintain discipline. The clause for joining the imperial grade being an Indian was that he had to a salary which was two-thirds of the salary of the British in the Imperial Service. Added to this discrimination, he was paid half of the already two-third salary during the temporary period. Although Bose discharged all his duties in the best of his abilities, he denied salary for three years after the Principal of the College, Tawney offered him a full salary. However, discrimination continued against him and the college authorities complained against him for undertaking experiments (even on his own expenses) after his lectures which were diverting him from the tuition of his students. Even after successful experiments which was recognised worldwide, Bose regretted that Bengal's Education Board had totally neglected his work and he had to struggle a lot during his career at the College for permission for grants, deputations, etc. (Gupta, 1964, pp. 17-25)

[205] Public, Education, No. 130, November 19, 1920. Also, see IOR/L/PJ/6/606, File No. 1429, July 16, 1902; IOR/L/PJ/6/641, File No. 1533, July 9, 1903 (The British Library, London).

[206] Response of the Assistant Director of Public Health, North-Western Frontier Province to the Chairman of the Royal Commission on the Superior Civil Service, Camp Delhi, Dated, Peshawar, November 2nd 1923, Paper No. (N. W.) 236, No. 877 (The British Library, London).

3.2.4. Indian's efforts towards scientific research and their recognition

The laboratories are an indispensable part of the science classes. The Universities Report of 1902, however, underlined that there was no reason for establishing science classes. As the opportunity of handling apparatus or undertaking practical work in laboratories were unavailable to the students of science. However, despite the lack of proper institutional and basic facilities and with discriminations and doubts that Indian scientific workers had to face, scientists like J. C. Bose, P. C. Ray, C. V. Raman, N. R. Dhar, etc. undertook research in basic sciences which was internationally recognised by the scientific community. Their efforts and contributions certainly bring to life the claim Bose made at the International Science Congress in 1900. Bose had said that there was hardly anything in the world which Indians could not match with a modern nation. He added that adequate training was needed by which a pack of wolves could eventually become formidable in this world (Gupta, 1964, p. 76). A similar view was also held by Ray and Raman who rejected the inferiority which was largely tagged because of being just Indians (Ray, 1958, p.123; Pisarothy, 1982, pp. viii-ix). Bose was totally committed to his teaching until 1894, when he undertook an experiment on Electromagnetic Waves. His first paper 'polarisation of electric waves by double refraction' was published in the Proceedings of the Asiatic Society in May 1895. Later, published in the Proceedings of the Royal Society of London in October 1895[207].

Ray discovered mercurous nitrate and first paper on it was communicated to Asiatic Society of Bengal in 1895 (Ray, 1958, p.123). His discovery was widely recognised both in India and abroad. Alexander Pedler while presiding over the Asiatic Society of Bengal's meeting in 1896, praised Ray's work and added that his discovery had filled up a blank in the Mercury series. Nature in its 28th May 1896 issue reviewed Ray's paper on the discovery of Mercurous

[207] His experiment in electromagnetic waves and their optical study led to the construction of an apparatus that could generate short Electromagnetic Waves simultaneously with Lebedew and Righi. Saha added that the workshop facilities in Calcutta were very primitive as a result his apparatus was highly appreciated in England. He formulated the generalisation which was communicated at the International Science Congress in 1900 through a paper titled 'On the similarity of response in the living and the non-living'. In 1901, Bose submitted a preliminary note 'On the electric response of inorganic substance' to the Royal Society and a detailed paper was published in the Journal of the Linnean Society in 1902. In 1904 Bose submitted a series of papers to the Royal Society showing the similarities between the electric and mechanical responses of plants and animals. Bose published his results in two books Plant response (1906) and Comaparative Electro-Physiology (1907). He perfected his resonant recorder which was published in Philosophical Transactions in 1913. See Sir Jagadis Chunder Bose, 1858-1937, Obituary Notices, Fellows of the Royal Society, London.

Nitrite and considered it worthy[208]. This certainly attests that Ray's discovery was well-received and recognised. Alongside his efforts, his pupils' efforts were also recognised. The credit for stimulating systematic research in Physical Chemistry in India went to Nil Ratan Dhar, a pupil of Ray. His paper on 'Complex and Double Salts' during M.Sc., was published in Journal of Chemical Society in London in 1913. He started his independent research with co-workers, D. N. Bhattacharya and A. K. Datta. The results of which were published in reputed journals of Germany.[209]

While these three scientists were working at the Presidency College in Calcutta. C. V. Raman undertook his M.A. course at the Presidency College at Madras which was largely a teaching institution with no scope for research. In 1904, he undertook experiments related to diffraction of light and penned his observation in a paper and sent it to his Professor at Presidency College. But he received no reply. As a result, he sent it to the *Philosophical Magazine* and it was published in London under the title 'Unsymmetrical Diffraction Bands due to Rectangular Aperture' in Nov 1906. The paper contained no acknowledgement of any help sought from anyone. In letters exchanged between them Lord Raleigh, a Mathematical Physicist and Raman, Raleigh referred to Raman as the Professor while he was just a master's student at the Presidency College. His appointment in the Finance Department and move to Calcutta, was indicative of the environment of scientific work in India at that time. In 1907, he joined Calcutta and secured facilities in the laboratory of IACS, which had a large laboratory with unused equipment, especially for demonstrations (Pisarothy, 1982, pp. 10-13). The scientific research undertaken by these scientists was increasingly appreciated by the scientific community across the world. These Indian scientists had clearly carved out a niche for themselves and future Indian scientists. They set the foundation of scientific research in India and initiated the formation of a specialist research group around themselves along with their students by the turn of the last century. These research groups formed lay at the core of the

[208] Even the Chemist and Druggist of London's issue of 25th July 1896 claimed that the discovery was well-received among chemists. Ray paper on "volatility of ammonium nitrite" was also recognised by eminent chemists and Nature in its 15th August, issue of 1912. Further, the Chemist Druggist of London in 26th June 1912 reported that Dr V. H. Veley called Ray as a representative of an illustrious Aryan nation which had attained a high degree of civilization and numerous chemical process when the country was a dismal swamp. He paid tribute to him along with his pupils for their valuable researches on ammonium (Natesan, 1918, pp. 14-19).

[209] Indian Chemical Society, *Acharya Nil Ratan Dhar, Short Life Sketch, Scientific Activities and List of Publications*, Calcutta: Indian Chemical Society, 1982, p. ii.

emergence of the scientific community in India which contributed immensely towards institutionalisation and professionalisation of science in India.

Figure 3.2. The Indian School of Chemistry in 1920s

Main Researcher	Period of Activity	No. of Publications	No. of Collaborating Researchers
P. C. Ray	1894-1920	107	37
E. R. Watson	1910-1924	25	12
P. Neogi	1907-1917	14	3
J. J. Sudborough	1912-1925	30	24
R. L. Datta	1912-1918	28	14
J. N. Rakshit	1913-1917	12	3
B. K. Singh	1913-1926	17	12
S. C. Jana	1914-N. A.	1	2
H. K. Sen	1914-1915	5	2
A. C. Sircar	1915-1926	12	9
J. L. Simonsen	1915-1926	27	4
N. R. Dhar	1913-1917	18	4
S. Dhar	1916-N. A.	1	1
P. C. Ghosh	1917-1920	4	2
J. C. Ghosh	1914-1918	7	4
P. C. Mitter	1918-1926	4	4
B. N. Ghosh	1918-1920	7	3
B. B. Dey	1911-1918	5	3

Source: Table derived from V. V. Krishna 'The Emergence of the Indian Scientific Community, Sociological Bulletin, Vol. 40, No. 1/2, March-September 1991, pp. 98.

3.2.5. Formation of research groups

Bose and Ray's appointment at the Presidency College enabled the formation of specialist groups which could be seen as the genesis of the scientific community in India. It also led to the initiation of the transformation of cultivation of science to advancement of science (Krishna, 1997). Ray acknowledged the initiative towards grant of research scholarships by Government of Bengal, on the recommendations of professors, to meritorious M.Sc. students who showed an aptitude for science. According to him, it encouraged students after 1900, who could join and work with him as research scholars. This is attested to by a number of Ray's papers co-authored with his students. These students later developed their own fields of research. They also secured doctorates, received prestigious scholarships and their research was published in various scientific journals of America, England and Germany. Although he added that except for one or two of his students more of them were non-research scholars who continued to work even after M.Sc. degrees with no adventitious help just because of the spirit of research. However, we see a research group was formed around Prof. P. C. Ray[210] who in his autobiography talked in great detail about his research scholars and their researches. He called his bond with his students as subtle as those of chemical affinity.[211] He also added the world-wide recognition of the Indian scientists' contributions had a great moral effect on the minds of the young scholars of Bengal (Ray, 1958, p.124-149). Prof. Sylvain Levi reviewed the second volume of the History of Hindu Chemistry in Journal Asiatique. He observed that Ray's laboratory was the nursery from which young chemists of New India blossomed. He added that numerous papers under joint-authorship with his pupils and co-workers entered the list of contributions from the chemistry laboratory of the Presidency College. Ray always showed full confidence in his pupils. He believed that the confidence of the master gave them the confidence to undertake their work with full responsibility. However, he also hinted that under the shadow of towering personalities often retards the growth of average men (Ray, 1958, pp.124-146).

Bose did not share a similar bond with his research scholars like Ray. However, Debendra Mohan Bose's career progressed under J. C. Bose's guidance who was his maternal uncle. Bose's biography also talked about D. M. Bose's informal relations with Ray. J. C. Bose made all major decisions related to his nephew's career. Unable to do an engineering course from Shibpur College of Engineering due to ill-health, D. M. Bose joined J. C. Bose as a research scholar and assisted him in his researches during 1906-1907. He also taught at the City

[210] His research scholars included Jatindra Nath Sen who was his first scholar and he collaborated with him on his research on mercurous nitrite. Research scholars like P. Neogi, Atul Chandra Ganguli, Atul Chandra Ghosh joined Ray after 1905. Ray himself in his auto-biography emphasised that a new era in the history of chemical research in Bengal was inaugurated in 1909, when brilliant scholars like Jnanendra Chandra Ghosh, Jnanendra Nath Mukherjee, Maniklal Dey, Meghnad Saha, Satyendra Nath Bose and Pulin Behari Sarkar enrolled themselves in I.Sc. class. Rashik Lal Datta and Nil Ratan Dhar were preparing for B.Sc. examination. Rashik Lal Datta worked with Ray on nitrites and published many papers in the Journal of the London Chemical Society. He also was the first Doctor of Science of the Calcutta University. Jitendranath Rakshit was associated with Ray in isolation of Amine nitrite. He contributed about forty papers. Hemendra Kumar Sen, Hemendra Kumar, Biman Behari Day were mentioned too in his autobiography (Ray, 1958, p.124-149).

[211] He used to visit them in their hostel rooms and they were his companions during his evening walks. Some of them like Meghnad Saha also went him to the village during the North Bengal floods in 1913 for helping the villagers. He also claimed that there was a rare bond of friendship even among the research scholars (Ray, 1958, p.124-149). It was such an image of a teacher that must have led S. S. Bhatnagar in his Presidential Address at ISCA's session in 1928 to regret that he wasn't born early enough to be his pupil but he certainly was his grand-pupil because he had received instruction in chemistry from one of the Ray's earliest pupil named Atul Chandra Ghosh at Lahore (Ray, 1958, pp.124-146).

College during the period. He went for advanced study to Christ College Cambridge in 1907 on his return, joined the University College of Science. He became the Director of the Bose Institute later on.[212] However, both the teachers at the Presidency College were adored by their students. Nil Ratan Dhar's biography is a testimony to this which recognised the two great teachers Bose and Ray who had a magical influence on their students and greatly invoked their dedication to intellectual pursuits. It is from them that N. R. Dhar absorbed the ideals. Dhar had a spirit of cooperation which inspired younger students like J. C. Ghosh, J. N. Mukherjee, Meghnad Saha and P. B. Sarkar. He also gathered and formed around him, a closed knit group of scholars who later became eminent scholars in their respective fields of scientific research.[213]

The increase in the number of research scholars with a greater number of Indian scientists undertaking scientific research and initial formation of research groups around these scientists during the first decade of the twentieth century can be view as the initiation of the growth of a scientific community in India. The formation of research groups was viewed by Krishna as the genesis of the emergence of an Indian scientific community (Gaillard, Krishna and Waast et. al., 1997). These research groups followed by the inception of Indian Science Congress in 1914 enabled the growth of a greater sense of community among scientific workers in India. The following section endeavours to assess Indian Science Congress's role in the emergence of the scientific community.

3.3. ISCA and the Emergence of scientific community in India

The preceding chapter and previous sections of this chapter clearly indicated the reasons for the absence of a community consciousness amongst scientific workers in India. The scientific work restricted to government services, employment conditions imposed in these services, problem of expatriate scientific workers, nature of universities which largely remained degree-giving institutions, lack of institutional support for scientific teaching and research as well as discrimination and doubts about the capability of Indians both in employment within

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[212] Bose Institute, Commemoration Volume, Calcutta: Bose Institute, 1985, pp.1-4.

[213] Indian Chemical Society, *Acharya Nil Ratan Dhar, Short Life Sketch, Scientific Activities and List of Publications,* Calcutta: Indian Chemical Society, 1982, p. i.

government scientific departments and in scientific research can be viewed as important reasons for the absence of a scientific community in India and lack of community consciousness. However, by the last decade of the nineteenth century, Indians began joining the government scientific services and the universities. By the turn of the century, J. C. Bose and P. C. Ray undertook scientific research which led to a greater recognition both in India and abroad. Curzon's university reforms led to the transformation of universities into centres for higher teaching and research in science. As a result, these science departments became the cradle for growth of specialist groups around these professors. Thus, ushered an era of scientific research in India. The Director Public Instruction told Ray that he was instrumental in founding a school of chemistry (Ray, 1958, pp. 149,150). The greater aptitude and recognition of importance of scientific research among Indians could be seen in the confidence of the founders of IISc. They strongly believed that sixty students would join the institute in coming two-three years. They added that the supply of scientifically trained skilled men would create a demand in nascent industries.[214] Also, by the second decade of twentieth century, number of Indian scientists like S. S. Bhatnagar, J. C. Ghosh, etc. who undertook scientific research abroad came back and joined various universities. They played an instrumental role in institutionalisation and professionalisation of science in India. Through their active involvement, they fostered multiplication of research groups in other parts of India firstly in universities only later in specialised science institutions and national laboratories. Therefore, at the time of inception of ISCA, workers in government scientific departments, research institutes, universities, specialised science institutes, national laboratories, etc. formed the scientific workforce of the country.

With an increase in scientific workers in India and also increasing number of Indians taking up scientific research, a need was felt for an institution that could bring all of them together. A. G. Bourne quoted the memorandum of the council of industries commission which marked that the isolation experienced by scientific workers in India, was one of the important reasons for disappointing results.[215] ISCA could enable greater interaction between both European and Indian scientific workers thus, shaping a community consciousness amongst the scientific community in India. Hill believed that scientific societies enabled the transformation of highly

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[214] Indian Institute of Science, Calendar, 1915-1916, Bangalore, 1915, pp. 12-14.
[215] See Proceedings of the Fourth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1917.

individualistic and critical people into ‘living community’. In India in 1944, he noted that various causes separated individuals, groups and communities from one another, a strong common interest in science or in one of its branch could influence in keeping people together.[216] Krishna opined that ISCA served as a platform for catalysing ‘community’ consciousness and also unified the scattered specialist groups during its annual meetings (Krishna, 1997, p. 243). Thus, the following sections will attempt to understand ISCA’s role in emergence, expansion and recognition of the scientific community in India.

3.3.1. Meeting ground for scientific workers in India

It was believed that lack of personal contact among scientists was a great deficiency of the scientific community in India. It was also argued that scientists of same departments and institutions remained unaware of each other’s scientific investigations. The isolation of Indian scientists from their local situation led to contact with foreign scientists largely through printed word. A difference was also seen between the contact pattern of ‘productive’ and ‘less productive’ scientists. The lesser productive scientists had greater contact with their colleagues in India. However, the productive scientists were largely isolated and shared intense and frequent international contact (Shiva and Bandopadhyay, 1980, pp. 585,596). The attempt here is to understand how ISC helped in addressing these issues faced by the scientific community. Thus, enabling a greater community conscious.

The founders recognised that the basis of the foundation of ISC was the realisation of the lack of scientific intercourse in India. Therefore, need for an organisation of science on the on the lines of British Association was proposed. As proposed in the circular letter for seeking views about its foundation in 1911, one of the most important objectives of the Association was mitigation of the isolation of scientific workers in India, enabling greater personal intercourse between them by holding annual meetings in different parts of the country.[217] The proposal met with the general consensus among the scientific workers in India. As most of them believed that closer acquaintance and cooperation between Europeans and Indians, was necessary for spread of scientific culture in India. However, few concerns were raised

[216] A. V. Hill, Scientific Research in India, London: William Clowes and Sons, August 14, 1944, pp. 49,50 (Deepak Kumar Collection).
[217] Proceedings of the Fifteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1928.

regarding the time ripe for such an organisation. They believed that the amount of work wasn't adequate in India to justify an annual meeting, which required traversing long distances. It also proposed to the Provisional committee to decide Association's relation with existing societies in India. The importance of Congress as a medium for communication among scientific workers of various institutions and disciplines considering the diversity of scientific fields was discussed by its first President of the Congress at the Calcutta session in 1914 by Ashutosh Mookherjee.[218] How far has the Indian Science Congress Association addressed its objective will be analysed and its' role in the emergence of the scientific community will be assessed in the following pages.

The first meeting of the provisional committee resolved that the annual meeting of the Indian Science Congress would be held under the auspices of the Asiatic Society of Bengal.[219] Eventually, the first session during 15th-17th January 1914 was held in the buildings of the Asiatic Society under its auspices. As the Asiatic Society was already recognised as an important scientific society, such a step already gave the Congress a stronger ground. The rules of the Congress underlined that as long as the present relationship with the Asiatic Society of Bengal continued, its General Secretary and Treasurer of the Asiatic Society would be members of the executive committee of the Congress.[220] At the same time, holding the first session during the centenary celebration of the Indian Museum also proved favourable for the Congress as the function was already being attended by government officials across the country on duty.[221] The first session of the Congress was attended by a total number of 105 members.[222] However, the question of the number of scientific workers who would attend Congress was a cause of concern for its committee. The concern could also be viewed by the reservations that the proposal received as to the time ripe for such an organisation as they believed as they believed that there wasn't adequate work in India to justify an annual meeting which required traversing such long distances. As a result, the committee requested the

[218] Department of Education, General, Part B, Nos. 32 A, An Account of the Proceedings of the ISC held in the rooms of the ASB, January 15th, 16th and 17th, 1914 (National Archives of India, New Delhi).
[219] Proceedings of the Fifteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1928.
[220] Proceedings of the Fifteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1928.
[221] Meetings of the Indian Science Congress, Letter from Secretary to Government of India to All Local Governments and Administrations Department of Education, 1914. See Proceedings of the Fifteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1928.
[222] Department of Education, General, Part B, Nos. 32 A, An Account of the Proceedings of the ISC held in the rooms of the ASB, January 15th, 16th and 17th, 1914 (National Archives of India, New Delhi).

Government of India for practical help and sought for allowing their scientific officers to attend the session in 1915 on duty and also provide railways concessions for the same. However, it didnot matierialise as the War broke out.[223]

Since its inception, we see both Indians and Europeans in the committee, as members, as General Presidents, Sectional Presidents. The choice of Ashutosh Mukherjee as its first President does attest to the recognition of Indians. Only Indian in the executive committee was R. D. Mehta until 1919. However, from 1919-1926, Indian scientists held adequate space in the executive committee of ISCA.[224] Out of the nine members of the executive committee of 1927-28, three were Europeans while six were Indians.[225] There was one European in the executive committee of 1942-43 which comprised fourteen members.[226] An analysis of the first decade of its sectional presidents also attest to a fair representation of Indians except the sections like agriculture, medical research and botany which had lesser number of Indians.[227] Robert Anderson argued that the foundation of ISCA was the first recognition of India's independence (Anderson, 2010). During the thirty-four sessions of the Congress before Independence, there were nineteen Indians and fifteen European General Presidents. During the initial years of the Congress, most of the Presidents were from the government services except very few from the universities like P. C. Ray, J. C. Bose. However, from the mid-1930s a number of came from universities including the general and sectional presidents. There was a competition between British and Indian scientists for its highest offices (Anderson, 2010, pp. 62-63). However, right from the first provisional committee of the Congress, composition of the executive committee, membership and co-authorship of papers presented both by Indians and Europeans attest to greater scope for cooperation between the Indian and European scientific workers in India. Although the number of co-authored papers by an Indian in

[223] See Proceedings of the Fifteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1928.
[224] These included scientists like P. C. Ray, R. N. Mookerjee, M. Visvesvaraya, C. V. Raman, N. R. Dhar, S. P. Agharhar, Baini Prasad, S. L. Hora, J. C. Bose, Birbal Sahni, etc.
[225] Proceedings of the Fifteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal 1928, p. 3.
[226] Proceedings of the Thirtieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1943, p.6.
[227] Proceedings of the Fourteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1927.

collaboration with a European very few in number.[228] Thus, it is clear the initial progress of ISCA was a result of combined efforts of both European and Indians.[229]

ISCA has certainly played an important role in institutionalisation and professionalisation of science which will be discussed in detail in the next chapter. From its inception until India's Independence, numerous scientific societies, academies of science, specialised research institutions, etc. came into being. The ISCA sessions provided an opportune time and meeting ground for annual meetings of scientific societies, academies of science and other scientific institutions. At the Thirtieth session of ISCA nine, scientific societies organised their meetings.[230] However, there were sixteen annual meetings of learned scientific bodies organised simultaneously with the Thirty-Third session of the Congress.[231] As annual meetings of the Association gave a wider platform for a number of scientific fields, it provided scope for varied institutions for greater association. The representatives of the Association formed members of various scientific institutions across India. M. Afzal Hussain and P. C. Mahalanobis represented the ISCA and were appointed as the council members of the National Institute of Sciences of India. B. C. Guha as a representative of ISCA became a member of the governing body of the Indian Research Fund Association for three years from September 1945. Dr. S. L. Hora attended the jubilee celebration of the Allahabad University as a representative of the Association on their invitation. Dr. S. Krishna and Prof. K. D. Bagchi attended the centenary celebration of the Roorkee College of Engineering on behalf of the Association.[232] ISC enabled greater association between scientists belonging to different institutions.

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[228] In the Agriculture section of the Fifteenth Indian Science Congress, H.S. Madhava Rao and Roland V. Norris jointly presented a paper titled 'Protozoa as a factor controlling the fixation of nitrogen in soils by azotobacter'.

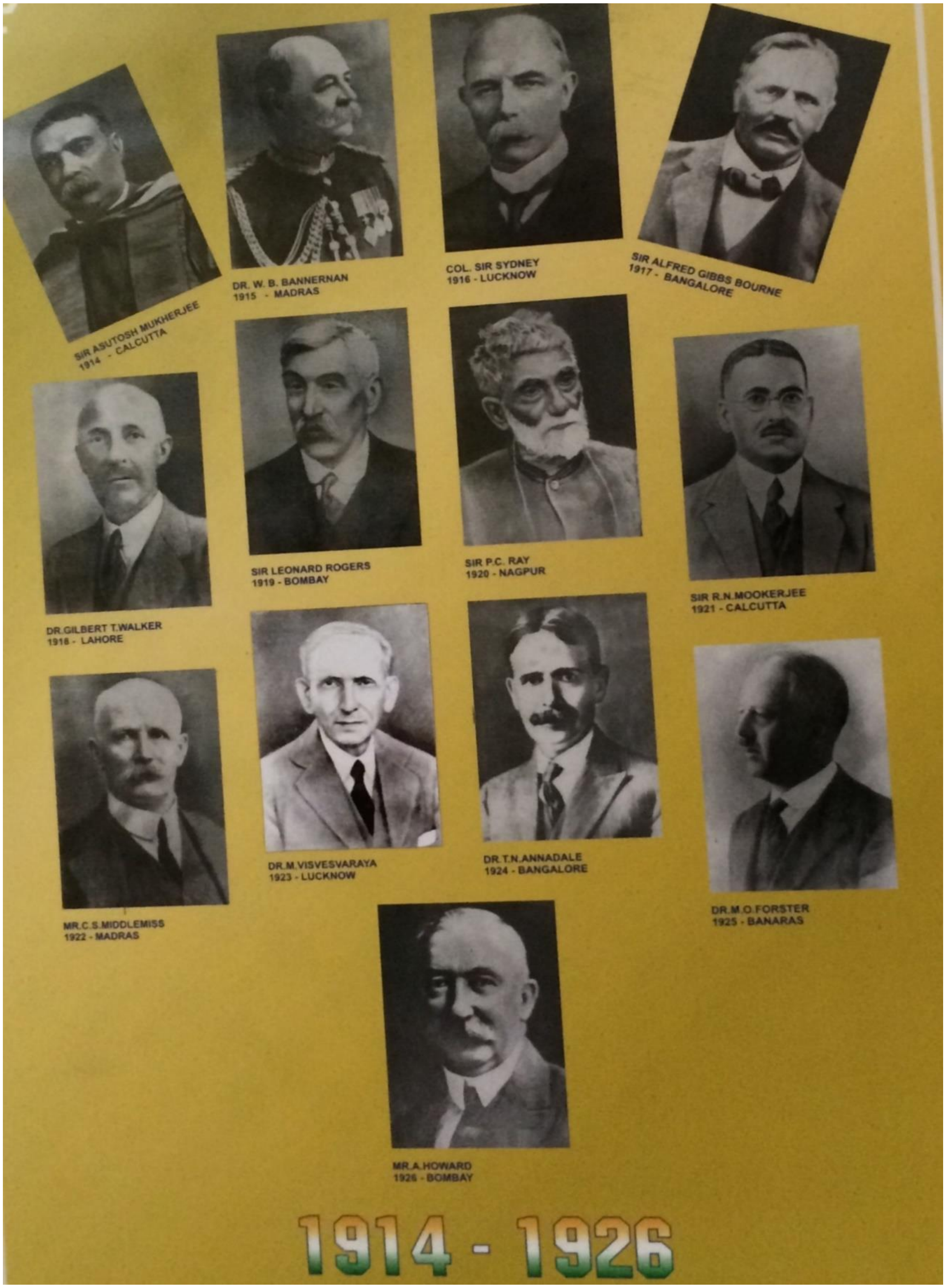
[229] The document has no date just mentions *'Courtesy Science and Culture'* available in the box containing archives relating to British Association at Bodleian Library, Oxford.

[230] Proceedings of the Thirtieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1943, pp. 17, 18.

[231] Proceedings of the Thirty-First Indian Science Congress, Calcutta: Indian Science Congress Association, 1944, p. 16)

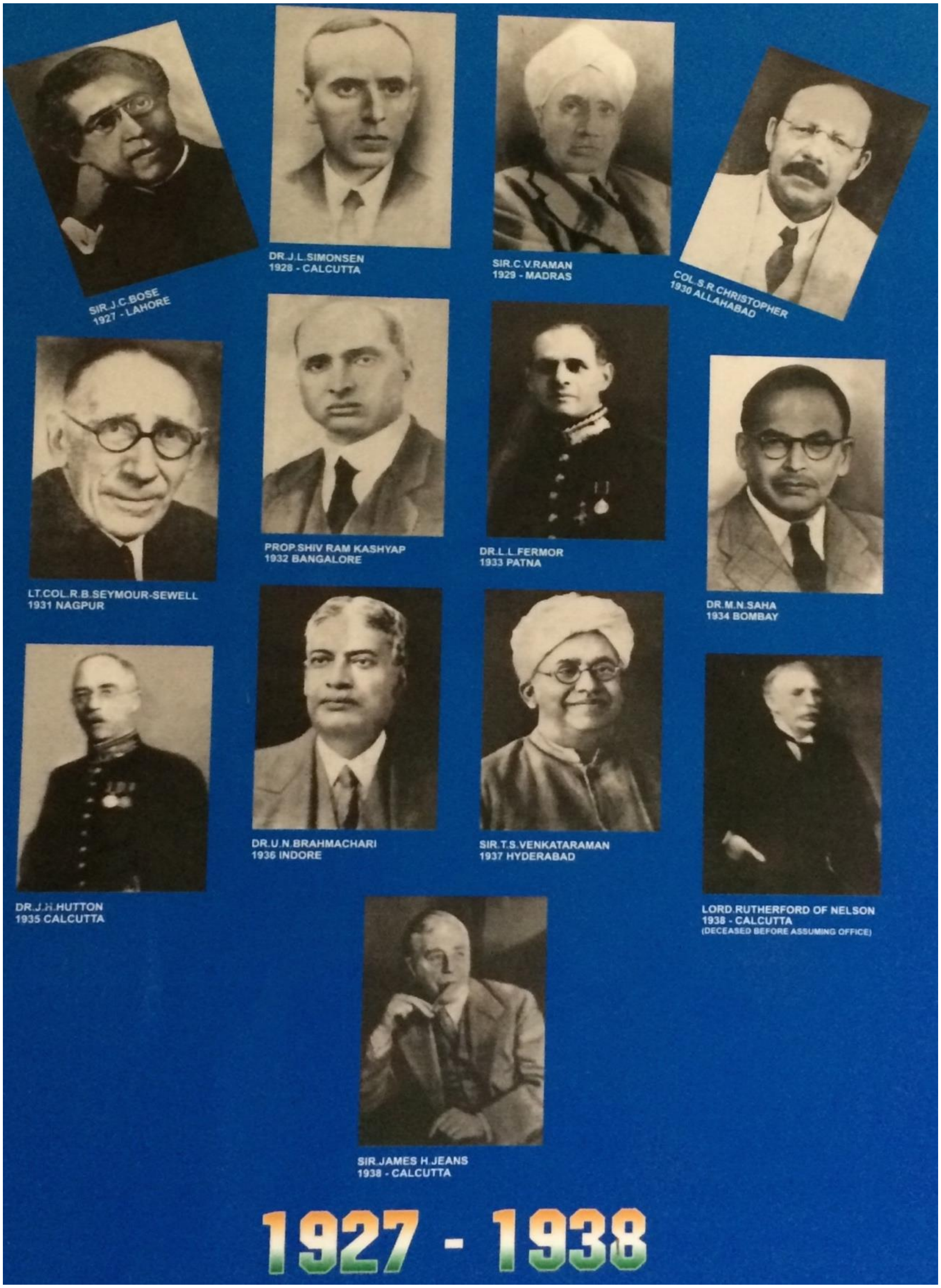
[232] Annual Report of ISCA of 1947 in the Proceedings of the Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948, pp. 32,33.

Figure 3.3. General Presidents of the India Science Congress Association (1914-1926)



Source: Picture taken at Indian Science Congress Association's Headquarters at Biresh Guha Street, Kolkata

Figure 3.4. General Presidents of the India Science Congress Association (1927-1938)



Source: Picture taken at Indian Science Congress Association's Headquarters at Biresh Guha Street, Kolkata.

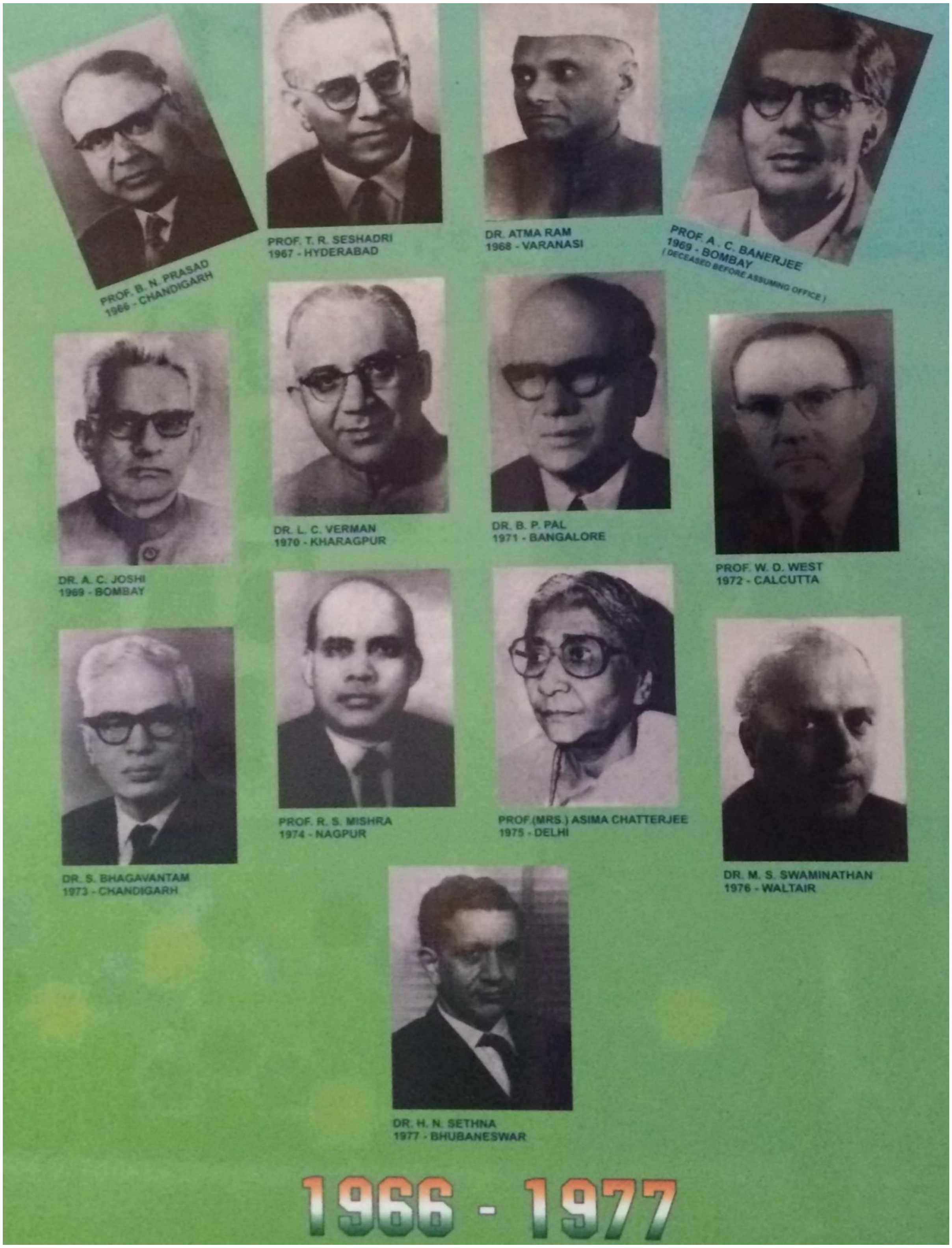
Figure 3.5. General Presidents of the India Science Congress Association (1939-1952)

Source: Picture taken at Indian Science Congress Association's Headquarters at Biresh Guha Street, Kolkata.

Figure 3.6. General Presidents of the India Science Congress Association (1953-1965)

Source: Picture taken at Indian Science Congress Association's Headquarters at Biresh Guha Street, Kolkata.

Figure 3.7. General Presidents of the India Science Congress Association (1966-1977)



Source: Picture taken at Indian Science Congress Association's Headquarters at Biresh Guha Street, Kolkata.

Figure 3.8. General Presidents of the India Science Congress Association (1978-1990)

Source: Picture taken at Indian Science Congress Association’s Headquarters at Biresh Guha Street, Kolkata.

Figure 3.9. General Presidents of the India Science Congress Association (1991-2004)

Source: Picture taken at Indian Science Congress Association’s Headquarters at Biresh Guha Street, Kolkata.

Figure 3.10. General Presidents of the India Science Congress Association (2005-2017)

Source: Picture taken at Indian Science Congress Association's Headquarters at Biresh Guha Street, Kolkata.

3.3.2. Spatial isolation of scientific workers

The Association organised annual meetings in different parts of the country. The rules stated in the Proceedings of the Indian Science Congress donot point at the criteria for choosing a venue for the annual session. However, there were regulations concerning the accommodation and availability of space and infrastructure for holding scientific meetings.[233] The decision of the venue of the next annual meeting was announced by the President for the forthcoming session during the meeting of a general committee held during the ongoing session. There were few instances of invitation by particular universities.[234] The annual meeting of the Congress was held in association with the universities of the chosen city and usually the Vice-Chancellor of the University was the Chairman of the Local Reception Committee. In few cases or in cities which didnot have a university, institutions or specific colleges were chosen.[235] The ISC sessions of 1969 and 1970 were held at IIT Powai and IIT Kharagpur respectively. Since Congress's annual meetings were held in educational institutions, it provided scope for greater intercourse between the delegates visiting the city and those of the host institution or local delegates.

Out of the thirty-four sessions of ISCA during 1914-1947, six meetings were held in Calcutta which certainly was the centre of scientific activity in the country. ISC met four times each it met in Bangalore and Madras, thrice in Bombay, Lahore and Nagpur, twice each it was held in Lucknow, Benaras and Delhi. It was held once in Allahabad, Patna, Indore, Hyderabad and Baroda. The significance of the city chosen and its contributions towards the advancement of science was reiterated during the opening proceedings. Lucknow was the capital of the United

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[233] The University of Travancore was chosen as the venue for the Thirty-First Indian Science Congress. However, owing to the peculiar geographical location and severe restrictions of train transport to reach Trivandrum, the venue was shifted to Delhi under the auspices of the University of Delhi. See Proceedings of the Thirty-First Indian Science Congress, Calcutta: Indian Science Congress Association, 1944, pp.1, 36.

[234] The Third-Third session of the Congress, the President, Prof. M. Afzal Husain announced that Patna University had invited the Congress for holding its next session in 1947. However, the session was finally held in Delhi See Proceedings of the Thirty-Third Session of Indian Science Congress, Calcutta: Indian Science Congress Association, 1946, p. 24.

[235] The Twenty-Third session was held at Holkar College in Indore and Principal of the College, Dr. P. Basu was the Chairman of the Local Reception Committee. See Proceedings of the Twenty-Third Indian Science Congress, Calcutta: Indian Science Congress Association, 1936.

Provinces and Bangalore had the famous IISc.[236] The diversity in the choice of places suitable for the annual Congress synced well with the Congresses' objective to promote and advance the cause of science in different parts of India based on the model of BAAS. But, it can also be seen that till the time of independence the annual meetings of the Congress remained restricted to populous cities and towns that were centres for scientific learning and research along with very few lesser emerging ones. However, until 1973 apart from those mentioned above, ISC was held in cities and towns like Pune, Hyderabad, Agra, Roorkee, Cuttack, Chandigarh and Kharagpur.

Table: 3.1. Venue of ISC sessions (1914-2003)

Place of ISC session	Number of Times ISC session held	Place of ISC session	Number of Times ISC session held
Calcutta	12	Agra	1
Bangalore	8	Annamalainagar	1
Delhi	8	Cochin	1
Chennai	7	Cuttack	1
Bombay	6	Goa	1
Hyderabad	6	Jadavpur	1
Lucknow	5	Jaipur	1
Nagpur	4	Jammu	1
Varanasi	4	Kharagpur	1
Baroda	3	Madurai	1
Chandigarh	3	Mysore	1
Lahore	3	Patiala	1
Pune	3	Ranchi	1
Ahmedabad	2	Roorkee	1
Allahabad	2	Shillong	1
Bhubaneshwar	2	Thiruvanathapuram	1
Indore	2	Tirupati	1
Patna	2	Vishakapatnam	1
Waltair	1		

Source: Compiled by data available from documents available at the ISCA Head office.

The Governor of Madras, Lord Pentland in his speech at the opening proceedings of the second session of the Congress talked about its importance in encouraging workers in science and bringing them together in a country so large in area as India through personal and social intercourse.[237] ISCA's importance in mitigating the twin isolations – namely geographical and specialization of scientific workers in India was reiterated by L. L. Fermor in his inaugural

[236] Proceedings of the Third Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1916; Proceedings of the Fourth Indian Science Congress, Calcutta: Asiatic Society of Bengal 1917.
[237] Proceedings of the Second Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1915.

address of National Institute of Sciences of India.[238] The Congress did address the issue of geographical isolation of scientific workers to some extent through its meetings in different cities. To what extent it catered to the specialised isolation of sciences will be discussed in the following paragraphs.

3.3.3. Isolation caused by specialisation

Prior to Indian Science Congress's annual meetings, there were hardly any scientific society or conference which accommodated as many scientific disciplines as the Congress. It has been adequately discussed in the previous chapter. Shiv Visvanathan believed that there was a need to transcend from specialization and excessive technicality of modern science (Vishvanathan, 1985, p. 13). At the inauguration ceremony of the Bose Institute in November 1917, Bose underlined that science was a large sphere and also highlighted that the western countries had divided it into numerous branches which had insurmountable walls between them (Gupta, 1964, p. 99). It cannot be argued to what extent the Congress broke down these walls. However, it does provide a platform for numerous branches of science to communicate, coordinate and co-exist at a single forum. P. C. Ray's autobiography also highlighted the growing number of scientific workers undertaking chemical research in the Presidency College, University College of Science, Dacca College, Punjab, during the second decade of the twentieth century (Ray, 1958, p.124-146). At its first session, papers were read under six section representing six different scientific fields. These included Chemistry, Physics, Zoology, Geology, Botany and Ethnography. By the Thirty-Fourth session of the Congress, the number of sections increased to thirteen.[239] The General Presidents of the Congress until Independence primarily included mathematicians, physicists, chemists and geologists with few physicians, botanists, zoologists, agriculturalists, anthropologists, engineers, physiologists and educationists. However, S. L. Hora in his presidential address in 1954 underlined a casual

[238] Proceedings of the First session of the National Institute of Sciences of India, Calcutta: National Institute of Sciences of India, 1935.

[239] The sciences represented at the Congress included Mathematics, Statistics, Physics, Chemistry, Geology and Geography, Botany. Zoology and Entomology, Anthropology and Archaeology, Medical and Veterinary Sciences, Agricultural Sciences, Psychology and Educational Science and lastly, Engineering and Metallurgy.

attitude towards biological sciences and highlighted the neglect of election of specialist in education, agriculture, anthropology, archaeologist as General Presidents.[240]

During the presidential address at the Thirteenth Indian Science Congress in 1926, Albert Howard emphasized on a team work between different scientific fields and a re-organisation of existing agricultural departments for ascertaining increase in agricultural productivity.[241] This certainly indicates the diversity of scientific fields dealt during the annual meetings which certainly reiterated L. L. Fermor's observation which testified ISCA's role in mitigating the isolation of scientific workers as a result of specialisation of scientific fields. It enabled scientific workers from all fields to come at one platform and discuss the progresses made in their respective field. The sectional president of the annual session in 1927, H. K. Sen called the chemistry section of the ISC as the most representative body of chemists in India.[242] The president of the medical and veterinary research, Lt. Col. R. Knowles during its seventeenth session recognised ISC as one opportunity which enabled scientific workers to get together and compare notes annually.[243] During the opening proceedings of the nineteenth ISC, Sir Mirza Ismail who read Maharajah's message attached great value to ISCA sessions for instigating, encouraging and coordinating research. He also credited ISCA for the original scientific investigations and position of Indian researchers in scientific advance.[244] The supplement of *Current Science,* viewed ISC as the common meeting ground for men of science belonging to all branches of science from all parts of India.[245] The Governor of Punjab reiterated the need for band of research workers inorder to extend the boundaries of human knowledge during the opening proceedings of ISCA in 1939.[246] ISCA also facilitated intra- and inter-disciplinary cooperation between scientists of various disciplines through the joint discussions and symposiums arranged during the Congress.

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[240] See Proceedings of Forty-First Indian Science Congress, Calcutta: Indian Science Congress Association, 1954.
[241] See Proceedings of the Thirteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1926.
[242] See Proceedings of the Fourteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal,1927.
[243] See Proceedings of the Seventeenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1929.
[244] See Proceedings of the Nineteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1932.
[245] See Current Science, New Delhi: Indian Science News Association, 1933, p. 193)
[246] Proceedings of Twenty-Sixth Indian Science Congress, Calcutta: Indian Science Congress Association, 1939.

At the silver jubilee session of ISCA, ten joint discussions concerning more than one section of the Congress were held.[247] The ISCA committee arranged numerous functions in connection with the Congress like garden parties, receptions, excursions, 'science dinners', 'science conversazione', etc. which effected greater personal and social intercourse between scientific workers. During the Twenty-First session 'At Home' was organised by the staff and post-graduate students of the Botany department of the Royal Institute of Science in Bombay for the delegates of the Botany section. The President and Fellows of the Bombay Branch of the Indian Chemical Society organised 'At Home' for the chemistry section of ISCA.[248] ISCA became a meeting ground for delegates from different scientific institutions and universities of the country. At the Thirty-First session of the Congress, 32 delegates from Universities of Annamalai, Bombay, Dacca, Madras, Nagpur, Punjab, Patna and Travancore took part. About six delegates represented scientific institutions like Institute of Plant Industry, Lahore, Indian Association for Cultivation of Science, Calcutta, Indian Botanical Society and Indian Charmicael College and Hospital.[249] At the Thirty-Third session, nineteen delegates came from scientific societies.[250]

3.3.4. Membership of ISCA

At the time of its inception, there were numerous concerns raised by the scientists regarding the time ripe for such an institution and if there were enough scientific workers that justified annual meetings of the congress. They also raised concerns about the feasibility of these meetings taking into account climate and distances to be traversed for attending them.[251] At the time of ISC's inception, an association that could bring together scientific workforce from

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[247] Proceedings of the Twenty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1938.

[248] Proceedings of the Twenty-First Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1924.

[249] Proceedings of the Thirty-First Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1944.

[250] These included Calcutta Chemical Society, Indian Botanical Society and Indian Statistical Institute. Eighty delegates from various universities across India like Aligarh, Allahabad, Andhra, Bombay, Dacca, Delhi, Lucknow, Madras, Nagpur, Osmania, Panjab, Travancore, Utkal including Holkar College in Indore and Victoria College, Gwalior both under Agra University attended the session. There were twelve delegates from research institutes like IACS, CSIR, Indian Central Jute Committee, Technological Research Laboratory, Calcutta and Indian Research Fund Association, New Delhi. See Proceedings of the Thirty-Third Indian Science Congress, 1946, pp. 10-12.

[251] Asutosh Mookerjee talked in great detail about the objective and the story of ISC's establishment during his Presidential address at the first session of ISC in 1914.

across India was largely unthinkable. Indians among the scientific workforce of the country were limited and were largely scattered and isolated in specific parts of the country. However, ISC was supported both by British and Indian scientists of the time. It was a wise decision to hold the first meeting of ISC along with the centenary celebrations of the Indian museum which was to be attended by numerous scientific and government officials. This could give a greater visibility to ISC. However, the numbers of attendees of the first session of ISCA became a concern for the organizing committee of ISC. Therefore, they requested government of India to allow their officials to attend annual meetings of ISC on duty and grant them travel allowances[252]. Government of India on the recommendations of Board of Scientific Advice extended the privilege of allowing selected officials to attend the annual congress on duty for 1916 as well.[253]

The membership of the Congress including all types of members was 105 in 1914. Simonsen in his address at the session in 1928 emphasised that numbers of papers presented and the attendance augured the threat for the future of the Congress. Its membership to about 2500 members by 1947.[254] Even, in the post-Independence era, there was a consistent growth in its membership. The graph shown below indicate the growth of ISCA's membership during 1914-1987. The annual report of the session of 1968 a temporary pause in the rising trend of membership. The report saw it as a sign of a process of consolidation of the gain in popularity reflected in the number of members enrolled in the preceding four years. They reported a trend evident in the preceding two decades each period of continuous rise of membership was followed by a period of consolidation that extended for two-three years. However, the report tried to explain the reason for a halt as caused by the new condition imposed by the Railway Board which made those earning more than Rs. 1000 per month ineligible to avail the concessional travel facility for attending the Congress.[255] A separate volume of the proceedings of the ninety-second ISC, which contained the list of all types of members of the Congress during 2004-20005 also help us to gauge its membership strength. All this certainly

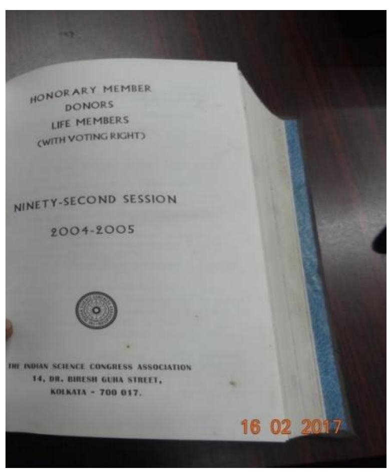
[252] Letter from D Hooper, Esq, Secretary and Treasurer of the ISC, ASB to The Secretary to the GOI, Dept od Commerce and Industry, No. 2379, dated Calcutta, the 24th November 1913 (National Archives of India, New Delhi)
[253] Proceedings of the Fifteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1928.
[254] Proceedings of the Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948.
[255] Proceedings of the Fifty-Sixth Indian Science Congress, Calcutta: Indian Science Congress Association, 1969.

attests to an increase in the size of the scientific community in India. It was viewed as the largest and most represented organisation of scientific workers in India, whose council consisted of practically all leading scientific workers of the country.[256]

Figure 3.11. Membership of the Indian Science Congress Association (1914-1987)

Source: Data compiled from various Proceedings and Annual Reports of ISCA

Figure 3.12. Volume containing the list of all types of Members of ISCA during 2004-2005



Source: Picture taken at the Headquarters of Indian Science Congress Association at Biresh Guha Street, Kolkata.

Until 1931, ISC wasn't a permanent organisation. After which a constitution was adopted under the title 'Indian Science Congress Association'.[257] There were no qualifications laid for

[256] Proceedings of the Thirty-Third Indian Science Congress, Calcutta: Indian Science Congress Association,1946.

the membership of the Congress until Independence. Although the types of membership and subscription fee have been underlined. During the Seventeenth Session of the Congress in 1930, there were three classes of members i.e. Full Members, Associate Members and Student Members with subscription fee at Rupees ten, five and two respectively.[258] However, by the Thirty-Third session in 1946 the types of membership increased. There were Ordinary members, Sustaining Members, Benefactors, Honorary Members and Sessional Members which further included Full Sessional Members, Associate Sessional Members and Student Members.[259] The subscriptions were increased for Ordinary Members and Full Sessional Member at Rs. 12 while the others remained similar.[260] The increased rate of subscription was extended for two successive sessions by P. C. Mahalanobis.[261] The increase in the subscription is not reflected by any significant decline in its membership. The financial statements also indicate a steady increase in the amount received from members' subscription.[262] The membership of the Congress including all types of members increased from 105 (1914)[263], 150 (1915)[264] to about 2500 members by 1947[265]. The membership almost quadrupled by 1987.[266] This certainly attests to an increase in the size of the scientific community in India. It was viewed as the largest and most represented organisation of scientific workers in India, whose council consisted of practically all leading scientific workers of the country.[267] However, it needs to be assessed if the membership of ISCA actually reflected an all-India character.

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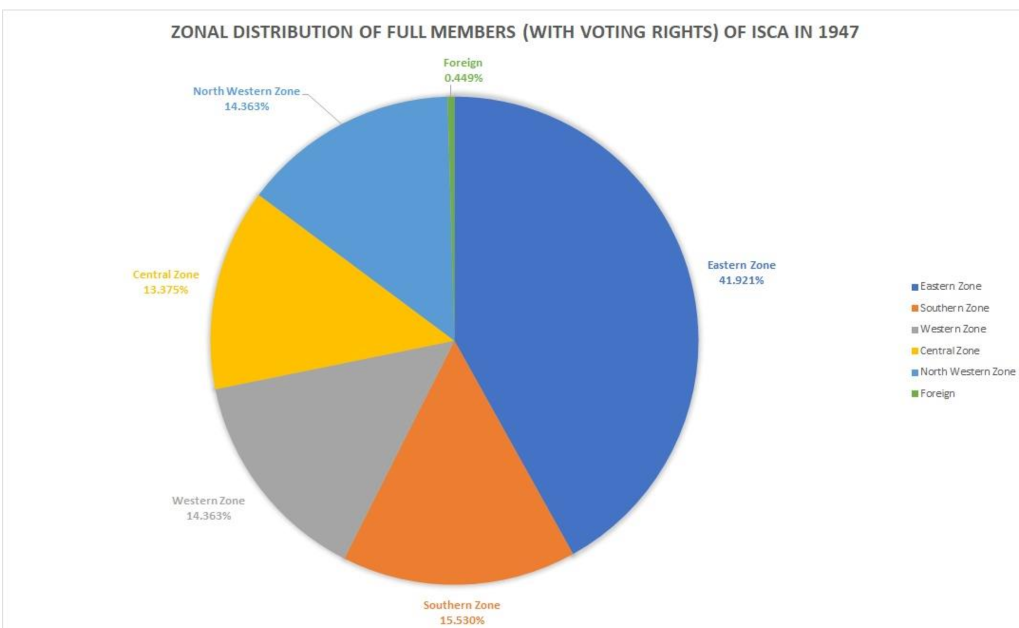
[257] Proceedings of the Twentieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1933.
[258] Proceedings of the Seventeenth Indian Science Congress, Calcutta: Indian Science Congress Association, 1930.
[259] Proceedings of the Thirty-Third Indian Science Congress, Calcutta: Indian Science Congress Association, 1946.
[260] Proceedings of the Thirty-First Indian Science Congress, Calcutta: Indian Science Congress Association, 1944, pp. 30, 31.
[261] Proceedings of the Thirty-Third Session of Indian Science Congress, Calcutta: Indian Science Congress Association, 1946, p. 24.
[262] Proceedings of the Twenty-Seventh Session of Indian Science Congress, Madras, Calcutta: Indian Science Congress Association, 1940, p. 53. Also, see Proceedings of the Thirty-Third Session of Indian Science Congress, Calcutta: Indian Science Congress Association,1946, p. 46, 47.
[263] Department of Education, General, Part B, Nos. 32 A, An Account of the Proceedings of the ISC held in the rooms of the ASB, January 15th, 16th and 17th, 1914 (National Archives of India, New Delhi).
[264] Proceedings of the Second Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1915.
[265] Proceedings of the Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948.
[266] Annual Report of the Indian Science Congress Association, Calcutta: Indian Science Congress Association, 1987.
[267] Proceedings of the Thirty-Third Indian Science Congress, Calcutta: Indian Science Congress Association, 1946.

The *Current Science* noted that curtailment was imposed on government officials for participation in ISC meetings in 1932. It recorded a decline in number of attendees including government officials, university professors, etc. It underlined that steps were needed to facilitate participation of distant members which included permanent members who were not government officials, through public grants, donations and legacies.[268] In the Annual Report of 1947, the executive committee underlined that the scientific community had not functioned as well as was accepted of it. It emphasized on greater cooperation of the scientific intelligentsia in India and aimed improving ISCA's work to bring it to the level of the British Association. It also highlighted the need to enlist more 'Ordinary Members' through personal influence. It was noted that numerous members enlisted them at the last moment, therefore there was a 'large shifting, fluid membership' of the Association. This according to the committee did not add to the strength of the Association with needed an active interest of these members focused throughout the year.[269]

Figure 3.13. Zonal Distribution of Full Members (with voting rights) of the Association in 1947



Source: Annual Report of the Indian Science Congress Association in 1947.

[268] See Current Science, Vol. 2, No. 3, September, 1933, p. 104. Also, Current Science, Vol. 3, No. 6, 1934, pp. 253, 254.
[269] Annual Report of the Thirty-Fourth Indian Science Congress, 1947 in Proceedings of the Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948, pp. 39-41.

The executive committee also provided a zonal analysis of the Full Members (with voting rights) which at the end of November 1, 1947 was a total number of 1060 members, percentage of participation was: Eastern zone (44.09%), Southern zone (16.3%), Western zone (15%), Central zone (14%), North-Western zone (10%) and foreign members (0.005%). The committee expressed a need for further strengthening the influence of the Association in Southern, Western, Central and North-Western zones. The analysis also gave the breakdown within the zonal membership which certainly helped in ascertaining the membership of the Association within specific cities/areas. Out of the total 1060 Full Members, maximum number of member i.e. 279 were from Calcutta (about 27 percent), followed by Bombay with137 members (about 13 percent). About 92 members came from Madras (9 percent). The United Provinces occupied the third place with 129 members which could be because of the existence of the universities of Allahabad, Benaras, Lucknow and Agra. There were 113 members from Bihar, the reason for this could be that the Thirty-Firth session of the Congress was to held in Patna in January 1948. The members from Delhi, Mysore, Punjab, Hyderabad were 66, 42, 34, 26 respectively. The figures suggest that about 49 percent of the members of the Association belonged to the three Presidencies.[270] The zonal membership in 1951 showed that 49.54 percent of its members belonged to West Bengal followed by 20.65 percent and 17.62 percent by United Provinces and Bombay respectively.[271] According to J. L. Simonsen, among the thirty-one papers presented at the First Science Congress in 1914, twenty-five were from authors belonging to Calcutta or other places in Bengal.[272] This is in consonance with Anderson's assessment of the Association membership in 1930s as he also hinted on a similar phenomenon. He stated that the scientists based in Bengal dominated the Science Congress. He also reiterated the need to regulate membership and demonstrate recognition for superior performance (Anderson, 2010, pp. 62-63). In 1970, S K Bose who was the Director of IIT Kharagpur recognised that ISC was held for the first time in a small town like Kharagpur. He also noted the presence of numerous students from nearby places who had enrolled for the congress.

[270] Annual Report of the Thirty-Fourth Indian Science Congress, 1947 in Proceedings of the Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948, pp. 39-41.
[271] Proceedings of the Thirty-Eighth Indian Science Congress, Calcutta: Indian Science Congress Association,1951.
[272] Proceedings of the Fifteenth Indian Science Congress, Calcutta: Indian Science Congress Association, 1928.

3.3.5. Assimilating women and young scientists

As early as mid-1930s, Simosen realised that the scope for young members to get inspired by personal contact with the pioneers of scientific thought was loosing sight and there was a need for emphasising it.[273] Kumar noted a growing trend of centralization and concentration of power in the scientific establishments of Independent India. Anderson observed a recorded growth in suicide among scientific workers from 1960. The conditions of work were also considered important for amplifying suicidal tendencies (Anderson, 2010, p. 12). Nehru during the inaugural of the National Chemical Laboratory at Pune on January 3, 1950 emphasised on the need to tap the talent of young men and women for the cause of science. Increasingly from the late 1950s he became critical of senior men in science for not giving the younger generation scientists both men and women, adequate chance and opportunity for creative work (Singh, 1986). He also added that there was a greater need for training younger generation and inculcating opportunities of leadership among them.[274]

Haldane emphasised that junior workers were regarded with jealousy by senior scientists who mostly discouraged them for original research or stole their results. He went on to say that a senior scientist of an Indian laboratory published fifty papers in a year and although most of the work was done by junior scientists, their names were not mentioned. He identified this as one of the reasons for migration of Indian scientists abroad (Haldane, 1965, pp. 20,21). Later, Indira Gandhi during inaugural sessions of ISCA also emphasised on encouragement of younger scientists as a responsibility of senior scientists. She emphasised on the need for urgent steps to remedy the conditions of our younger generation scientists and ensure their involvement in policy making which was critical for S&T development.

ISCA Young Scientists' Programme was inaugurated from the Sixty-Eighth Session of the Congress in 1981 to encourage young scientists (below the age of thirty years). It gave them opportunity to present their research proposal under different sections with opportunities to

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[273] Printed material (1 box) 1938, "printed material relating to the meeting of the Indian Science Congress Association" (Bodleian Library, Oxford).

[274] Proceedings of Forty-Ninth Indian Science Congress, Calcutta: Indian Science Congress Association,1962. Also see Proceedings of Fiftieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1963.

exchange ideas in relevant scientific problems with their counterparts and specialists. For the seventieth session, ISCA selected eight young scientists for Young Scientists Awards where they received a certificate of merit and cash along with the contingent grant.[275] A special session for young scientists was organised and chaired by the secretary of Department of Science and Technology which gave them an excellent opportunity to freely expressed their views about the focal theme before the senior scientists and decision/policy makers of the country. They also shared their personal free and frank views the issues and problems related to R&D activities in various scientific institutions.[276] At the general body meetings of the Congress during 1981-1983, a project on school teachers programme on environment was discussed and undertaken and was to be coordinated by the Association's headquarters and monitored by its representatives for a period of three years.[277] A booklet highlighting the presentation of ISCA Young Scientists' Awardees of 1987 was published.[278] Twenty-seven best poster presentations from different sections, were selected for the Ninetieth session of ISC in 2003 to encourage scientists.[279]

Figure 3.14. ISCA Young Scientist Awardees with General President C. N. R. Rao at the Platinum Jubilee Session of ISCA in 1988

Prof. C.N.R.Rao, General President of the 75th Indian Science Congress with the ISCA Young Scientist Awardees for 1988.

[275] Proceedings of the Seventieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1983.
[276] Proceedings of the Seventy-Second Indian Science Congress, Calcutta: Indian Science Congress Association, 1985.
[277] Ibid.
[278] Proceedings of the Seventy-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1988.
[279] Proceedings of Ninetieth Indian Science Congress, Calcutta: Indian Science Congress Association, 2003.

Source: Picture taken from the Proceedings of the Seventy-Fifth Indian Science Congress, 1988 at the Headquarters of ISCA, Kolkata.

The Proceedings of the Congress clearly attest that women were least represented in the committee of ISCA.[280] It was only during 1970-73 that Prof. Asima Chatterjee General Secretary of the Association was the first woman to become the during 1970-1973 followed by four other woman scientists who held the office until 2019. Prof. Chatterjee also became the first woman General President in 1975[281], followed by Prof. Archana Sharma, Dr. Manju Sharma and Prof. Geeta Bali in 1987, 1999 and 2017 respectively. The Forum for Women and Science was created and its first meeting was held during the Baroda session in 1992 under the convenorship of Dr. S. P. Arya.[282] The Forum organised three symposia, a panel discussion on the Focal Theme and a special lecture. The session was attended by about hundred women scientists. The symposium assessed the abilities and opportunities for Indian women scientists. It also highlighted their role in promoting scientific awareness, national building and women welfare.[283] The Forum was inaugurated by Dr. Sarla Gopalan who was the Secretary of the Department of Women and Child Welfare. She gave a keynote address on 'Gender issues in technological development'.[284] Dr. Manju Sharma, Secretary of Department of Biotechnology in her inaugural address emphasised on the role of women S&T professionals had to ensure that that the twenty-first century became India's century of women. She also emphasised on consideration of a task force on women to report to the Prime Minister Office. About 120 participants attended the session.[285] The Open House Interactive session in the following year came out with recommendations for encouragement of women in S&T.[286] By 2012, a separate Women Science Congress was inaugurated during the ISC sessions each year during the Science Congress which gave opportunity for women scientists. Through these attempts, ISCA

[280] Prof. Usha Nath Chatterji was the Sectional President of Agriculture Science in 1969. During the same session Dr. (Mrs.) A. Mookerjee was elected as the member of the Committee of Science and Social Relations. A special lecture by Prof Mrs. I. Karva was delivered in the Anthropology and Archaeology section. Dr Sashi Prabha was the sectional president of Mathematical Sciences in 2004.

[281] Proceedings of Sixty-Second Indian Science Congress, Calcutta: Indian Science Congress Association, 1975.

[282] Proceedings of the Seventy-Ninth Indian Science Congress, Calcutta: Indian Science Congress Association, 1992.

[283] Proceedings of the Eighty-First Indian Science Congress, Calcutta: Indian Science Congress Association, 1994.

[284] Proceedings of the Eighty-Fourth Indian Science Congress, Calcutta: Indian Science Congress Association, 1997.

[285] Proceedings of Eighty-Seventh Indian Science Congress, Calcutta: Indian Science Congress Association, 2000.

[286] Proceedings of Eighty-Eighth Indian Science Congress, Calcutta: Indian Science Congress Association, 2001.

encouraged the young and women scientists. At the same time, it also tried to popularise scientific temper and critical thinking among school students through children science congress and general public through science and Pride of India exhibitions. Thus, trying to enlarge and expand the scientific community in India.

3.3.6. Contacts with Foreign Scientists

Indian Science Congress also provided a forum for bringing together both European and Indian scientific workers at a platform within India. By the 1930s, need was felt for greater communication between the Indian scientific workers with those abroad. In 1933, the Imperial Committee on Economic Consultation and Cooperation under Dr. O. D. Skelton, suggested a conference for discussing collaboration in scientific research. So, in 1936 British Commonwealth Scientific Conference was held. However, its subject remained restricted to agriculture.[287] The Indian scientists were increasingly recognised internationally and the Association's meetings provided a forum for interaction with the foreign scientists as well as greater visibility to the Indian scientific workers. Jawaharlal Nehru emphasized on international cooperation and collaboration with foreign scientists. As a result, a joint session of the British Association and Indian Science Congress was scheduled for the Silver jubilee session of the Congress in 1938 during the Twenty-Third Session of the Congress in Indore in 1936. The letters exchanged between the British Association and the committee of the Indian Science Congress attest to great interest taken by the members of the British Association as well as the donors for the British scientists to attend the silver jubilee session in Calcutta.[288][289] The joint session was to be presided by Lord Rutherford but because of his sudden death, the session was presided by James H. Jeans. A total of ninety-one members including the ladies attended the session. The British scientists' delegation reached Bombay on 17th December 1937 and returned on 15th January 1938 after the annual session. They participated in the scientific deliberations, presented papers, delivered popular lectures and attended joint-

[287] Report of Proceedings, British Commonwealth Scientific Official Conference, IOR/L/E/8/4759, C&O 85/46, 1946 (The British Library, London).

[288] Correspondence (496 leaves) 1935-7, 1947, "concerning delegates of the Association who attended the meetings of the Indian Science Congress Association in India, with a volume of accounts labelled 'India Fund' (Bodleian Library, Oxford).

[289] Printed material (1 box) 1938, "printed material relating to the meeting of the Indian Science Congress Association" (Bodleian Library, Oxford).

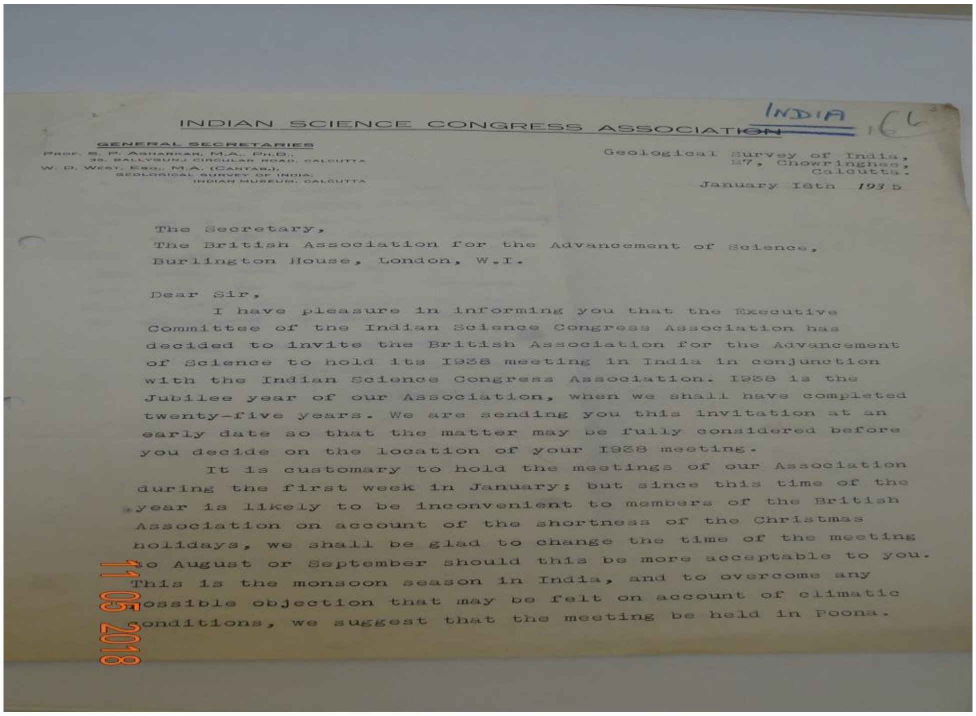
meetings during the session.[290] They gave broadcast speeches at several places on topics of public interest and consulted various bodies on scientific matters of interest to them.[291] In the message to the press after the session, James jeans highlighted the powerful new bond beyond the bounds of science forged between Indian and British scientists as a result of the invitation of the session. He mentioned special gratitude for the huge audiences during the popular lectures. He also highlighted the great interest shown by students in advancing scientific research. The Council also underlined that it provided scope to the delegates to get acquainted with the scientific work undertaken at various universities and institutes and successfully personally engage with Indian scientists.[292]

[290] During their stay in Calcutta they delivered lectures at IACS, Institute of Chemists, Indian Physical Society, University of Calcutta and University College of Science. Apart from these they also undertook the tour which was mainly focused to give them an account of the historical and cultural background of India. The tours also enabled the Indian scientists to interact with them during the tours and establish mutual contact with the major scientific centres or institutions which they visited. The foreign delegates attended various social and scientific engagements, addressed various scientific institutions and attended convocation of various universities

[291] They visited various scientific institutions like Royal Institute of Science, Haffkine Institute, Grant Medical College, various Departments of the University at Bombay, Osmania University in Hyderabad, the Latitude Observatory of the Survey of India and Upper Air Observatory of the Meterological Department in Agra, Agricultural Research Institute in Delhi, Forest Research Institute in Dehradun, Banaras Hindu University in Varanasi. Sir James Jeans delivered lectures and short addresses at various institutions and interacted with scientific workers in the city. The geologists went ahead to visit Koderma for geological excavations. After the session, they visited the universities of Madras, Mysore. After which they visited the Indian Institute of Science and College of Science in Bangalore. See Proceedings of the Twenty-Fifth Indian Science Congress, Calcutta: Asiatic Society of Bengal,1938, pp. 35-43.

[292] Proceedings of the Twenty-Fifth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1938, pp. 35-43.

Figure 3.15. Letter by the General Secretary of ISCA to the Secretary of the British Association for Advancement of Science (BAAS) on January 18th, 1935 proposing for a joint session in 1938.



INDIAN SCIENCE CONGRESS ASSOCIATION

INDIA 66

GENERAL SECRETARIES
PROF. S. P. AGHARKAR, M.A., PH.D., 30, BALLYGUNJ CIRCULAR ROAD, CALCUTTA
W. D. WEST, ESQ., M.A. (CANTAB.), GEOLOGICAL SURVEY OF INDIA, INDIAN MUSEUM, CALCUTTA

Geological Survey of India,
27, Chowringhee,
Calcutta.

January 18th 1935

The Secretary,
The British Association for the Advancement of Science,
Burlington House, London, W.I.

Dear Sir,

I have pleasure in informing you that the Executive Committee of the Indian Science Congress Association has decided to invite the British Association for the Advancement of Science to hold its 1938 meeting in India in conjunction with the Indian Science Congress Association. 1938 is the Jubilee year of our Association, when we shall have completed twenty-five years. We are sending you this invitation at an early date so that the matter may be fully considered before you decide on the location of your 1938 meeting.

It is customary to hold the meetings of our Association during the first week in January; but since this time of the year is likely to be inconvenient to members of the British Association on account of the shortness of the Christmas holidays, we shall be glad to change the time of the meeting to August or September should this be more acceptable to you. This is the monsoon season in India, and to overcome any possible objection that may be felt on account of climatic conditions, we suggest that the meeting be held in Poona.

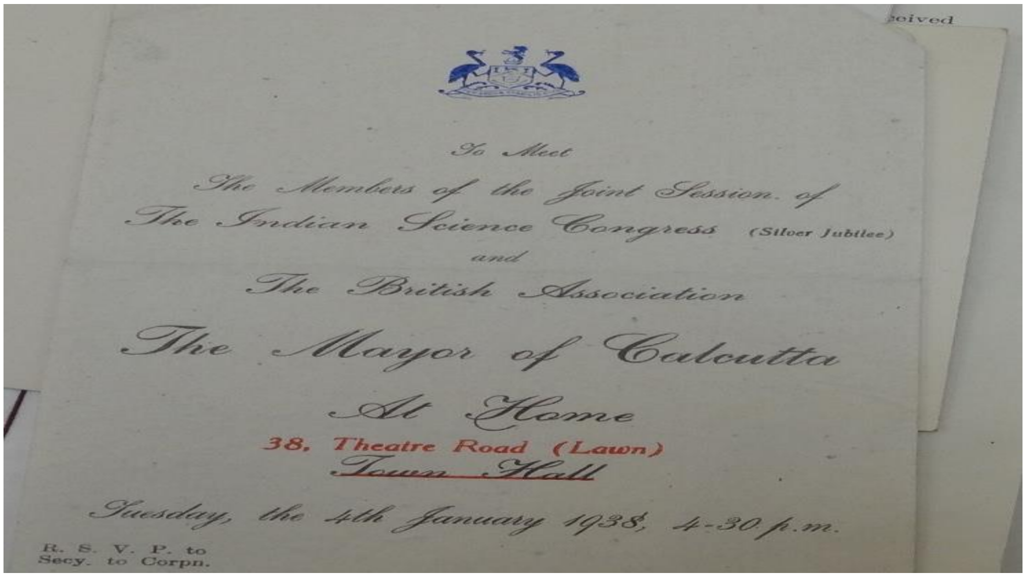
11 05 2018

Source: Picture taken at Bodleian Library, Oxford which houses the archives of the British Association for the Advancement of Science.

Figure 3.16. File containing all documents of donations made towards attending ISC session in 1938.

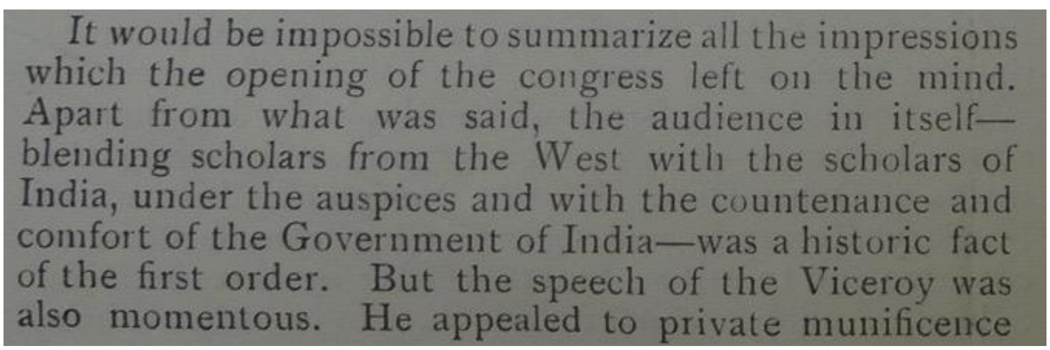
Source: Picture taken at Bodleian Library, Oxford which houses the archives of the British Association for the Advancement of Science (BAAS).

Figure 3.17. Invitation by the Mayor of Calcutta to the Members of Joint Session of ISCA and BAAS


To Meet
The Members of the Joint Session of
The Indian Science Congress (Silver Jubilee)
and
The British Association
The Mayor of Calcutta
At Home
38, Theatre Road (Lawn)
~~Town Hall~~
Tuesday, the 4th January 1938, 4-30 p.m.
R. S. V. P. to
Secy. to Corpn.

Source: Picture taken at Bodleian Library, Oxford which houses the archives of the British Association for the Advancement of Science.

Figure 3.18. Excerpts from the Cambridge Review dated February 11, 1938 about the Indian Science Congress Session by Ernest Barker.


It would be impossible to summarize all the impressions which the opening of the congress left on the mind. Apart from what was said, the audience in itself—blending scholars from the West with the scholars of India, under the auspices and with the countenance and comfort of the Government of India—was a historic fact of the first order. But the speech of the Viceroy was also momentous. He appealed to private munificence

Source: Picture taken at Bodleian Library, Oxford which houses the archives of the British Association for the Advancement of Science.

In 1937, during the Twenty-Fourth session, proposal was made by the Committee for inviting scientists apart from those connected to the British Association. Although the invitations were sent to a number of scientists and few of them couldn't attend even after accepting the invitation, ten scientists from Amsterdam, Germany, Africa, Canada, United States attended the Twenty-Fifth session of the Congress. It became a regular feature of the Congress after the silver jubilee session.[293] Numerous congratulatory messages came from various scientific associations and academies of science across the world for the Jubilee session of ISCA.[294] Number of members of the Congress were invited for the Empire Scientific Delegation who on behalf of the Government of India represented India. This enabled scientific collaboration with British, American, Australian and European Societies. This created greater awareness of the value of Indian science within international spheres as a result of which ISCA received numerous enquiries from scientific bodies in Britain, Russia, America, Canada and Australia. It also received invitations and goodwill messages from various scientific associations Ceylon, Indo-China and Afghanistan. Two delegates from the American Association for the Advancement of Science and one from Pacific Science Association attended the Congress meeting in 1941.[295] In 1943, three delegates came from the American Association.[296] Forty-seven scientists from twenty countries attended the ninetieth session.[297]

Post-War reorganization necessitated establishing closer scientific connections with technically advanced countries. In 1946, nine Indian scientists visited the British Commonwealth Scientific Official Conference.[298] The Member of Industries and Supplies, C. Rajagopalachari informed that an Indian Scientific Mission had visited UK, USA and Canada to see recent developments in S&T research.[299] He added that eminent scientists are sent and appointment of liaison officers in these countries as well as USSR was under consideration.[300] In 1957, about seventy-seven foreign delegates from sixteen country and international

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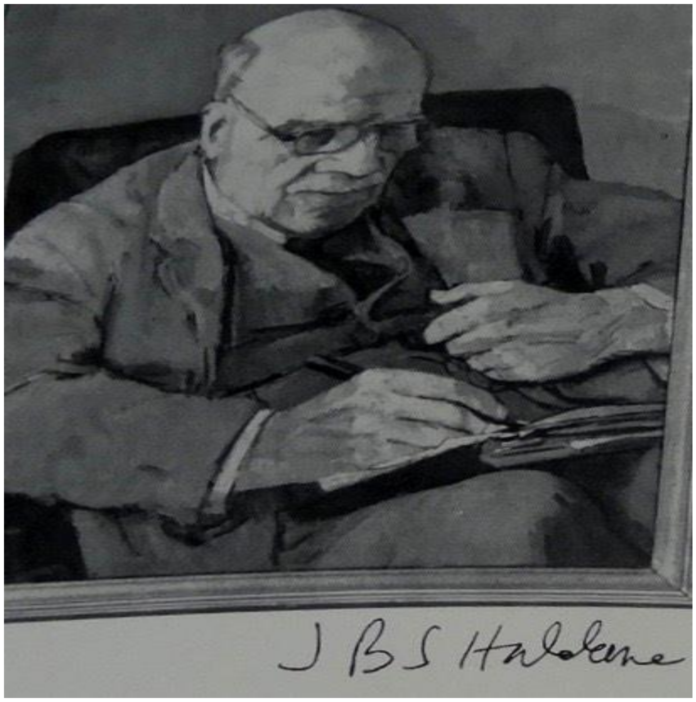
[293] Proceedings of the Twenty-Fifth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1938, p. 44.
[294] These included American Association for the Advancement of Science, Smithsonian Institution, Washington; Prussian Academy of Sciences, Kaiser Wilhelm Society for Advancement of Science, Deustche Akademie, Munich; USSR Academy of Science.
[295] Proceedings of the Twenty-Eighth Indian Science Congress, Calcutta: Indian Science Congress Association, 1941, p. 33.
[296] Proceedings of the Thirtieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1943, p. 14.
[297] Proceedings of the Ninetieth Indian Science Congress, Calcutta: Indian Science Congress Association, 2003, pp. 129,130
[298] Report of Proceedings, British Commonwealth Scientific Official Conference, IOR/L/E/8/4759, C&O 85/46, 1946 (The British Library, London).
[299] Gopalachari was asked the reason for no scientific mission to USSR. To which he replied that one is aware of the difficulties in getting information from them. See, Post-War Scientific Collaboration, IOR/L/E/8/4759, C&O 85/46, May 3, 1947 (The British Library, London).
[300] Ibid.

agencies like UNESCO, WHO, E.O.A.F.E. attended the session.[301] Twenty-two foreign delegates attended ISCA session in 1970 from various academies of science along with few individual scientist.[302] Forty-seven foreign scientists attended the session in 1988 and few gave special lectures as well during the platinum jubilee session of ISC in Pune.[303] However, in the proceedings of ISCA in 1994, 1997, 1999, 2000 and 2001 there is no separate list of foreign delegates as seen in earlier proceedings. They largely said about 3000, 4000 and 5000 delegates from India and abroad attended the session. Thirty-five scientists from sixteen countries attended ISC's session in 1996.[304] A Space summit was organised during ISC's session in 2003. At the meeting the chairman of ISRO, Dr. K. Kasturirangan emphasised on the need for cross-fertilisation and welcomed representatives from various space agencies across the world. Atleast eight of eleven panelists were foreign scientists.[305] Haldane had said in his assessment of the Bombay Science Congress that its time that the people of India realised that invitation of foreign scientists at these Congresses lowered the prestige of Indian science considerably (Haldane, 1965, p. 24). However, ISC annual sessions saw a continued participation of foreign scientists. Recently, there numbers have been reduced and the star foreign scientists of the annual session largely were the Nobel Laureates invited each year.

[301] Proceedings of the Forty-Fourth Indian Science Congress, Calcutta: Indian Science Congress Association, 1957.
[302] Proceedings of Fifty-Seventh Indian Science Congress, Calcutta: Indian Science Congress Association, 1970.
[303] Proceedings of the Seventy-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1975.
[304] Proceedings of Eighty-Third Indian Science Congress, Calcutta: Indian Science Congress Association, 1996, pp. 111,112.
[305] Proceedings of Ninetieth Indian Science Congress, Calcutta: Indian Science Congress Association, 2003, p. 153.

Figure 3.19. J. B. S. Haldane (1892-1964)



Source: Picture taken at the Archives of the Royal Society, London.

J. B. S. Haldane was invited for ISC early in 1952. During his stay in India he gave multiple lectures at the Statistical Institute. On his return, he wrote a letter to Nehru for developing and adding to the research in biology in India. He visited ISI again in 1954. As a result of his liking for Nehru, Mahalanobis and greater opportunities for biological investigations in India than Britain, he decided to emigrate to India. According to Blackett's biography, he viewed his meeting with Jawaharlal Nehru during ISCA's annual session in 1947 as one of the most important events of his life (Lovell, 1976, p. 96).[306] In a letter from an Australian scientist, M. L. Oliphant dated September 1952 to Blackett, he invited him to visit Australia after attending the Science Congress in India in January 1953. He added that he came to know about Blackett's plan to attend the Congress indirectly through H. J. Bhabha.[307] The Thirty-Fourth session was attended by scientists from Great Britain, America, Canada, China, France, Russia, etc. The ISCA also received good will messages from a number of scientific

[306] After few months of ISCA meeting, Nehru invited Blackett to spend in India and sought for his advice on the research and development needs of the armed forces. During the next twenty years, Blackett became a frequent visitor of India. He and his wife stayed at Nehru's house on many of these visits (Lovell, 1976, pp. 96, 97).
[307] See Blackett Papers, 1948-1973 (Royal Society Archives, The Royal Society, London).

institutions abroad.[308] The efforts of P. C. Mahalanobis and S. S. Bhatnagar enabled number of foreign scientists to attend the Thirty-Fourth session. Twenty-four representatives were invited from the Royal Society, BAAS, AAAS, National Academy of Science of America, Royal Society of Canada, National Research Council Canada, French Academy, Chinese Academy of Sciences and Society Academy of Sciences.[309] There were about thirty-five foreign delegates during ISCA sessions from various individual scientist and those from scientific institutions and academies across the world during ISC session in 1975.[310] During the Thirty-Fourth session, post of "Foreign Secretary" within ISCA was proposed for grater contact between Indian science and the world science.[311] P. C. Mahalanobis was invited was invited to the United Nations as the Chairman of the Indian Statistical Commission of the United Nations Organisation. The Cultural Adviser of the French Embassy requested the Association to establish relation with the International Union for Biological Sciences. The Ceylon Association also requested for a representative of ISCA.[312] The sub-committee of science and its social relations requested H. J. Bhabha to suggest how ISCA through its committee could cooperated with the activities of UNESCO.[313]

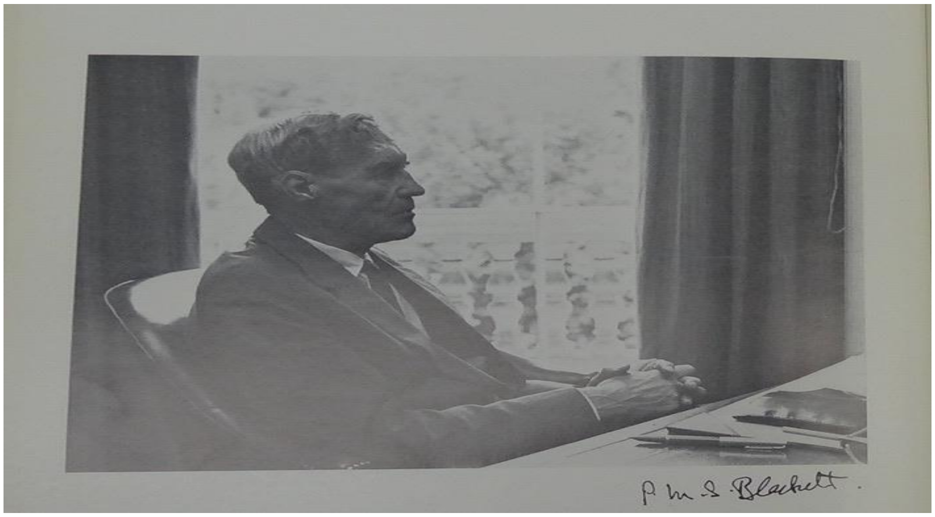
This certainly highlights the greater recognition of the Indian Science Congress among the scientific associations and institutions abroad and the Indian scientific community at large. The Congress annual meetings provided a platform for greater international network of scientists which recognised the growth of the Indian scientists as a community. It provided a meeting ground for personal intercourse of scientific workers not just within India but also made its presence felt and recognised by the scientific community abroad. It also enabled greater scope for cooperation and collaboration for an international culture of science especially in the post-war era, when science and its utilisation for peaceful purposes became widely professed in the Peace conferences. C. V. Raman during Asian Relation Conference in 1947, emphasised that closer contact between Asian countries would be a great fillip to

[308] Annual Report of the ISCA of 1947 in the Proceedings of the Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948, p. 32.
[309] Ibid, pp. 36,37.
[310] Proceedings of the Sixty-Second Indian Science Congress, Calcutta: Indian Science Congress Association, 1975, p. 21.
[311] Annual Report of the ISCA of 1947 in the Proceedings of the Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948, p. 39)
[312] Ibid, p. 33.
[313] Ibid pp. 49, 51

scientific research. The all-round development necessitated putting together of the results of work of different countries for international and inter-regional organisation. He pointed that most of the headquarters for international organisation were in Europe or America and stressed that since most of the Asian countries were under-development, inter-regional organisation could help in tackling problems facing the Asians countries by formation of common policies.[314] The annual meetings helped in stimulating close and constant collaboration between scientific workers in India in rationalising scientific work in India. It eliminated the risk of mutual ignorance and needless duplication of efforts to some extent. It also rendered the service of showcasing the work done by Indian scientists to the outside world. The post-Independence era saw greater inter-personal relations between Indian scientists and P. M. S. Blackett. This can be attested to by a number of letters exchanged between P. M. S. Blackett and Indian scientists like Bhabha, P. C. Mahalanobis, D. N. Wadia, Vikram Sarabhai, S. N. Bose, M. L. Dhar, etc. during 1951-1973. Blackett wrote an obituary for Bhabha in 1966, where he acknowledged his twenty years' close friendship with him and remembered that a fortnight earlier Bhabha had told him that he planned to develop the electronic industry of India. Blackett also emphasised on Bhabha's close friendship with late Prime Minister, Nehru. He called Bhabha's death as a loss to the world of science and a great tragedy for India[315]. Blackett relations with Nehru and Indian scientists has been adequately studied by Anderson (Anderson, 1999, pp. 253-271).

[314] C.V. Raman, , Scientific Research in Asia, Indian Council of World Affairs, New Delhi, 1947 (India Office Records, Q/26/3/60, The British Library, London).
[315] See Blackett Papers (1948-1973 (Royal Society Archives, The Royal Society, London).

Figure 3.20. P. M. S. Blackett (1897-1974)



Source: Picture taken at the Royal Society of London.

3.4. ISCA and the Government

The foundation of the Indian Science Congress necessitated greater communication between 'scientific estate' and political world and translation of the dialect of science in to popular idiom (Vishvanathan, 1985, p. 13). The annual meetings of the Congress were held in different provincial centres and saw the presence of various heads of the Provincial Government. The opening proceedings of the annual sessions were attended by the Governors, Viceroys, Governor-General, etc. The Fifteenth annual meeting had the Governor-General, Edward Frederick Lindley Wood and Governor of Bengal, Sir Francis Stanley Jackon as the Patrons.[316] Apart from these, on several occasions dinners and at homes were organised by the governor for the delegates. ISCA provided scope for greater visibility of the needs of science and scientists to the government as well as interaction between the government and the scientific community. This had been highlighted by the first president of the Science Congress, Ashutosh Mookerjee on his presidential address at Calcutta. He opined that the periodical meetings and discussions would bring their aims to a public notice and press them upon the attention of the Government.[317] ISCA's role in this regard was not restricted to deriving grants

[316] Proceedings of the Fifteenth Indian Science Congress, Calcutta: Asiatick Society of Bengal, 1928, p. 1)
[317] Ashutosh Mookerjee's address during the First session of the Indian Science Congress. See Proceedings of the First Indian Science Congress in Journal and Proceedings of the Asiatic Society of Bengal, Calcutta: Asiatic Society of Bengal, 1914.

from the government or concessions for leaves and travel for attending its annual sessions. The foundation of Madras Fisheries Department Marine Biological Station in Krusadai Island, by the government was direct result of the efforts of the two sections of the Congress.[318]

Since its inception ISCA carried on its activities with partial assistance from the Asiatic Society of Bengal and largely through its own subscriptions. Although, during the jubilee session it received donations from the government, universities, learned societies, business firms, individual donors, members of ISCA, British Association and commercial, institutional and individual donors of Britain.[319] ISCA approached the government for a grant of Rs. 75000 towards the traveling cost of the foreign delegates which was sanctioned by the Government.[320] However, the activities of the Association increased and so were its expenses. The Association was hesitant to increase the subscription fees as it would discourage the young scientists from joining. The government was approached and it granted an amount of Rs. 5000 for the years 1945-46 and 1946-47. The executive committee strongly voiced the need for an annual grant of Rs. 25000 from the government for the appointment of clerical staff. The need was also felt to increase the subscription fees to meet the high cost of publications and to pay the employees of the Association. The need for permanent habitation of the Association which largely functioned from the buildings of the Asiatic Society was also voiced.[321] Not until 1957, the foundation stone of ISCA Office was kept in 1957 by its General President, Dr. B. C. Roy.

The delegates from Government also attended the ISCA session at Benaras in 1941. These included four delegates representing Government of India, Government of Bihar and Government of United Provinces of Agra and Oudh.[322] Delegates were sent by various universities, research institutes, learned societies, colleges, states and government

[318] Current Science, Vol 2, No. 4, 1933, p. 195.
[319] The Government of India, Government of Bengal, Government of Tranvancore and Diwan of Junagarh State contributed Rs. 20000, Rs. 10000, Rs. 1000 and Rs. 500 respectively (Proceedings of the Twenty-Fifth Indian Science Congress, 1938, p. 51-54).
[320] Annual Report of the ISCA of 1947 in the Proceedings of the Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948, p. 37).
[321] Proceedings of the Twenty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1938, pp. 33,34)
[322] Proceedings of the Twenty-Eighth Indian Science Congress, Calcutta: Indian Science Congress Association, 1941, p. 34.

departments. The Public Health departments of Jodhpur State and Government of Bihar sent five delegates. The Department of Industries and Civil Supplies sent S. S. Bhatnagar and Dr. S Siddiqui as representatives of the Government of India. Apart from being members of the delegations abroad, members of the ISCA became members of the Planning and Development Department, Planning Commission and Council of Scientific and Industrial Research. Ardeshir Dalal who presided over the ISCA session in 1941, headed the Planning and Development Department in 1944. M. Visvesvaraya, Meghnad Saha were closely associated with the National Planning Committee. S. S. Bhatnagar played a critical role in the establishment of CSIR in 1942. The Central Advisory Board of Archaeology under the Ministry of Education requested a member of ISCA as its representative. N. N. Chatterjee was appointed as a member of the Board. The Central Board of Irrigation under the Government of India also requested a representative member of ISCA for its Board. P. C. Bose was selected. Thus, we see a number of ISCA members as members of various advisory boards under the Government.[323] The resolutions passed by the section of zoology recommended the executive committee of ISCA to urge the GOI for constituting an all-India department of fisheries for developing it on scientific lines.[324] The sub-committee on standard time for India under the chairmanship of S. K. Mitra submitted a report in 1946. The copies of which were circulated Railways, Airways and Government departments for adoption of a uniform standard time across India. The Decimalization committee of ISCA under convenorship of Mr. P. Sett strongly propagated the advantages of decimalisation of both weights and measures on the basis of metric system, through publishing of pamphlets.[325]

As the chairman of the National Planning Committee founded in 1939, Jawaharlal Nehru had sent a message to the silver jubilee session of the Science Congress (Singh, 1986, p.1). Jawaharlal Nehru was appointed the President for the Thirtieth session and continued to be the President-Elect for the next session. Although he couldn't preside over the session.[326] He was

[323] Annual Report of the ISCA of 1947 in the Proceedings of the Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948, p. 33)
[324] Proceedings of the Twenty-Sixth Indian Science Congress, Calcutta: Indian Science Congress Association, 1939.
[325] Annual Report of the ISCA of 1947 in the Proceedings of the Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948, p. 35, 36.
[326] Proceedings of the Thirtieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1943, p. 25.

the president for the session in Delhi in 1947. His presidential address emphasized on the importance of science and scientists in the service of the nation. In the post-Independence era, during his prime ministership he inaugurated atleast fourteen sessions of the Science Congress (Singh, 1986).

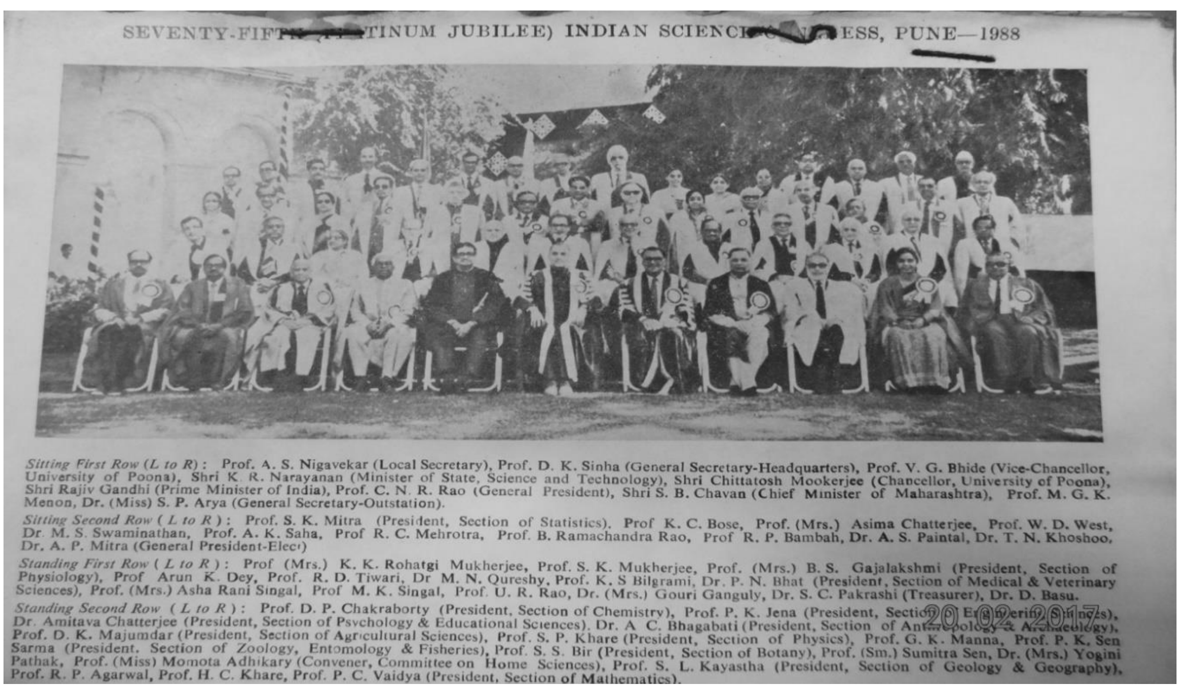
However, Mahatma Gandhi who was so active during the National Movement, was completely absent from the Proceedings of the Indian Science Congress. Kumar noted that Gandhi seldom used terms like ‘science’ and ‘technology’. He added that Gandhi addressed the issue of science on two of the few occasions, one when he addressed the students at Trivandrum in 1927 and the other in 1927 when he visited IISc. Gandhi declared that he was not an opponent of science but he wanted limitations of scientific research and its application (Kumar, 2000, pp. 245-247). The Science Congress can be aptly seen as a platform for greater intercourse of the political leaders like Nehru and Indian scientists as well as those from abroad like P. M. S. Blackett. Thus, post-Independence era saw shaping a science-politics nexus which became thoroughly evident during Nehru’s tenure as a Prime Minister. Anderson’s book highlighted this science-politics nexus in the post-Independence era (Anderson, 2010). The period saw increasing recognition of science and the scientific community by the state and their role for general progress of the country and the well-being of the people of India. This is evident in the inaugural speeches of Nehru made during the ISC sessions. Nehru until 1953 attended the inaugural meeting as an honoured guest. After the acceptance of the Honorary Membership of the Association, he attended the session in 1955 at Baroda as a member.[327] After which it became a customary for Prime Ministers to attend the inaugural session of the Science Congress.

[327] Proceedings of the Forty-Second Indian Science Congress, Calcutta: Indian Science Congress Association, 1955.

Figure 3.21. Prime Minister, Morarji Desai at the Sixty-Sixth Session of the Indian Science Congress in 1979.

Source: Picture taken from the Proceedings of the Sixty-Sixth Indian Science Congress, 1979.

Figure 3.22. Prime Minister, Rajiv Gandhi at the Seventy-Fifth Session of the Indian Science Congress in 1988.



Source: Picture taken from the Proceedings of the Seventh-Fifth Indian Science Congress, 1988.

Figure 3.23. Prime Minister, V. P. Singh at the Seventy-Seventh Session of the Indian Science Congress in 1990

Source: Picture taken from the Proceedings of the Seventh-Seventh Indian Science Congress, 1990.

Figure 3.24. Prime Minister, P. V. Narasimha Rao at the Seventy-Ninth Session of the Indian Science Congress in 1992

Source: Picture taken from the Proceedings of the Seventh-Ninth Indian Science Congress, 1992.

Nehru's address in 1947 reinforced his support for science and scientists. However, in the same speech he did highlight that scientists need not depend on government always. ISC showcased need of scientific community in professional matters like remuneration of scientific workers and professional status of scientists. The committee of ISCA were requested for their recommendations on the professional status of statisticians and pay of scientific workers at the annual meeting in 1946.[328] ISC became a platform for showcasing the expectations of the country from the scientists and the state responsibilities towards S&T progress. It also emerged as a platform for showcasing the needs of funding scientific research as well as issues concerning scientific community. S. L. Hora in his presidential address in 1954 highlighted the disparity between the emoluments of the scientists in the universities and those in the administrative department. He demanded for a uniform scientific service for scientists which had a defined grade of status and pay and which enabled usual promotions on the basis of merit and ability to avoid resentment among the junior grades. He criticised the appointment of scientists in industries on higher emoluments as against scientific men for pure sciences. He also emphasised on an equal position for all branches of knowledge and voiced against any privileged position given to scientists. He viewed disparity as an inhibiting factor that shaped a 'caste system' among scientists. He opined that scientists needed to be adequately paid and reasonably secured without being given any privileged position. He also emphasised on the financial and institutional encouragement of scientists as well as rewards for junior scientists.[329]

Prof. Humayun Kabir emphasised on state support for science and scientists through increasing research funding for accelerating scientific progress in India as scientific research was expensive and was impossible without the support of the state. In 1963, at a Conference of Scientists it was suggested at atleast one percent of national income had to be earmarked for scientific research. He identified the lack of proper facilities and environment of encouragement for younger scientists as the reasons for their migration to foreign countries. He suggested numerous steps to stop migration. emphasised on collaborative research with scientific workers abroad. However, he cautioned that the recognition of importance of science for military, industry, commercial and other purposes and funding by the state shouldn't

[328] Proceedings of the Thirty-Third Indian Science Congress Association, Calcutta: Indian Science Congress Association, 1946.

[329] Proceedings of the Forty-First Indian Science Congress, Calcutta: Indian Science Congress Association, 1954.

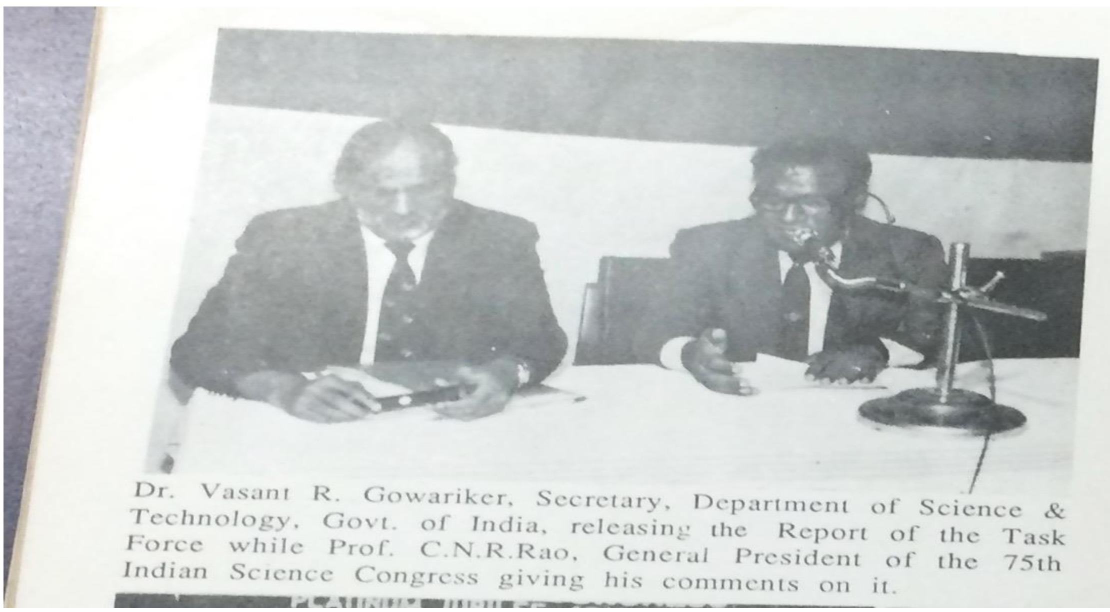
control the course of scientific progress and curb the freedom of scientists. He suggested setting up of national Research Councils and Advanced Research centres for liaison between universities for training future generation of scientists whose funding for all would be decided by an advisory council consisting of representative from various scientific institutions.[330] The General President of ISCA session in 1994 discussed the expenditure on S&T during the first and the seventh five-year plan. He also analysed the allocation and distribution of the R&D expenditure which was largely consumed by five scientific organisations with DRDO utilising the maximum and CSIR the minimum.[331]

Nehru had indicated the importance of science in planning for S&T progress and overall progress of the country.[332] The period saw greater involvement of scientists towards planning and development. S&T occupied a significant place in the Five-Year Plans and the Science Policy Resolution (1958). In her inaugural address during ISC's session in 1974, Indira Gandhi reiterated government's commitment towards S&T policy.[333] It was believed that the Congress which saw a conglomeration of scientists from various spectrum, could have S&T implications on various issues facing the country. As a result, M.G.K. Menon introduced Focal Themes of 'national' relevance, which could be discussed widely in all the sections, committees and forums during the annual session. Alongside, plenary sessions were also organised around various facets of the Focal Theme, in which scientists, technologists, administrators and policy makers could interact with one another. Thus, a significant departure in the deliberations of the Congress is seen from 1976. During Gandhi's address in 1976, she recognised that ISC through its focal themes could help the government with content and direction for planning for the progress.[334] The recommendations arrived at during various sectional meetings, standing committee meetings and forums were consolidated by the General President and then finalized by the council of ISCA. The final recommendations of the Congress were handed over to P. N. Haksar, Chairman of the Planning Commission, who

[330] Proceedings of the Fifty-First Indian Science Congress, Calcutta: Indian Science Congress Association, 1964.
[331] Proceedings of the Eighty-First Indian Science Congress, Calcutta: Indian Science Congress Association, 1994.
[332] Proceedings of the Twenty-Fifth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1938.
[333] Proceedings of the Sixty-First Indian Science Congress, Calcutta: Indian Science Congress Association, 1974.
[334] Proceedings of Sixty-Third India Science Congress Part I, Calcutta: Indian Science Congress Association, 1976, p. 36.

assured possible help in implementing the resolutions.[335] For the first time, the Association organised a special programme and invited heads of various Government departments and agencies responsible for policies making and its implementation with regard to S&T programmes of the country to present a progress report to the scientists, planners and science communicators.[336]

Figure 3.25 Dr. Vasant Gowarikar, Secretary of DST releasing the Report of the Task Force during ISCA's session in 1988



Source: Picture taken from the Proceedings of the Seventy-Fifth Indian Science Congress, 1988.

Another significant step towards empowering the relation between the government and the scientific community could in seen in the setting up of the permanent task force by the Department of the Science and Technology in 1980. The follow-up actions undertaken by the government was discussed during ISC session on the recommendations submitted during the preceding year. Menon reported on the actions taken on the recommendations of the Sixty-Eighth Congress in 1981 during a session organised by Department of Science and Technology. He discussed the follow-up actions taken by various organisations, agencies of

[335] Ibid. p. 37.

[336] The secretaries of Departments of S&T, New Delhi, Non-Conventional Energy Sources, New Delhi and Atomic Energy, Bombay were invited to speak on their programmes pertaining to the Focal Theme of the session 'Frontiers of Science and Technology' in 1988 (Annual Report of ISCA, 1987-1988, p. 15).

GOI, on specific recommendations that emanated through the technical and plenary sessions on the focal theme.[337] With greater recognition of self-reliance and the need for mobilizing indigenous scientific and technological capabilities to solve national problems, Indira Gandhi placed the Technology Policy Resolution in 1983 before the nation during ISC sessions. She welcomed the suggestions from the scientists and technologists on the policy.[338] During ISCA's session in 1995, government's policies on S&T was discussed in detail. Later, the forth-coming S&T policies of the government, vis-à-vis Science and Technology Policy and Science, Technology and Innovation Policy, were inaugurated during the ISC sessions in 2003 and 2013 respectively. With the New Industrial Policy of 1991, the General President of ISCA's session in 1995 undertook a SWOT analysis so that India was better prepared for sudden challenges faced by global competiveness, through planning. The challenges and the credibility of the Indian scientific community were also discussed by Pakrashi in his address. He further went ahead and underlined the 'new role' of the government as required by the New Economic Policy with regard to incentives for new technologies, tax relief and enhabced support to universities and R&D institutions and partnership with industries. U. R. Rao in his address in 1996 also reiterated on greater role of government and the need for the government to tackle the policy issues created by globalization. The IPR concerns were also raised by scientists during ISCA sessions during this period. This certainly coincides with time when US filed numerous patents on Indian plants which caught public media attention in 1998. Prime Minister advised the CSIR scientists to re-write IPR laws based on the laws followed in other countries to protect India's heritage. A vision statement was released by Prime Minister during ISC in 2002 which stated that India would be free of poverty, hunger and malnutrition and become an environmentally safe country by 2020. The President of the session spelled out 'Panch Sutras' strategy to realise the vision.[339]

[337] Annual Report of ISC session of 1982, p.3.
[338] Proceedings of the Seventieth session of ISC, Part I, Calcutta: Indian Science Congress Association, 1983, p. 44-48).
[339] R. S. Paroda presidential address. See Proceedings of the Eighty-Eighth Annual Session of the Indian Science Congress, Part I, Calcutta: Indian Science Congress Association, 2001.

3.5. Conclusion

The main focus of this chapter has been to understand the role of the activities of ISCA, its leading scientists in emergence of a scientific community in India. The chapter began by highlighting the reasons for the limited number of scientific workers in India and the lack of a community consciousness among them, during the eighteenth and the early nineteenth century. The motive behind the formation of an association as diverse in its scope catering to various specialisms of science was to foster community consciousness, enabling formation of scientific community. The Congress's emerged and continues to remain the sole platform which provide scope for the scientists across the country from various disciplines of science to meet and discuss at one platform. It enabled greater interaction between workers of different scientific fields through its sectional meetings giving the widest scope for intra- and inter-discipline communication, cooperation and collaboration. Through its annual meetings organised in different parts of India and across varied disciplines of science, it helped in mitigating both geographical and specialized isolation faced by scientific workers. ISC also made efforts for greater inclusion of younger and women scientists. Thus, broadening the scientific community.

The Congress evolved as the Congress of savants and became a forum for gaining 'who's who in science'. It also saw the participation of most of the eminent scientists of various scientific disciplines. It evolved as a meeting ground for most of the scientific institutions of the country. As, it saw an increase in institutional membership as well as many such institutions began arranging their annual meetings during ISC sessions each year. It enjoyed a favourable position among the scientific institutions in India. The members of ISCA were invited and elected as council members of various universities, research institutions, academies of science in India. It certainly, emerged as an important binding force for the scientific community. An increase in the volume of its proceedings, membership attest to the growth of its activities. The ISC has played a pivotal role in transforming the 'small, elitist Bengal-centric' community into a larger all-India community. It now enjoys a considerable participation of scientists, research scholars, students of varied S&T fields from various science colleges, universities from smaller cities, towns.

ISCA, leading scientists and related institutions connected to it created a climate of professionalization of science in India. Mostly dominated by native scientists, this group of scientists contributed to the professionalization of science outside the main colonial science institutions created by British (Krishna, 1991). Exploration on ISCA and social history of science between 1876 and 1940s undertaken in this chapter confirms this insight. ISCA provided the medium for greater communication with the scientists abroad. The foundation of greater interaction with the international scientific community was first kept during the silver jubilee session of the Congress, with the invitation to delegates from BAAS. This enabled ISC's evolution as a forum for showcasing progress made in scientific research by Indian scientists. Thus, gaining greater attention within the international scientific community. From 1947, it emerged as a regular meeting ground for foreign scientists belonging to various associations and academies of science across the world and enabled greater interaction and intercourse with the Indian scientific workers. It also received encouragement and recognition and a number of international scientific institutions sent goodwill and congratulatory messages to the Congress. These developments giving a specific identity of science to India in the international sphere of science. The long-term involvement of scientists like Haldane and Blackett with S&T progress in India, seemed to have germinated during the annual sessions of the Congress. Increasingly Indian scientists were also invited by the international scientific institutions.

The ISC emerged as the interface between the government and the scientific community. As the Congress aimed at removal of any disadvantage of public kind. It had to develop as a ground which could interact with the government and seek financial support. From its early history, governor-generals, governors, maharajahs, etc. were present at ISC sessions. In the post-Independence era, Prime Minister attended most of the sessions of the Congress. Later, representatives of various committees, departments and ministries of the government began attending the Congress. A number of representatives from the Association were appointed as members of important committees and boards of various departments of the government. ISCA made recommendations through its sub-committees on issues like standard time for India and decimalization of weights and measures according to the metric system. From 1980, permanent Task Force was initiated by the Department of S&T which followed up the recommendations made by different sections of the Congress each year. Therefore, ISCA provided the ground for shaping a viable scientific community and catalysed the community consciousness within the scientific workforce in India. At the same time, it emerged as the necessary interface between the government and scientists. Thus, enabling a mutually inter-dependant relation between them where, ISC showcased the needs of the community and government sought suggestions for shaping the S&T policy for the country.

Chapter 4

Professionalisation of Science in India: Role of ISCA

4.1. Introduction

The previous chapter began by assessing the nature and structure of scientific workers and the reasons for a lack of community consciousness among scientific workers in India. Further, it tried to gauge ISCA's role in emergence of a scientific community in India. The Congress provided a forum for interpersonal contact between European and Indian scientific workers in India, mitigating the geographical and specialised isolation among them. It initiated the growth of numerous specialist groups which could be seen as the genesis of the scientific community. It provided a meeting ground for specialists from different fields of science across universities, scientific organisations, government departments from various parts of the country. The marked increase in its membership clearly indicated the growth of scientific community. A joint silver jubilee session with BAAS initiated greater interaction with the international scientific community. After which, individual scientists as well as those from scientific institutions and international organisations increasingly attended its sessions. ISCA provided a stage to showcase these achievements and provided scope for greater visibility to the Indian community. The Congress enabled wider expansion of the scientific community with increasingly efforts made especially from the 1960s, for greater inclusion of young and women scientists. It also tried to bring within its fold the school children as well as the general public. Therefore, aiming for a greater popularisation of science will be discussed in greater detail in the next chapter. As a forum of scientists, it provided a suitable medium for expressing the needs of the scientific community as well as scientific research to the government and the general public. In the post-Independence era, it stands as a testimony of an increasing science-politics nexus which increasingly emerged around the development discourse and greater role of S&T in the general well-being of the country.

In the previous chapter has adequately drawn the central role played by ISCA in shaping a considerable Indian scientific community and catalysing 'community' consciousness among the scientific workers in India. This chapter assesses its role in professionalisation of science. It discusses how ISCA's members contributed towards institutionalisation of science through foundation of university departments, scientific societies, specialised science and technological institutions, academies of science, national laboratories, etc. It attempts to assess ISCA's role in fostering specialisation and sub-specialisation within S&T fields, through its sections and sub-sections. It assesses the space its proceedings provided the basic and applied sciences, emerging technologies and social sciences. It attempts to understand its sectional meetings as an opportunity for specialists and its members for showcasing S&T discoveries, advancements and knowledge production within the country. It also engages with assessment of ISCA's role in launch of scientific journals, initiation of a peer-review system and recognition of Indian scientists. With greater understanding of international character of science as well as globalisation, the chapter endeavours to assess ISCA's role in underlining the challenges faced for professionalisation of science in India.

4.2. Institutionalisation of Science

The scientific institutions during the eighteenth and early twentieth century, before the inception of ISCA included government science departments, a few science departments in colleges and universities and a handful of scientific research institutions (See Table 4.1). Most of these served utilitarian purpose for the British Government. In 1911, the foundation of the Indian Research Fund Association, aimed at encouraging experimental research in tropical diseases in India.[340] The universities, IACS and IISc aimed at cultivation and advancement of science in India. The IACS and universities have been discussed in the previous chapters. IISc, research institute in 1909 was established to encourage young Indians in the pursuit of science through post-graduate training in various pure and applied scientific disciplines.[341] It is pertinent to understand the extent to which it could achieve its objectives. Raman pointed that IISc and Forest Research Institute (FRI) could not produce scientific results, despite colossal amount spent on them (Ray, 1958, p.164). In IISc, Ray believed that princely-paid Europeans at the top positions couldn't conduce and guarantee its success. Meghnad Saha also observed

[340] Indian Medical Gazette, Calcutta: Thacker Press, 1934, pp. 691, 692.

[341] The departments initiated were General Chemistry, Organic Chemistry, Applied Chemistry and Electrical Technology (Indian Institute of Science Calendar, Bangalore, IISc, 1915).

that its locality, isolation, administration and wide gap in salaries paid to the Director and the research assistants restricted its aims (Ray, 1958, pp. 162,163). IISc enjoyed liberal pecuniary aid from the government as against many 'indigenous' efforts already underlined in chapter one.

Bhargava and Chakrabarti opine that there had been extensive insititutionalisation and growth of S&T since Independence (Bhargava and Chakrabarti, Hyderabad, 2003). However, the process gained momentum with the inception of ISCA. ISCA's members contributed immensely towards institutionalisation of science in India. It evolved as the forum for staging the issues facing insitutionalisation and professionalisation of science during the post-Independence era as well. Kasturirangan in his presidential address noted that India had one of the largest systems for S&T creative generation with atleast six major science departments, about 400 national R&D labs, 231 universities and nearly 1300 industrial in-house R&Ds.[342] It was believed that India was adorned with S&T institutions that was capable of carrying out intensive R&D.[343] The period of study saw the growth of scientific institutions in India, from a handful number in the first decade of 1900s to a large network of S&T institutions by the first decade of next century.

Table: 4.1. S&T Institutions before ISCA

Name of Institution	Year	Name of Institution	Year
Survey of India	1767	Universities of Calcutta, Bombay and Madras	1857
Geological Survey of India	1851	Indian Association for Cultivation of Science	1876
India Meteorology Department	1875	Indian Institute of Science	1909
Botanical Survey of India	1890		
Indian Veterinary Research Institute	1889		
Haffkine Institute	1896		
King Institute of Preventive Medicine	1899		
Agriculture Institute, Pusa	1903		
Central Research Institute	1905		
Forest Research Institute	1906		
Indian Research Fund Association	1911		

Source: Author's compilation

[342] Proceedings of the Ninetieth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 2003, pp.1-4.
[343] Proceedings of the Eighty Fifth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1998, pp. 2-5.

4.2.1. S&T in Universities

From the last quarter of nineteenth century, there were increased efforts towards scientific teaching and research in India. By 1880s, PG teaching and scientific research began in Presidency College, Calcutta. Ray persuaded the Government of Bengal for a new up-to-date chemistry laboratory in 1894 (Ray, 1958, pp. 90,91). The real beginning coincided with Ashutosh Mookherjee's efforts towards initiating PG teaching departments in both arts and sciences, which was realised with the foundation of University College of Science, few months after he presided over the first meeting of ISCA in 1914 (Ray, 1958, pp. 159-166). Initially it faced financial constraints. With no assistance from the state, donation from Taraknath Palit and Sir Rasbehari Ghosh led to institution of university chairs.[344] The college instituted eleven privately owned university chairs (Anderson, 2010, pp. 38). However, the College still faced problems of space and funds for extension of laboratories (Ray, 1958, p. 160,165). The favouritism in financial assistance was underlined by Ray[345] which got aggravated when education became a provincial subject in 1919.[346] In the post-Independence era, state became the largest funding agency for S&T research. ISC provided the forum for emphasisng an increased R&D expenditure on S&T, in the wake of liberalization of the economy that necessitated revitalisation of S&T institutions at par with global standard.[347]

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[344] P. C. Ray and C. V. Raman were the first Palit professors of Chemistry and Physics respectively. Rash Behari Ghosh's cash gift instituted four professorships in applied mathematics, physics, chemistry and botany. These positions were occupied by Ganesh Prasad, D. M. Bose, P. C. Mitter and S. P. Agarkar. Another gift from Rash Behari Ghosh and Khaira endowment led to the foundation of a Technology Faculty with four more chairs of Applied Physics, Applied Chemistry, Physical Chemistry and Wireless Telegraphy (Ray, 1958, pp. 160-165). The first batch of teachers at the University College included P. C. Ray, C. V. Raman and S. K. Mitra. The first batch of students of M.Sc. included S. N. Bose, Meghnad Saha, J. C. Ghosh, J. N. Mukerjee, etc. All of them played crucial role in advancing science in their respective fields Calcutta University. (1986), *Commemorative Volume-Hundred Years of Post-Graduate Teaching in Chemistry under Calcutta University, 1886-1986*, Calcutta: The Organizing Committee, Celebration of Hundred Years of Post-Graduate Teaching in Chemistry under Calcutta University.

[345] He cited the reason as being political bias as the government had a generous attitude towards Madras and Bombay Presidencies primarily because those institutions were staffed, managed and controlled entirely by the British. Another reason was University College of Science owed its origin to Indian initiatives which was against the policy of the government that everything good should follow from the pen of paternal bureaucracy (Ray, 1958, p.165).

[346] In 1926 during a speech at the Congress of Universities, he also put forth the difficulties faced by the College as a result of Montagu-Chemsford reform of 1919. He complained about the problem of approaching Government of India for funds and Government of Bengal's had restriction, as a result of provincialisation of universities (Ray, 1958, pp. 166-168).

[347] Proceedings of the Ninetieth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 2003, pp.1-4.

Most of the professors and research scholars at the University College were closely associated with the Science Congress (as members, sectional and general presidents, secretaries and members of executive committee). Also, they were involved with the foundation of numerous science departments, discipline-centric courses, specialised institutions and laboratories catering to different specialisms of science. ISCA's members were critical to the foundation and progress of science courses and departments in various universities. This is evident from the contributions made by its General and Sectional Presidents along with the executive committee, council and ordinary members of ISCA.

At Madras, A. G. Bourne strived for inclusion of biology in the curriculum.[348] N. R. Dhar founded the chemistry department at Allahabad University.[349] His students created several schools across India which enriched Indian chemistry.[350] The formation of strong research groups around Indian scientists in the universities continued until Independence. S. S. Bhatnagar created a strong research group on physico-chemical research at BHU. He also inaugurated a research school on colloidal and magneto chemistry for higher teaching and research in chemistry which increased admissions in applied chemistry (Bhatnagar, 1988, p. 5-7).[351] C. V. Raman founded the physics department at IISc (Pisharoty, 1982, p. 31). Birbal Sahni taught palaeobotany at the department of botany started in 1921 at Lucknow University. He worked hard for initiation of geology in 1943 and raised the departments as important centres of teaching and research (Gupta, 1978, pp. 22-24). After discovery of nuclear fission in 1939, Meghnad Saha included nuclear physics in M.Sc. syllabi for acquainting students with the latest developments (Chatterjee and Chatterjee, 1984, p. 55).

[348] The General president A. G. Bourne Biographical memoir. For details see, Indian Science Congress Association, *The Shaping of Indian Science: Indian Science Congress Association Presidential Addresses, Volume I: 1914-1947*, Hyderabad: University Press, 2003, pp. 44,45.
[349] Indian Chemical Society, *Acharya Nil Ratan Dhar: Short Life Sketch, Scientific Activities and List of Publications*, Calcutta: Indian Chemical Society, 1982.
[350] These included K. P. Chatterjee, Nrityanand Chatterjee, K. C. Sen, Prof. A. C. Chatterjee, Prof. Satyeswar Ghosh. Of many of his students Prof. B. K. Mukherjee, C. C. Palit, Aboni K. Bhattacharya, Akshay K. Bhattacharya, Dr. D. N. Chakrabarty, Prof. Gopala Rao, Dr. Atma Ram, Prof. W. Bhagawat, R. N. Mittre, R. C. Mehrotra, R. C. Kapoor, B. N. P. Ghildayal and Dr. Sirtaj Bahardur Sinha became famous in their respective fields and contributed largely. Atma Ram became Director General of CSIR, Prof R. C. Mehrotra and A. C. Chatterjee became VCs of Delhi and Gorakhpur Universities respectively (Indian Chemical Society, 1982, pp. v, vi.
[351] See Biographical Memoirs of the Fellows of the Royal Society, Vol 8, 1962, pp. 1-16 by T. R. Sheshadri (Deepak Kumar Collection).

The Indian Institute of Science, Bangalore also witnessed rapid growth in new branches of sciences like aeronautical engineering, internal combustion engineering, fermentation technology, high pressure technology, etc. under the leadership of J. C. Ghosh in 1939. Visvesvaraya at ISCA in 1923 emphasised for technical education with encouragement to mechanics, applied chemistry and commerce which were relegated low status in university curricula. The Mysore University (1916) was the first university which on its own without government's assistance. So, it faced difficulties and recognition wasn't forthcoming. The inclusion of sociology was also emphasised by the Committee of Science and its Social Relations in 1940s. The importance of technology canbe viewed in the growth of the IIITs from the 1950s. The engineering college with industrial engineering and applied chemistry and strongly voiced during its first convocation in 1918 (Rao, 1973, pp. 30-42).

The state of laboratories in university science departments in India was evident from observations made by various scientists. The shortage of funds limited the possibility of maintaining well-equipped laboratories at the University College.[352] In 1944, Hill pointed that science departments in Indian Universities were ill-equipped and understaffed (Hill, 1944). Indian scientists were handicapped with the lack of well-equipped laboratory facilities and followed research lines on those formulated by the west. Even in these discouraging conditions, scientists like C. V. Raman, S. N. Bose, Meghnad Saha contributed significant work (Shiva and Bandopadhyay, 1980, p. 579). ISCA's scientist members made efforts towards well-equipped laboratories with sophisticated scientific instruments. During Raman's Directorship at IACS, he made great efforts to transform its laboratory into the best place for scientific research (Pisharoty, 1982, p. 39). Most of the scientists were concerned about the state of laboratories and scientific apparatus in India. Only P. C. Ray insisted indigenous manufacture of chemicals through Bengal Chemical and Pharmaceuticals. Later in 1952, J. N. Mukherjee identified the lack of laboratory equipment, chemicals, and scientific apparatus along with workshop and library facilities as serious problems which got aggravated by War. He believed that indigenization of manufacture of scientific instruments, apparatus and

[352] P. C. Mitter and Ray made optimum use of the material available in the chemistry laboratory. Ray added that the departments of physical chemistry and physics lacked even basic apparatus, which was aggravated by the impossibility of importing apparatus from Europe due to the War. The two departments started un-equipped which handicapped the professors and lecturers to undertake investigations (Ray, 1958, pp.159, 160).

chemicals would reduce its cost and improve the general standard of research in India. He also suggested that few science libraries could serve as centres of information service.[353]

The period under study saw the proliferation of universities. The universities grew from twenty-five in 1947 to eighty in 1969 and almost doubled with 5723 affiliated colleges by 1989 (Krishna et. al., 1997, p. 251). This trend is evident in the participation at ISCA sessions. During ISCA's early history, most general presidents were science workers from government departments/services. But it saw a consistent increased participation from the universities and colleges. The growth of universities for obtaining trained S&T personnel was recommended by the Scientific Manpower Committee in 1947 (Krishna et. al., 1997, p. 251). By 1950s, scientists became critical of the precedence given to R&D laboratories over universities. Saha identified universities as basis for fundamental research. Bhatnagar proposed increased grants for universities as constant influx of qualified 'votaries' were required for instilling life into the national laboratories, which he identified as 'temples' (Chatterjee and Chatterjee, 1984, p. 78). During 1950s-1960s, the members of ISCA individually were voiced demands for greater funding and attention towards universities. These could have led to the inauguration of the Universities Grant Commission (1953) under the chairmanship of S. S. Bhatnagar (Krishna et. al. 1997, p. 251).

Raina and Habib noted the supersession of the university which was considered as 'age-old site' for knowledge by emergence of new institution with the coming of big science (Raina and Habib, 2004, p. 201)). by the emergence Later, ISCA evolved as the forum for voicing the infrastructural needs at universities for S&T in India. There was a curious absence of discussion on universities at ISC, until Kothari's address in 1963 identified them as largest contributor to fundamental science and strongly voiced for strengthening them. He recommended balanced allocation of resources between research institutions and

[353] J. N. Mukherjee's address at ISCA session in 1952. For details see Indian Science Congress Association, *The Shaping of Indian Science: Indian Science Congress Association Presidential Addresses, Volume I: 1914-1947*, Hyderabad: University Press, 2003, pp. 655, 656.

universities.[354] Also, it emphasised on 'revolution' in curriculum and climate for teaching and research in university for free scientific enquiry and greater collaboration.[355] After Kothari's address, ISCA emerged as a platform for reiterating the importance of universities and raising attention and funding towards them, both within the scientific community and political circles. The universities were seen as barometer of standard S&T which formed the backbone of S&T training and spearheaded of scientific progress.[356]

During 1960s-1970s, beside General Presidents' addresses which recognised the role of universities in S&T development, Prime Minister, Indira Gandhi inaugural addresses also that universities required special attention for fostering scientific approach. The universities formed the core for basic sciences, which was critical for technological advancement. Greater association and collaboration between universities and laboratories had to be evolved.[357] At the Sixtieth session, Gandhi added the need for getting universities and industries together.[358] The basic research undertaken at universities was also critical for quality of education. Thus, greater need for strong interconnections for mutual benefit is needed between universities, research institutes and industrial units.[359]

The ISCA also became a platform for proposing advancement of teaching in various disciplines of science and technology. A few General President's address and various sectional president addresses focused on teaching and research in numerous disciplines of S&T. From late 1980s, scientists at ISCA discussed mediocrity of Indian universities. It also dwelt on efforts for transforming them from merely examinations dominated and ensure inclusion of

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[354] D. S. Kothari's Presidential Address during ISC session in 1963 at Delhi. See Indian Science Congress Association, *The Shaping of Indian Science: Indian Science Congress Association Presidential Addresses, Volume II: 1948-1981*, Hyderabad: University Press, 2003, pp. 884.
[355] Ibid. pp. 880-883.
[356] The Presidential Address given by the First Woman Scientist, Prof. Asima Chatterjee 'Science and Technology in India in Indian Science Congress Association, *The Shaping of Indian Science: Indian Science Congress Association Presidential Addresses, Volume II: 1948-1981*, Hyderabad: University Press, 2003, p. 1030.
[357] Proceedings of the Fifty-Fifth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1968, p. 39.
[358] Proceedings of the Sixtieth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1973, p. 43.
[359] M.G.K. Menon's address 'Basic research as an Integral Component' in 1982 at Mysore in Indian Science Congress Association, *The Shaping of Indian Science: Indian Science Congress Association Presidential Addresses, Volume III: 1982-2003*, Hyderabad: University Press, 2003. pp. 1282,1283.

deprived sections, first-rate faculty, adequate physical infrastructure.[360] The decline in standard of research in universities also became a cause of concern for scientists at ISCA sessions. The weak infrastructure of Indian universities when compared with those abroad was also underlined. With the liberalization of economy in 1991, the need to increase the capability and vitality of the universities was also felt.

During ISCA session in 1998, Rao identified ISC as the opportune platform for flagging the issue and recommended strengthening research infrastructure at one selected university in every state and all central universities. It also pointed at efforts by DST like Regional Sophisticated Instrument Centre (RSICs) and Sophisticated Instruments Facilities (SIFs) to enable massive upgradation of infrastructure, computing and networking facilities.[361] An enhanced support and representation in the funding recommendation committee from the government and the industrialists, economists, social scientists along with scientists and technologists was emphasised. At its Ninetieth session in 2003, university meet was organised which brought educationists, academicians, policy planners together to deliberate and recommend on issues relating to relevance of university system. The panelists noted disproportionate tendency towards opting for engineering, medical and commerce courses. K. V. Venkatsubramanian, member of the Planning Commission, saw an ‘avalanche’ of courses in computer and business administration in universities and institutions in India and abroad. A marked decline in admission to science courses was seen to the extent that few panelists spoke about de-emphasing and removal of basic sciences from their curriculum.[362]

Thus, we see that ISCA lay central to the evolution of S&T departments across various universities in India. Numerous university chairs, science departments, laboratories came up during its early history. These developments got reflected in the growing participation ISCA enjoyed from the universities. However, in the post-Independence era, we see individual scientists associated with ISCA raising voice against the precedence given to national

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[360] R. P. Bambah presidential address during ISC at Ranchi in 1984 in Indian Science Congress Association, *The Shaping of Indian Science: Indian Science Congress Association Presidential Addresses, Volume III: 1982-2003*, Hyderabad: University Press, 2003, pp. 1369-1373.
[361] Proceedings of Eighty-Fifth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1998, pp. 9,10.
[362] Proceedings of Ninetieth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 2003, pp. 159,160.

laboratories over universities. This gave way to ISCA evolving as a platform for increased recognition of importance of universities for scientific research and training of students from 1960s both by the members of the scientific community and political leaders. The problems faced by universities and the ways it could be catered were also became subject of discussion and activity of ISCA. Increasingly with the liberalisation and globalisation of the Indian economy the quality of university education was discussed.

4.2.2. Specialised S&T Institutions and National Laboratories

The scientists actively involved with ISCA contributed towards establishment of various specialised S&T institutions and national laboratories. J. C. Bose founded Bose Institute (1917) through his own savings.[363] The discoveries made by Bose's research scholars were recognised by the Royal Society. Even then it struggled for grants from the Indian government. The provincial government viewed its research as abstract and limited in scope for immediate application and utilisation in industry and agriculture. It expressed difficulty in spending resources for advancement of science for claiming intellectual status for India or its remote possibilities of practical benefit to India or the world at large. It believed that Institute's claim for funds on these grounds fell within the arena of the central rather than provincial government. As a result, Bose Institute received grant from the central government on its academic standard.[364] The marine biological station was proposed for stimulating pure and applied zoology research through field visit of the students[365] and proposal for Central Institute of Applied Psychology was accepted.[366] In Post-Independence era, while national laboratories received huge grants from the government, Raman Research Institute (1948)

[363] The inscription on the Institute building dedicated the scientific organisation for 'bringing honour to India and happiness to the world' (Gupta, 1964, p. 98).

[364] Correspondence between Sir William Duke, KCSI, Under Secretary of State for India, India Office London and J. C. Bose, Director of the Bose Institute, Calcutta during December 1920 – February 1921. See Papers regarding Sir J. C. Bose and the Bose Research Institute, Calcutta, IOR/L/PJ/6/1306, File 1101, 30 October 1913-4 August 1931 (The British Library, London).

[365] It was proposed by the President of the section of zoology, R. B. Seymour Sewell as well as during the annual meeting of Lahore in 1925 by the president of section of zoology. See Proceedings of the Fourteenth Indian Science Congress, Calcutta: Asiaitc Society of Bengal, 1927.

[366] During the Thirty-Third session, P. C. Mahalanobis reported that on the recommendation of the section of psychology and educational science. See Proceedings of the Thirty-Third Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1946.

started independently. His institution evolved as an active center of research which saw outstanding publications from young scientists (Pisarothy, 1982, p. 39).

The Indian Industrial Commission (IIC) and experience of WWI acknowledged the need for industrialisation and increasing agriculture productivity.[367] The importance of basic and applied sciences in agriculture and other scientific fields which could help both agriculture and industry was reiterated at various ISCA meetings. Hence, N. R. Dhar's[368] Indian Institute of Soil Sciences (renamed after as Shiela Dhar Institue of Soil Sciences) came up. Since majority of Indian population depended on agriculture, Visvesvaraya in his address at ISCA in 1923 stressed for an agricultural institute. He then established agricultural schools and experimental farms in Mysore.[369] The Imperial Agricultural Research Institute was renamed as Indian Agricultural Research Institute after Independence which later played a critical role in institutionalizing agricultural research. But, J. N. Mukherjee in his presidential address strongly criticised the absence of agriculturalists among general presidents of ISCA.[370] The need for River Research Laboratory was proposed by Saha in his research articles in Science and Culture and during his presidential address at ISCA in 1934. The Bengal River Research Institute (1943) in Haringhata was found (Karmohapatra, 1997, pp. 84-85).

P. C. Mahalanobis'[371], Indian Statistical Institute (1931) provided high-level facilities for research training and execution of large-scale statistical work. Haldane joined ISI and viewed it as an institution of higher standing than the universities of Cambridge, Oxford and McGill in teaching and research (Clark). Institute of Textile Chemistry and Chemical Engineering was started in Bombay under the guidance of Dr. Forster.[372] Visvesvaraya was central to foundation of Sri Jayachamarajendra Occupational Institute in Bangalore in 1943. The main object was to train foreman type of men required for industries (Rao, 1973, pp. 30-42). After WWII, Meghnad Saha realised the importance of nuclear energy for catering needs of power

[367] Report of the Indian Industrial Commission 1916-18, Calcutta: Superintendent Government Printing, 1918.

[368] He was elected as ISCA's sectional President of the section of chemistry and later General president in 1961.
[369] Proceedings of the Tenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1923.
[370] Proceedings of the Thirty-Ninth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1952.
[371] P. C. Mahalanobis was born in 1893. He established the Indian Statistical Institute in 1931.
[372] He presided over the Twelfth session in 1925. See Proceedings of the Twelfth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1925.

in India. He stressed on a separate institute of nuclear research and Institute of Nuclear Physics in 1948 with central government's assistance, which was formally inaugurated in 1950 (Chatterjee, 1984, p.58). Bhabha founded the Tata Institute of Fundamental Research (1945) with financial assistance from the Tata Trust and the Government of Bombay.[373] He along with few other scientists also voiced demands CSIR on the lines of DSIR in Britain for the coordination between scientific and industrial research.

Prior to WWII, little or no attention was given to coordination between scientific and industrial research. IIC had provided lip-service to the cause of industrialisation in India. WWII revealed the unorganised state of scientific and industrial research in India. During 1930s various ISCA's General President and Sectional President addresses at ISCA stressed for the cooperation. Jawaharlal Nehru also reiterated the co-operation for industrialiation and catering to glaring problem facing the country. Barring a few, research programmes were not developed by industries. In 1937, the Tata Iron and Steel Company initiated research on steel and established a research laboratory at Jamshedpur which served as a nucleus for National Metallurgical Laboratory of the CSIR. A similar organisation named the Kala Bhavan played an important role in the development of Baroda as an industrial town in 1940s. The proposal for the foundation of the Fuel Research Institute in Dhanbad was voiced by D. N. Wadia at the annual session of the Indian Science Congress in 1943.[374]

As early as 1923, need was felt central organisation similar to the Department of Scientific and Industrial Research and National Research Council which came up in Great Britain and America respectively in 1916.[375] In 1933, Sir Richard Gregory, editor of *Nature* visited various scientific departments and universities in the main cities of India and drew attention of Sir Samuel Hoare, Secretary of State for India towards the lack of appropriate research organisations in India equivalent to those of the British DSIR for the development of natural

[373] Blackett in his speech said 'Homi Bhabha was unique in the diversity of his gifts, there were other great theoretical physicists, other great international statesmen of science, others who created fine basic research laboratories, still others who created huge institute for applied science, other gifted painter and devotee to all beautiful things. There were all these but, there was one who was there all Homi Bhabha and my life has been enriched by knowing him'. See PB/7/I//I/10/7, G-28, November 1948 (The British Library, London).
[374] Proceedings of the Thirty-Third Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1946.
[375] See Visvesvaraya's address in the Proceedings of the Tenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1923.

resources and new industries. Gregory's view strengthened the initiatives of C. V. Raman, Seymour Sewell and J. C. Ghosh who proposed for the creation of an Advisory Board of Scientific Research for India. There were repetitive appeals made by Indian scientific workers for the constitution of the body on the lines of DSIR. The urgent need was voiced by J. C. Ghosh[376] and later Visvesvaraya again in his address at Indian Institute of Science, Bangalore. As aresult, The Board of Scientific and Industrial Research was set up in 1940 for planned liaison between industry and science. Later, Mudaliar and S. S. Bhatnagar's efforts led to Council of Scientific and Industrial Research (CSIR) in 1942. S. S. Bhatnagar considered setting up of national laboratories and research institutes as a relevant step for India because major contribution of industrial production comes from small and medium scale industries but they cannot afford research on their own. As a result, these laboratories and institutes could undertake assessment of resources, conduct tests and evolve standards and advice the government as well as the industry. Therefore, a number of national laboratories came up in India during 1940s with the support of Nehru. All-India Medical Centre was proposed which could produce future leaders in public health and medicine through training of teachers and research workers (Hill, 1944, pp. 17,18). His proposal could be seen in the establishment of the All India Institute of Medical Sciences in 1956. Kumar saw in the last decades of colonial rule, flickers of 'constructive imperialism (Kumar, 2018, p.288).

From the 1940s, a total of fifteen national laboratories came up. The inauguration of National Chemical Laboratory (NCL) were arranged during ISCA session in Poona in 1950. During the First Five Year Plan, numerous laboratories across India under Bhatnagar laid foundation for self-reliance (Mukhopadhyay, 2014, p. 1984). The National Research Laboratory (1947) was founded by Vikram Sarabhai at his own residence. In 1952, building's foundation stone was kept by Raman in Bhatnagar and Bhabha's presence and was formally inaugurated by Nehru in 1954 (Shah, 2007, p.73). The post-Independence era was marked by 'big sciences' namely atomic, defence and space research. The scientists associated with the foundation of Bhabha Atomic Research Centre (1952), Defence Research and Development Organisation (1958) and Indian Space Research Organisation (1969) were members of the council of the ISC also served as its general and sectional presidents like H. J. Bhabha, D. S. Kothari and Vikram A.

[376] J. C. Ghosh's presidential address during the Lahore session of the Indian Science Congress 1939. See Proceedings of the Twenty-Sixth Indian Science Congress, Calcutta: Indian Science Congress Association, 1939.

Sarabhai. Sarabhai’s plan for the space programme received skepticism. His co-director at PRL, Ramanathan had said that he was young and unaware about the functionalities of the government and also added that the established scientists would not let it happen. However, the hurdle was crossed by recognition of the field of space research for peaceful uses under the jurisdiction of DAE which set up a committee for Space research in 1962 under chairmanship of Sarabhai (Shah, 2007, p.122). The space programme saw a modest budget and low profile in contrast with the atomic energy programme (Shah, 2007, p. 155). The period was seen as the dawn of the era of big science (Chatterjee, 1984, p. 59). These scientists played an instrumental role in charting the road-map of R&D in S&T (Mukhopadhyay, 2014, p. 1984).

Raman was disappointed with huge financial grants towards imitating and following scientific research undertaken by the west with expensive imported equipments. He was against big science which was exemplified by atomic power, rocket exploration after WWII. Raman believed that 99.99 dollars out of every 100 dollars used for developing atomic energy, would be used for war and only 0.01 dollars for peace (Pisharothy, 1982, p. 82). Indian and foreign administrators with their advisor scientists viewed application of big science critical for economic betterment of the country. This difference in opinion with those in power, distanced Raman from the scientific activities of the National Laboratories. Science for him was an attempt to understand nature and free from its practical utility and relevance (Pisarothy, 1982, p. 40). In 1950 during inauguration of the NCL Raman pointed that utility was not the main incentive for scientific work. This dissension may be the reason that although Raman figured in the members of the council as ordinary or honorary members of ISCA, his presence after ISC’s session in 1950 in Poona is not known. Shiva and Bandopadhyaya also hinted towards tendency among Indian scientists who chose research fields undertaken in western countries, since most of the journals came from the west (Shiva and Bandopadhyay, 1980, p. 577).

ISCA emerged as a forum for discussing the issue of ‘culture’ in scientific institutions. The Saha criticised slow and secretive work-style of the Atomic Energy Commission (Chatterjee, 1984, p. 76). Haldane resignation from ISI and CSIR was due to stupidities of officialdom, large organisation and deadening effects of bureaucracy in Indian scientific institutions, rather than low salaries and lack of equipments. He called CSIR as ‘Council for Suppression of

Independent Research'. He believed that these conditions forced scientists to migrate to foreign countries and his resignation could help catch public attention (Clark, pp. 156-160). These clearly demonstrate the 'culture' in scientific institutions as well as Indian scientists. Ashis Nandy observed that Vikram Sarabhai was insecure about working with people 'brighter than himself' (Shah, 2007, p. 68). Kumar saw the emergence of a 'scientocracy' and also underlined that centralization and consolidation of power in most scientific organisations hallmarked the post-Independence era (Kumar, 2000, p. 3893) The importance of human resource primarily skilleded S&T workforce was constantly reiterated at ISCA sessions. At the same time maintaining high standard of teaching and research in universities through restructuring of text books, laboratory and library facilities was considered of prime importance.[377] Therefore, the problem of 'Brain Drain' also caught considerable attention during ISCA sessions. S. Z. Qasim in his address in 1993 recognised the steps taken by the government to absorb large number of scientists in the country. But he did underline that there were numerous trained scientists and engineers who were unemployed.[378] In the following year, the General President observed the lack of infrastructural facilities and problems with 'science culture' in scientific establishments in India as an important reason for brain drain.[379]

ISCA members were directly involved with foundation of few specialised science institutions and national laboratories. Most of the institutions came up in those scientific fields that could help solve general problems facing the country. It provided a conducive atmosphere for institutionalisation of science and showcased the problems faced of 'science culture' in various institutions. The problem of sidelining of universities with the growth of national laboratories has already been discussed in the previous section. Although great importance was given to the applied sciences during its sessions, basic science research was considered equally important. The funding of these S&T organisation and expenditure on R&D had been a regular discussion at ISC sessions especially from the 1990s when these institutions had to face global competitiveness.

[377] J. N. Mukherjee's presidential address. See Proceedings of the Thirty-Nineth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1952.
[378] Proceedings of the Eightieth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1993.
[379] Proceedings of the Eighty-First Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1994.

4.3. Professionalisation of Science

The activities of scientific societies lay at the core of the development of science in most countries. These provide common meeting ground for personal intercourse where new ideas or facts could be expressed, debated and criticised enabling professionalisation of science. ISCA played an instrumental role in organisation of scientific societies, academies of science. Until Independence seventeen scientific societies and professional associations representing various disciplines of science came up (Krishna, Gaillard and Waast, 1997). Sen also gave an an account of general scientific societies and academies during this period (Sen, 2017, pp. 197-219). The section will analyse ISCA's role in professionalisation of science through organisation and evolution of various professional scientific bodies, specialization and advancement within various S&T disciplines, growth of scientific journals and communication channels for specialists, efforts towards knowledge production along with peer review, rewards and recognitions.

4.3.1. Scientific Societies

Prior to ISC, there were a handful of scientific societies which have been adequately discussed in the second chapter of the thesis. It was noted that by 1938, there were 'fair' number of specialist and general societies.[380] ISCA emerged as the sole platform which provided scope for intercourse between scientists of specific sciences and of varied fields. During its early history, its sectional meetings was central to organisation of numerous S&T fields which is evident in the organisation and growth of specialist scientific societies (Krishna, 1997, pp. 243, 244). Barring a few societies that existed prior to ISCA, numerous societies blossomed after ISCA's inception. Though not an exhaustive list, atleast thirty-two scientific societies including specialist and general societies came up until India's Independence. M. Visvesvaraya's address during Science Congress' Lucknow session in 1923 referred to a tendency of formation of more and more societies and associations for furthering special interests or emphasizing local interests.[381] Table 5.1. shows the scientific societies. ISCA

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[380] Archives of the British Association for the Advancement of Science available at the Bodleian Library, Oxford. 'Indian Science Congress Association, 1914-1937' says 'Courtesy *Science Culture*' (date not mentioned).
[381] Proceedings of Tenth Indian Science Congress, Calcutta: Indian Science Congress Association, 1923.

provided an umbrella institution for the growth of numerous scientific societies. Number of these societies were proposed during ISCA sessions and its members were closely associated with the foundation of many of them. Certainly, ISCA provided conducive eco-system and stimulated the proliferation of specialist scientific societies.

Table 4.2. Learned Scientific Societies, Academies of Science, Professional associations during 1914-1947

S. No.	Name of the institution	Year of foundation
1.	Indian Botanical Society	1920
2.	Institution of Engineers, India	1920
3.	South Indian Science Association	1920
4.	Anthropological Club	1921
5.	Indian Psycho-analytical Society	1922
6.	Indian Chemical Society	1924
7.	Geological, Mining and Metallurgical Society of India	1924
8.	Indian Psychological Association	1925
9.	Institution of Chemists	1927/1928
10.	Indian Ceramic Society	1928
11.	Academy of Sciences of the United of Agra and Oudh, Allahabad	1930
12.	Society of Biological Chemists, Bangalore	1931
13.	Calcutta Geographical Society	1933
	Association of Economic Biologists, Coimbatore	1933
14.	Indian Physical Society	1934
15.	Physiological Society of India	1934
16.	Indian Society of Soil Science	1934
17.	Indian Academy of Sciences, Bangalore	1934
18.	Indian Psychological Society	1935
19.	National Institute of Sciences of India	1935
20.	Indian Science News Association	1935
21.	Indian Society of Pathology and Microbiology	1938
22.	Association of Microbiologists of India	1938
23.	Entomological Society of India	1938
24.	Indian Pharmaceutical Association	1939
25.	Indian Statistical Conference	1939
26.	Zoological Society of India	1939
27.	Indian Ecological Society	-
28.	Indian Society of Genetics and Plant Breeding	1941
29.	Indian Psychiatric Society	1946
30.	Maharashtra Association for Cultivation of Science	1946
31.	All India Nutrition Board	-
32.	Association of Scientific Workers of India	1947

Source: Proceedings of Indian Science Congress Association (1914-1947)

ISCA was directly involved in the foundation of many of these societies. Most of the societies were inaugurated during ISCA sessions. The resolution for Indian Botanical Society was passed by the Section of Botany during ISCA's Nagpur session in 1920.[382] The initiative of the participants of the Twelfth session of ISCA, held in Benares led to the foundation of Indian Psychological Association in 1925 (Chatterjea, 1968, pp. 77-78). At the silver jubilee session of ISCA in 1938, Indian Society of Pathology and Microbiology was formally inaugurated. Sir U. N. Brahmachari was an elected member of the provisional executive committee.[383] The inaugural meeting of the Zoological Society of India was held during ISCA's twenty-sixth annual meeting held at Bombay on January 7, 1939.[384] In 1940, the opening session of the Indian Statistical Conference was held during the ISCA session.[385] The Indian Society of Genetics and Plant Breeding was inaugurated at Banaras during ISCA session in 1941.[386] During the Thirty-Third session, a meeting was convened by Major R. B. Davis and Indian Psychiatric Society was founded.[387]

The Indian Chemical Society, national forum for chemists was founded in 1924. It was modelled on the lines of the London Chemical Society and was conceived by J. N. Mukerjee, J. C. Ghosh and S. S. Bhatnagar. According to Bhatnagar, initiation of an All India Chemical Society under the presidentship of P. C. Ray on the model of the Chemical Society of London was private discussed between them in the University Chemical Laboratories in London in 1919 (Ray, 1956, pp. 151, 152). P. C. Ray, General President of ISCA in 1920 was the founder President of the Chemical Society in 1924. J. L. Simonsen, founders of ISCA was its Vice President. Apart from the leadership, office bearers, council members, the three scientists who conceived the idea of the Chemical Society were closely associated with ISCA and became Sectional Presidents, General President in future sessions of ISCA including J. C. Ghosh, S. S.

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[382] In order to carry out the resolution, a committee was formed under the chairmanship of Dr. Winfild Dudgeon of the Ewing Christian College, Allahabad. The committee members included Rai Bahadur K. Rangachariar (Agricultural College, Coimbatore), Professor Birbal Sahni (Banaras Hindu University, Varanasi), Professor Shiv Ram Kashyap (Government College, Lahore), Dr. P. Bruhi (University College of Science, Calcutta) and Dr. W. Burns (Agriculture College, Poona). The committee sent out a letter in October 1920, to the botanists. Proceedings of the Eighth Indian Science Congress, Calcutta: Asiatic Society of Bengal,1921.

[383] Proceedings of the Twenty-Fifth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1938.

[384] Proceedings of the Twenty-Sixth Indian Science Congress, Calcutta: Indian Science Congress Association, 1939.

[385] Proceedings of the Twenty-Seventh Indian Science Congress, Calcutta: Indian Science Congress Association, 1940.

[386] Proceedings of the Twenty-Eighth Indian Science Congress, Calcutta: Indian Science Congress Association, 1941.

[387] Proceedings of the Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948.

Bhatnagar, J. N. Mukherjee and N. R. Dhar to name a few. The Indian Physical Society is a professional body of physicists and its objectives were similar to that of the Royal Society of London. Meghnad Saha, presided over the annual session of ISCA in 1924 and emphasised on the need for consolidating the scientific workforce and advised the government on issues of betterment science as well as social life of the nation.[388] He was central to the formation of the Indian Physical Society in the same year along with other scientists like D. M. Bose and C. V. Raman. It aimed at strengthening both teaching and research in all branches of physics. During the same session, a joint meeting of various sections was held which considered the advisability of starting the national section of the International Society of Soil Science.[389] The Governor of Punjab during the Twenty-Sixth session, reported that the output of written work in chemistry and physics at Punjab University had increased since 1927.[390]

Numerous scientists associated with the institutions mentioned in the table above, were closely associated with ISCA as well. Most of these scientific societies had their own journals and proceedings which were a great indicator of scientific productivity. ISCA certainly provided a conducive eco-system and acted as the umbrella institution for growth of these scientific societies. Most of the scientific institutions mentioned in the table above used to hold their annual meetings or general body meetings simultaneously with the ISCA sessions. From the time of its inception, numerous scientific learned societies, discipline-centric associations came up unlike the period before its foundation which saw limited number of such institutions catering to very few scientific disciplines. With growth of numerous S&T fields and its increased specialisation and sub-specialisation, we see proliferation of scientific societies in the post-Independence era as well.

4.3.2. Academies of Science

With the growth of specialist societies and other S&T institutions, the demands for organisation of scientific research and for cooperation and consolidation of scientific work in

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[388] Proceedings of the Eleventh Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1924.
[389] Proceedings of the Twenty-First Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1934.
[390]Proceedings of the Twenty-Sixth Indian Science Congress, Calcutta: Indian Science Congress Association,1939.

India grew. By the 1930s, these demands led to the foundation of three Science Academies in India unlike, one in most countries across the world. ISCA played a critical part in their foundation. The proposals for United Provinces Academy of Science (later names as National Academy of Science), Allahabad and National Institute of Sciences of India (later renamed as Indian National Science Academy) (INSA), New Delhi were presented during ISCA sessions. While C. V. Raman inaugurated the Academy of Science in Bangalore.

During ISCA's annual session in Allahabad in 1930, scientists from the United Provinces met, where Saha proposed an Academy of Science for coordination of scientific activities undertaken by the scientists. Saha felt the need for organising the scattered scientific workforce force to consolidate them and give them a voice in matters of development. As a result, the United Provinces Academy of Science was constituted in 1930. He played a leading role in drafting objectives, rules and regulations modelled on ASB. The object of the Academy was not limited to scholarly exchange of ideas but also application of S&T in solving problems facing India. It recognised their role in finding solution to socio-economic problems faced by the country. The membership of the Academy increased and also extended the geographical limits of the United Provinces. Thus, United Provinces Academy of Science was renamed as National Academy of Sciences in 1934.

Unsatisfied with the regional character of the Academy, Saha began his efforts towards the foundation of an all-India Science Academy. During his presidential address at ISCA in 1934, he proposed an Indian Academy of Science.[391] He acknowledged that lack of organisation of the efforts and work undertaken by various scientific societies could play a role towards better future prospects of India. Dr. Agrahar in the Modern Review recognised the need for close cooperation between the workers in scientific services of the government and university professors in other countries, which was absent in India. Thus, it was realised that better organisation of scientific workforce could help impress their needs upon the government, states and public bodies for encouragement of scientific research and for utilising S&T for

[391] Proceedings of the Twenty-First Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1934.

economic and industrial progress of the country. The best way was organisation of scientific men into a body like the National Institute of Sciences of India.[392]

The resolution presented at the annual session of ISCA at Patna in 1933, by Fermor contained views of scientists about its composition and function. The attendees of the annual session of ISCA in 1934 were provided full history of the movement as well as the proposal for its foundation. One of the duties of the Academy included organisation of various sciences into scientific societies. It was proposed that Academy would take care of all branches of science until they were organised into specific scientific societies. The Royal Society of London and Prussian Academy of Germany were identified as its prototypes. The Academy would hold the apex of the pyramid of scientific societies in India. Its' membership was to be limited was to be considered a mark of distinction and honour.

The objectives, organisation and structure of INSA were also discussed by the General President of ISCA in 1934 where Saha asked for support for Indian Academy of Science on the lines of the Royal Society. The proposal was unanimously accepted by ISCA's committee. It was decided that at the next session of ISCA a detailed report including the objectives of the national academy, its draft constitution, names of 125 foundation fellows selected by the special committee of specialists and provisional committee of academy consisting of 25 scientists as members would be submitted. The report was presented by L. L. Fermor before a special meeting of the joint committee and the recommendations were accepted unanimously. As a result, the National Institute of Sciences of India was established as an all-India body of scientists[393][394]. Thus, ISCA played a leading role in the foundation of the Academy which was established on the January 7th, 1935 at a meeting at Calcutta University under the chairmanship of J. H. Hutton, who also presided over the annual session of ISCA. The Governor of Bengal, Sir John Anderson addressed the inaugural session and L.L. Fermor was

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[392] Indian Science Congress Association (2003), *The Shaping of Indian Science: Indian Science Congress Association Presidential Addresses, Volume I: 1914-1947,* Hyderabad: University Press.

[393] Ibid.

[394] National Institute of Sciences of India, *Proceeding of the National Institute of Sciences of India.* Calcutta: National Institute of Sciences of India, 1935.

the founder president of the Academy.[395] Very similar to ISCA's case, it functioned with its headquarters at the Asiatic Society of Bengal till 1951 after which it shifted to Delhi.

Raman founded the Indian Academy of Sciences in 1934 (Pisharothy, 1982, p. 35) needs to be seen within the larger picture of his strife and dissension with Saha. His critics believed that Raman pre-empted the foundation of INSA by founding the Indian Academy of Science. Raman's biographer noted that Raman was critical of INSA and believed that Indian science could not prosper under the tutelage of an Academy which had fifteen British members in a council. He added that only two three of the thirty members were fit as Fellows (Ramaseshan, 1988, p. 19). The annual meetings of the Academy of Science Bangalore were held in the University as Raman wanted young scholars to be aware of the work done in research centres. He invited the most distinguished scientists of the country, gave the presidential address and popular lectures in the evenings. The Fellows of the Academy called these annual meetings as 'Raman Circus' (Pisharothy, 1982, pp. 36,37).

D. N. Wadia in his presidential address in 1943 discussed the proposal for institution of a National Academy of Social Sciences for India put forth by the Committee of the Science and its Social Relations before the executive committee of ISCA. The proposed academy along with ISCA and other insitutions existing in the country could take up long-range problems of the social well-being of the people of India. The Association of Scientific Workers of India was founded at ISCA annual meeting held in 1947. It was inaugurated under its auspices by Jawaharlal Nehru who was the General President of the session held in Delhi. A provisional committee was set up to draft a constitution for this body which would be placed for finalisation during Patna science congress.[396] Thus, ISCA lay at the core of the proposal and foundation of Science Academies in India.

4.3.3. Proliferation of scientific fields and Knowledge Production

During the nineteenth century, Europeans laid the foundation of field sciences like trigonometrical surveying, geodesy, geology, meteorology, zoology, botany, anthropology,

[395] Ibid.

[396] Proceedings of the Thirty-Fifth Indian Science Congress Association, Calcutta: Indian Science Congress Association, 1948.

etc.[397] These sciences were primarily concerned with the geographical and intellectual knowledge required for consolidation of the empire. The scientific knowledge met the dual mandate of the ‘colonial explorer-cum-scientist’ (Kumar, 1995, pp. 32-47). IACS was a victory of quest for scientific truth over practical science, which ended the debate between science and technical education. The sciences included General Physics, Chemistry, Astronomy, Systematic Botany, Systematic Zoology, Physiology and Geology (IACS, 1976, pp. 5-23). The scientific activity in the physics and chemistry departments of the Calcutta University gained greater momentum with the appointment of J. C. Bose and P. C. Ray in 1880s. By the second decade of twentieth century, research in chemistry undertook rapid and gigantic strides and specialisation in chemistry grew with inorganic, organic and physical chemistry (Ray, 1958, p.138). Geology education started when the GSI allowed one of its officers to function as a part-time lecturer in the Presidency College in Calcutta in 1892.[398] By the early part of twentieth century, education of geology was restricted to universities of Madras and Calcutta. In 1907, Wadia joined as a lecturer of geology at the Prince of Wales College, Jammu. He noted that he faced great difficulty in teaching because of absence of modern book on the subject (Stubblefield, p. 545).

During 1801-1900 papers published by ‘native’ Bengalis included disciplines like agriculture, biological sciences, earth sciences, mathematics, medical science, physical science and technology. During this period, maximum number of papers were published in medical sciences, followed by physical sciences, earth sciences and mathematics respectively (Roy and Sen, 2010, pp. 1850-1857). The aim of the Indian Institute of Science was to promote advanced studies and original research in both pure and applied sciences inorder to cater to the needs of the Indian society. The classes in General Chemistry, Applied Chemistry, Organic Chemistry and Electro-Technics began in 1911 (IISc, 1915, p. 15). Thus, it is evident that the scientific fields at the time of inception ISCA were limited to few sciences.

[397] Indian Association for Cultivation of Science, *A Century*, Calcutta: Indian Association for Cultivation of Science 1976, p.2.
[398] Thomas Holland who was a junior officer at the Geological Survey of India was also a lecturer of geology at Presidency College in 1894 (Ray, 1958, p. 91).

4.3.3.1. S&T fields in ISCA's session

ISCA's progress during the hundred years saw proliferation in S&T fields evident in the growth of its sections. Initially the deliberation of ISC were largely organised into sections which represented deliberations represented different branches of science, where science workers presented their papers or individual research or participated in various discussions and symposia of their or mutual interest. These sections represented numerous scientific fields which can also be viewed within the larger socio-economic context of India which will be discussed in the following sections in detail.

At the first meeting of ISCA in 1914, following six disciplines were included[399]: (i) Chemistry, (ii) Physics, (iii) Zoology, (iv) Geology, (v) Botany, (vi) Ethnography.

During the next session of ISCA in 1915 at Madras, the subject of agriculture science and applied botany were seen in a new section.[400] However, Botany and Agriculture became distinct sections in the following year.[401] The sectional committees got instituted in 1917. In the same year, Mathematics became a section.[402] The Medical and Veterinary Research were clubbed into a single section, during the Bombay session of the ISC in 1919.[403] During the ninth ISC at Madras, the subject of Anthropology was included as a section in 1922.[404] Three years later, in 1925 Psychology got represented at the Benaras Congress.[405] By the Fifteenth ISC session, Physics which had ceased to exist after entry during the first session, was clubbed with section of Mathematics.[406] While, Physiology came up as an independent section, Geography was added to the existing section of Geology during the Twenty-Third Session of the Indian Science Congress in 1936.[407] The silver jubilee session of the Science Congress had

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399 Meetings of the Indian Science Congress, See Education General, Part B, Nos. 32A, September 1914 (National Archives of India, New Delhi).
400 Proceedings of the Second Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1915.
401 Proceedings of the Third Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1916.
402 Proceedings of the Fourth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1917.
403 Proceedings of the Fifth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1919.
404 Proceedings of the Sixth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1922.
405 Proceedings of the Seventh Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1925.
406 Proceedings of the Fifteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1933.
407 Proceedings of the Twenty-Third Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1936.

thirteen sections.[408] The subjects that were seen in the sections of the Congress held at Calcutta in 1938 were as follows:

(i) Mathematics and Physics, (ii) Chemistry, (iii) Geology, (iv) Geography and Geodesy, (v) Botany, (vi) Zoology, (vii) Entomology, (viii) Anthropology, (ix) Agriculture, (x) Medical Research, (xi) Veterinary Research, (xii) Physiology, (xiii) Psychology

During the Twenty-Eighth session, Medical and Veterinary research again came back together as one section. The subject of Engineering and Statistics was included among the sections of the Congress. While, Physics became an independent section in 1941. During the same session Education Science was added to the existing section of Psychology.[409] Similarly, during its Thirtieth session in 1943 at Calcutta, Statistics was clubbed with the section of Mathematics. However, Geodesy disappeared and Geology and Geography together came as an independent section during the same session.[410] At the Thirty-First Session of the Science Congress in Delhi, we see the addition of Archaeology, Statistics and Metallurgy to the existing sections of Anthropology, Mathematics and Engineering respectively in 1944.[411] Mathematics and Statistics again became distinct sections during 1947 session.[412]

There was no break seen in the structure of the deliberations of the Congress after Independence. Most of the subjects which formed ISC's sections were similar. Thirteen sections were seen during the Thirty-Fifth session of the Congress, held in 1948 at Patna.[413] These include:

(i) Mathematics, (ii) Statistics, (iii) Physics, (iv) Chemistry, (v) Geology and Geography, (vi) Botany, (vii) Zoology and Entomology, (viii) Anthropology and Archaeology, (ix) Medical

[408] Proceedings of the Twenty-Fifth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1938.
[409] Proceedings of the Twenty-Eighth Indian Science Congress, Calcutta: Indian Science Congress Association, 1941.
[410] Proceedings of the Thirtieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1943.
[411] Proceedings of the Thirty-First Indian Science Congress, Calcutta: Indian Science Congress Association, 1944.
[412] Proceedings of the Thirty-Fourth Indian Science Congress, Calcutta: Indian Science Congress Association, 1947.
[413] Proceedings of the Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948.

and Veterinary Sciences (x) Agriculture, (xi) Physiology, (xii) Psychology and Educational Science, (xiii) Engineering and Metallurgy

These sections remained the same largely until 1991 except few. The subject of fisheries was added to the existing section of Zoology and Entomology, during the Sixty-Third Indian Science Congress at Waltair in 1976.[414] While, metallurgy was dropped from the Engineering Sciences during the next session.[415] While, the section of Geology and Geography got transformed into Earth System Sciences. We see three new sections which led to a total number of sixteen sections representing number of subjects during the Seventy-Eighth Indian Science Congress at Indore.[416] The sections are as follows:

(i) Mathematics, (ii) Statistics, (iii) Physics, (iv) Chemistry, (v) Biochemistry, Biophysics and Molecular Biology, (vi) Material Sciences, (vii) Earth System Sciences, (viii) Botany, (ix) Zoology, Entomology and Fisheries, (x) Anthropology and Archaeology, (xi) Medical and Veterinary Sciences, (xii) Agricultural Sciences, (xiii) Physiology, (xiv) Psychology and Educational Science, (xv) Engineering Sciences, (xiv) Computer Sciences

During the early years of the twenty-first century, mostly 2002 many of these sections got restructured with few additions most of them continue till date. The Forestry Sciences was clubbed with the Agricultural Sciences. However, Plant Sciences and Environmental Sciences came up as independent sections in 2002 and 2003 respectively. However, Botany ceased to exist from 2002.[417] During the 100th session of the Congress which was held at Kolkata in 2013, a total of fourteen sections representing various branches of science could be seen.[418] These sections are as follows: (i) Agricultural and Forestry Sciences, (ii) Animal, Veterinary

[414] Proceedings of the Sixty-Third Indian Science Congress, Calcutta: Indian Science Congress Association, 1976.

[415] Proceedings of the Sixty-Fourth Indian Science Congress, Calcutta: Indian Science Congress Association, 1977.

[416] Proceedings of the Seventy-Eighth Indian Science Congress, Calcutta: Indian Science Congress Association, 1991.

[417] Proceedings of the Eighty-Ninth Annual Session of the Indian Science Congress, Part III, Abstracts, Calcutta: Indian Science Congress Association, 2002. Also, see Proceedings of the Ninetieth Annual Session of the Indian Science Congress, Part III, Abstracts, Calcutta: Indian Science Congress Association, 2003.

[418] Proceedings of the Hundredth Annual Session of the Indian Science Congress, Part III, Abstracts, Calcutta: Indian Science Congress Association, 2013.

and Fishery Sciences Statistics, (iii) Anthropological and Behavioural Sciences (including Archaeology, Psychology, Educational and Military Sciences), (iv) Chemical Sciences, (v) Earth System Sciences, (vi) Engineering Sciences, (vii) Environmental Sciences, (viii) Information and Communication Science and Technology (including Computer Sciences), (ix) Material Sciences, (x) Mathematical Sciences (including Statistics) (xi) Medical Sciences (including Physiology), (xii) New Biology (including Biochemistry, Biophysics, Biotechnology and Molecular Biology), (xiii) Physical Sciences, (xiv) Plant Sciences

The growth in sections of the Congress clearly represent proliferation of scientific fields during ISCA sessions. From the time of Independence, the number of sections at ISC have remained constant at thirteen or fourteen. However, we see addition of new scientific fields from 1991, with the representation of Biosciences, Computer Sciences, Biotechnology, Environmental Sciences, Material Sciences, etc. Although, 'applied' scientific fields occupied greater importance especially in the post-Independence for their ability to cater to the general needs of the country. ISC has continuously professed importance of 'basic' sciences.

4.3.3.2. Sub-sections in ISCA's sections

Through the sections at ISCA we see the growth of a number of scientific fields. Also, within scientific fields we see greater sub-specialisation which was clearly visible in the proliferation in the number of sub-sections. The formation of a tree-like model is a crucial indicator of professionalisation of science. Thus, growth of number of sciences along with development of its numerous sub-branches attests to professionalisation of science. There were no sub-sections until the sixteenth session of the Congress.[419] The sub-sections emerged in the sections of Agriculture, Medical and Veterinary Research and Botany during the Seventeenth ISC held in 1930 at Allahabad. The Agriculture section had nine sub-sections while Botany and Medical and Veterinary Research had six and seven sections respectively.[420]

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[419] Proceedings of the Sixteenth Indian Science Congress, Third Circuit, Calcutta: Asiatic Society of Bengal, 1929.

[420] Proceedings of the Seventeenth Indian Science Congress, Third Circuit, Calcutta: Asiatic Society of Bengal, 1930, pp. vii-xxx.

Ten sub-section appeared under the section of Geology and Geography during the Nineteenth Congress in 1932.[421] However, the earlier sub-section under Medical and Veterinary Research were absent. But, it appeared again during the Twentieth session in 1933.[422] The four and eight sub-sections emerged in Chemistry and Anthropology during ISC in 1936 at Indore.[423] In the following year at the Twenty-Fourth Session we see five sub-sections under Mathematics and Physics section of which Statistics was one. While Chemistry had four and Psychology had nine, Education Science being one of it.[424] By the silver jubilee session of the Congress, nine sections of the thirteen had sub-sections.[425] In 1939 sub-sections emerged in the sections of Mathematics, Physiology, Biology and Psychology as well.[426] Physics and Entomology had sub-sections in the following year.[427] The sub-sections emerged under the section of Engineering and statistics in 1941[428] and 1946[429] respectively. During the Thirty-First session, nine sub-sections emerged under section of Physics, Chemistry, Geology and Geography, Zoology and Entomology and Psychology and Educational Science saw five sub-sections each, Physiology had three sub-sections. Thus, we see of the twelve sections, nine have sub-sections. However, it was absent in the sections of Mathematics and Statistics, Anthropology and Archaeology and Engineering and Metallurgy.[430] The sub-sections emerged under the section statistics in 1946.[431]

[421] Proceedings of the Nineteenth Indian Science Congress, Third Circuit, Calcutta: Asiatic Society of Bengal,1932, pp. vii-xxxvii.
[422] Proceedings of the Twentieth Indian Science Congress, Third Circuit, Calcutta: Asiatic Society of Bengal,1933, pp. vii-xxxix.
[423] Proceedings of the Twenty-Third Indian Science Congress, Third Circuit, Calcutta: Asiatic Society of Bengal, 1936, pp. vii-xxxiv.
[424] Proceedings of the Twenty-Fourth Indian Science Congress, Third Circuit, Calcutta: Asiatic Society of Bengal,1937, pp. vii-xxxix.
[425] Proceedings of the Twenty-Fifth Indian Science Congress, Part III, Abstracts, Calcutta: Asiatic Society of Bengal,1938, pp. vii-xlviii.
[426] Proceedings of the Twenty-Sixth Indian Science Congress, Part III, Abstracts, Calcutta: Indian Science Congress Association,1939, pp. vii-xlix.
[427] Proceedings of the Twenty-Seventh Indian Science Congress, Part III, Abstracts, Calcutta: Indian Science Congress Association,1940, pp. vii-xlix.
[428] Proceedings of the Twenty-Eighth Indian Science Congress, Part III, Abstracts, Calcutta: Indian Science Congress Association,1941, pp. vii-xxxviii.
[429] Proceedings of the Thirty-Third Indian Science Congress, Part III, Abstracts, Calcutta: Indian Science Congress Association, 1946.
[430] Proceedings of the Thirty-First Indian Science Congress, Part III, Abstracts, Calcutta: Indian Science Congress Association, 1943, pp. 1-190.
[431] Proceedings of the Thirty-Third Indian Science Congress, Part III, Abstracts, Calcutta: Indian Science Congress Association, 1946, pp. 1-15.

By, the turn of the century, the section of agriculture and forestry sciences had thirteen sub-sections. While the animal, veterinary and fisheries sciences had four sub-sections. The section of anthropology and behavioural sciences included sub-sections of psychology and education as well. There were six, seven, eleven sub-sections within the section of chemical, earth system, medical sciences, physical sciences. However, there were no sections in environmental, material, information and communication, new biology and mathematical sciences.[432] There is a decline in the number of sub-sections within scientific fields. This could be a result of lesser number of papers presented during ISC sessions after the focal theme was inaugurated, when compared with the humongous number presented earlier under each section. Simonsen as early as in 1930s, had suggested restricting the number of individual papers and emphasised greater scope for a platform like ISC for discussions, joint meetings, etc. There are a number of plenary sessions organised around various aspects of the focal theme. From the time of its inception, there is a marked proliferation in scientific fields. It became the sole forum where all scientific disciplines co-existed not just through the sections but also through the election of General Presidents who belonged to varied branches of science.

4.3.3.3. Charting the Emerging S&T Fields

During the thirty-third session of ISC, there were thirteen sectional committees which constituted scientific workers from across the country. However, it was recognised that the activities of these sectional committees remained restricted to brief meetings during annual sessions and election of office bearers. It was highlighted that the sectional committee could work towards a general policy and plan of action towards growth of respective branches of sciences.[433] In the post-Independence era, representation of these sciences continued. However, there was a growth in atomic, defence and space research as show earlier which could be seen as a move towards self-sufficiency and an attempt to ‘catch-up’ with the western countries. It largely focused on self-reliance and strengthening of the technoligcal base of the

[432] Proceedings of the Ninetieth Indian Science Congress, Part III, Abstracts, Calcutta: Indian Science Congress Association, 2003.
[433] Proceedings of Thirty-Third Indian Science Congress, Calcutta: Indian Science Congress Association, 1946.

country. Although admist of the 'new sciences' started emerging by the 1960s-1970s, they evolved as separate sections of the Congress not before 1990.

By the 1950s P. C. Mahalanobis was involved with computer research and its installation. He aimed to make India self-sufficient in the information processing technology. He had ambition to manufacture computing machine indigenously. Beyond ISI, some computational work was carried out by in TIFR, IISc, some IITs and Defense Laboratories. Mahalanobis had foreseen that these had great importance in statistics as well as other sciences. His faith national self-sufficiency and capacity of Indians to catch up with the advanced world in all fields was enormous. A joint computer project was started by Jadavpur University and ISI in 1961. They built the first solid-state computer in India in 1965. The other attept was made at TIFR which built the first-generation computer named TIFRAC but, it did not function effectively. But, these efforts had to be aborted as the First ISI Review Committee (1967) reported that designing and fabricating machines was beyond the legitimate activity of ISI (Majumder, 1993, pp. 97-101; Rudra, 1996, pp. 276-281). Although importance of computer science and research was increasingly felt, it was not until 1990 that the Science Congress included is as one of its section.[434] Until then, its representation remained restricted to a few discussions and lectures on computer sciences.[435] By 2003, the section got restructured into Information and Communication Science and Technology (including computer sciences).[436] The importance and progress of Information technology for knowledge societies was increasingly discussed and software industry was identified as the fastest growing sector of Indian economy by ISCA presidents after the 1990s.[437]

One of the reasons cited by Haldane for emigration to India was the opportunities that biological investigations had in India (Clark, p.134). Sunder Lal Hora in his presidential address at the Science Congress in 1954 discussed that very early ISC's history, W. B. Bannerman in 1917 had indicated the importance of biological sciences. Hora noted absence

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[434] Annual Report 1989-1990, Calcutta: Indian Science Congress Association, 1991, p. 13.

[435] Proceedings of Sixty-Seventh Indian Science Congress, Calcutta: Indian Science Congress Association, 1980, p. 33.

[436] Proceedings of Ninetieth annual session of the Indian Science Congress Association, Calcutta: Indian Science Congress Association, Part III, Abstracts, 2003.

[437] Presidential addresses of S. S. Kathiyar and K. Kasturirangan in 2002 and 2003. See Proceedings of Eighty-Ninth annual session of the Indian Science Congress Association, Calcutta: Indian Science Congress Association, Part II, Presidential Addresses, 2002. Also, see Proceedings of Ninetieth annual session of the Indian Science Congress Association, Calcutta: Indian Science Congress Association, Part II, Presidential Addresses, 2003.

of biological sciences section as well as election of very few biologists and those from related fields, as ISCA' presidents. According to him, there was an unjustifiable neglect of biological sciences which was essential for exploitation of biological resources, critical for development and industrial advance.[438] The section of New Biology was created in 1990. From 1996, we see a growth and recognition in the importance of use of biotechnology, nanotechnology, advanced materials, biomedical research. There were discussions during ISCA on increasing IPR issues and various challenges faced with the growth of biosciences.[439] It was during the same session material sciences evolved into a separate section of the Congress. The environmental issues continued to occupy a prominent place during ISCA sessions. However, it did not evolve as a separate section until 2006.

4.3.3.4. Basic Sciences and Applied Sciences

ISCA since its inception recognised the distinction between the pure and applied sciences. Also, it strongly propagated the importance of both pure and applied sciences. Although the experience of the World Wars, indicated importance of applied sciences for self-reliance and utilisation of sciences for solving problems facing the country. ISCA's general and sectional presidents on numerous occasions emphasised on co-existence of both pure and applied science and restrained from greater emphasis on the utilitarian aspect of the latter over the former. A. G. Bourne underlined that sustained efforts should be made to see that both basic and applied sciences are undertaken in proper proportion and the importance of pure science is not submerged by the utilitarian wave.[440] P. C. Ray also reiterated importance of pure science and added that pure sciences lay at the core of its application. He believed that full attention had to be given to cultivation of pure science but equal attention was required for applied science in order to develop both intellectual and industrial resources of the country. He also underlined that during the academic year 1918-1919, there were seventeen, twenty-four and

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[438] Indian Science Congress Association, *The Shaping of Indian Science: Indian Science Congress Association Presidential Addresses, Volume I0: 1947-1981*, Hyderabad: University Press, 2003, p. 703.

[439] Proceedings of Eighty-Fourth annual session of Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1997, 1999, 2002, 2003.

[440] The General President's address. See Proceedings of the Third Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1917.

twenty-one original contributions from departments of Applied Mathematics, Physics and Chemistry respectively.[441]

The sectional presidents' addresses were seen on similar lines. The president of chemistry section, F. L. Usher hinted at the importance of pure chemistry for plethora of industrial problems.[442] As a result, sub-section of industrial chemistry came up at ISCA sessions. During the same session, president of the zoology and ethnography section emphasized on the practical importance of zoology in the post-war period.[443] The *Engineering* reported that the period during the late thirties until the end of war, saw development of a number of engineering projects like Mettur Dam and Lloyd Barrage. It added that these developments showcased the importance of employing modern engineering resources. It also noted that although the facilities of technical education had been moderate but, it had led to the growing body of qualified engineers and scientists.[444] Mahalanobis distinguished the objectives of the pure and applied sciences and identified engineering and statistics as an essential applied science which primarily solved a practical problem.[445] However, Mukherjee in his address discussed blurring of distinction between fundamental and applied research.[446]

The increasing importance given to technology can be viewed in the foundation of IITs during 1950s. However, the Science Policy Resolution emphasised on centrality of basic sciences and aimed at developing basic infrastructure for development of scientific research gave way to the Technology Policy Statement in 1983 which noted the importance of technology for national growth. Numerous presidents and sectional presidents of ISCA have underlined the importance of basic sciences. The sections of ISCA and the papers read also indicate a fair assemblage of basic and applied sciences. Srivastava in his address in 1994 emphasised on academic research as the seed for application of science. He viewed quality basic science research was critical in India. But, he noted that basic sciences evident from publications fell

[441] Proceedings of the Seventh Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1920.
[442] Proceedings of the Fourteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1927.
[443] Proceedings of the Sixth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1919, pp. cxxxiii-cxxxvii.
[444] Engineering, Vol. 159, no. 4138, Dated May 4, 1945, p. 351, 3646/2788/43/02 (The British Library, London).
[445] Proceedings of the Thirty-Seventh Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1950.
[446] Proceedings of the Thirty-Ninth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1952.

far behind developed nations.[447] A. L. Mudaliar address ‘Tribute to Basic Sciences’ underlined that efforts had to be made to see that progress of basic sciences is not impeded and that balance is maintained between the pure and applied sciences.[448]The centrality of basic sciences even in emerging sciences, was put forth by Dr. Manju Sharma in her address on ‘New Biosciences’.[449] During sectional meetings, future scope and line of researches in various fields and sub-fields, both in pure and applied sciences for scientific advancement as well as catering to the practical needs of the country was discussed.

4.3.3.5. Social Sciences

The importance of social sciences was also voiced during ISC sessions. The initiation of the section of anthropology and psychology during its early years attests to the need for understanding human behavior, especially after WWI. J. P. Mills, president of an anthropology section stressed the need for cooperation of anthropologists with other scientists and social scientists including historians, archaeologists, geologists, mythologists, philologists, educationalists, psychologists, etc. It was considered essential for understanding man’s social environment which had drastically changed in the post-war era as well as gauging the impact of government policies on the people. Meghnad Saha during his presidential address in 1934 had envisioned the foundation of an Academy of Social Sciences. He believed that the world had adequate resources for the entire population. Thus, the rivalry had to give way to a cooperative rational production with judicious and equitable distribution. He added that an international board of trained industrialists, economists and eugenists need to take up the duties of the politicians. He underlined the importance of social sciences like economics and insisted on the foundation of the Academy of Sciences which could act as a model for the evolution of an organisation of the men of letters and those representing social sciences. He also suggested that during the following year, all conferences representing oriental,

[447] Proceedings of the Eighty-First Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1994.
[448] Proceedings of the Forty-Sixth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1959.
[449] Proceedings of Eighty-Sixth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1999.

philosophical, economic including the annual science congress could be held at a central place to discuss the proposal.

This was taken forward by the sub-committee of Science and its Social Relations which recognised the importance of the study of social sciences. It surveyed the status of sociological studies in Indian universities. Dr. Ashok Jain, Convenor of the Committee on Science and Society noted that it had urged the British government to introduce social sciences in the curriculum of Indian universities. The committee proposed an Academy of social sciences as a body of high academic standing and professional knowledge, which could take up long-range problems of the social well-being of the people. It was expected to collaborate with ISC and other institutions on socio-medical and political subjects, human relations, anthropology, political science, vital statistics, social biology, population problems, sociological research, etc. The proposal was supported by Vice-Chancellors of numerous Indian universities and a progress report of inclusion of sociology as a subject was also presented. The executive committee of ISCA appointed a committee of experts to suggests ways and means of appointment of the Academy. The chief function was to find avenues through which contributions of science could be adapted to the life of an individual along with the nation without any anti-social application of scientific knowledge. It also meant to endeavor a greater integrated approach to every problem through the application of basic social sciences.

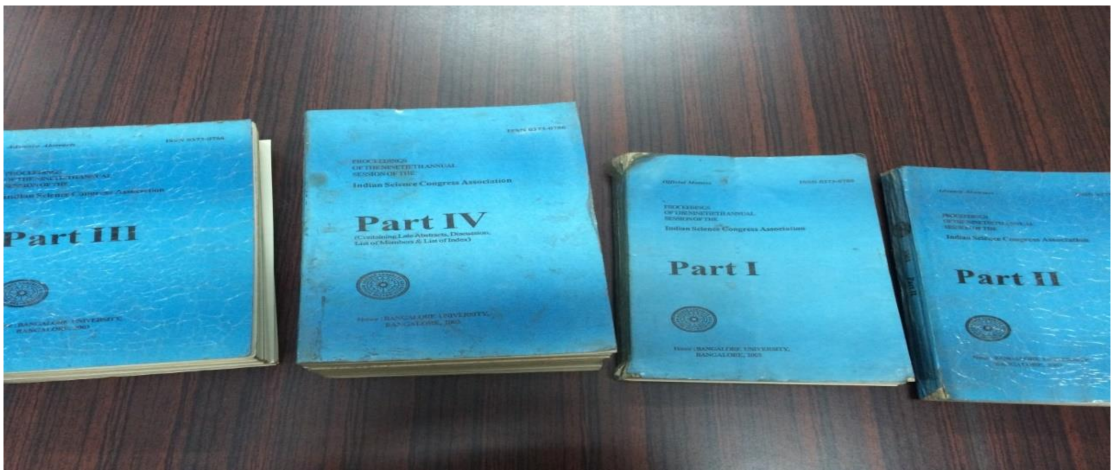
Despite recognition of the importance of social sciences during ISCA's early history. Social sciences largely remained outside the purview of its sections except for sciences like psychology, educational science, anthropology, and archaeology. The former two and latter two were clubbed into separate sections, which continued until the Eighty-Ninth Indian Science Congress session in 2002. During ISCA's session in 2003, the sections were restructured as a section on Anthropological and Behavioural Sciences which included sciences like Archaeology, Psychology, Educational and Military sciences.

4.3.3.6. Knowledge Production

ISCA increasingly became a platform for showcasing research undertaken by its members. Its members contributed immensely towards knowledge production across varied fields. According to Patra and Muchie, the publication history in India during 1807-1858 was sporadic with only 99 publications. This could be attributed to the nature of the scientific community and lack of institutional foundation. They analysed subject-wise publication in various disciplines of science before Independence and concluded that across twenty-four disciplines and sub-disciplines representing different sciences and social sciences, the maximum number of papers were published in chemistry (2118) followed by medical sciences (1173) and agricultural and biological sciences (1124). The publications increased from 123 in 1929 to 377 in 1936 which was attributed to the consolidation of an institutional process during the 1930s. Until Independence 6008 scientific articles were authored by 3443 authors. According to their study, the highest number of papers were contributed by T. R. Seshadri followed by N. R. Dhar and C. V. Raman (Patra and Muchie, 2017, pp. 127-130). Most of the contributors including these three scientists were associated with ISCA. Patra and Muchie's study also tried to assess the individual and institutional collaborations. 1948 articles were collaborated between individuals out of a total of 6008 articles. It underlined that there were very few collaborations between Indian and British scientists (Patra and Muchie, 2017, pp. 128-132). The steady growth in the number of scientific periodicals during 1914-1947, certainly hint at the volume of knowledge production in various S&T fields (Sen, 2005, pp. 60, 61, 90).

There is a similar rise in the papers presented during ISC sessions annually and the consistent increase in the volume of its proceedings also hint significantly at the growth in scientific activities and scientific productivity of the scientific workers in India. The proceedings of the First session of ISCA consists of six pages including Ashutosh Mookherjee's address. The volume of its proceedings has ever since increased. They were issued in four parts. The first part comprised of the official matters and the financial statement of the Association. The second part of the Proceedings comprised of the presidential addresses of the General President and sectional Presidents of the session. The Third part contained the abstracts of the papers presented during the session while the fourth part had the late abstracts under various sections, discussions, symposia, and list of members. From the 1990s the volume of part III of the Proceedings has increased to the extent that in recent years the proceedings of each sectional meeting are printed in a separate volume.

Figure 4.1. Four volumes of the Proceedings of the Ninetieth Indian Science Congress Association



Source: Picture taken at the ISCA Head office at Kolkata.

Figure 4.2. Volume of the Proceedings during 1970s-1980s (left) and 1990s (right)

Source: Picture taken at the ISCA Head office at Kolkata.

The papers read during the sectional meetings of the Congress saw a steady growth. This is evident from the table below. About 2000 papers were presented at the Congress in 1973.[450] However, concerns were raised by numerous scientists regarding the number of papers presented and the quality of the abstracts.

Table 4.3. Total number of papers presented during ISCA sessions, 1914-1941

S. No.	Year of the annual meeting of ISCA	Place	Number of papers presented
1.	1916	Lucknow	65
2.	1917	Bangalore	74
3.	1920	Nagpur	100
4.	1926	Bombay	436
5.	1927	Lahore	481
6.	1930	Allahabad	727
7.	1931	Nagpur	697
8.	1933	Bombay	703
9.	1935	Calcutta	776
10.	1938	Calcutta	800
11.	1941	Benaras	775

Source: Proceedings of Indian Science Congress Association, 1914-1941.

Fermor in his presidential address at ISCA's session in 1933 pointed that with the marked increase in papers, only a fraction of a paper could be read and discussed. He added that the flood of research papers attested to increase in research activities.[451] With the growth of a number of societies and academies, it was believed numerous platforms had evolved where papers could be read and discussed. Atleast 221 papers were listed under the chemistry section during the Twenty-Fourth session of ISC which hardly provided scope for discussion. It was noted that although the volume of scientific production is much greater in the United Kingdom, British Association selected only twenty-one papers to be read and discussed. The abstracts occupied a small part of its proceedings, while 70-80 percent of ISC proceedings were occupied by them. The importance of reading papers was not minimised but, it was believed that efforts had to be made for the promotion of scientific discussion which was

[450] Proceedings of the Fifty-Ninth Session of the Indian Science Congress, Calcutta: Indian Science Congress Association, 1973.
[451] Proceedings of the Twentieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1933.

viewed as the real function of the Congress.[452] Only a proportion of papers submitted to the Science Congress were read and those papers taken up for reading hardly aroused discussions following the presentation.[453]

The time allocated for reading of large number of papers under each section during ISCA's early years, was later utilised by greater number of symposia and discussions around the focal theme from 1980s. Krishnan opined that important changes were required in the work programme of the Congress. He believed that acceptance of miscellaneous papers had to be ceased so that symposia could be arranged on topics of special interest. The cost of printing of the Proceedings was reduced, if only summaries of symposia and few important papers were published.[454] Though a marked quantitative progress in number of papers is visible, quality of the abstract could only be assessed by people who were competent. Bhagvantan opined that there was a progress in the quality but it was not so evident. The growth of the Congress was seen by many as a self-defeating load and doubted the organizational structure.[455] The deliberations and discussions among scientists both Indian and those from abroad during ISC encouraged new lines of research. During ISC's session in 1938, discussions about recent investigations made on 'tracks of inonising particles in photographic emulsion' by Taylor and Bothe resulted in D. M. Bose and Dr. Bibha Chaudhuri taking up research in the field.[456]

The president of the medical and veterinary research, Lt. Col. R. Knowles during its seventeenth session recognised ISC as essentially the most important stimulus to scientific research in India.[457] ISCA played a substantial role in coordinating and stimulating useful scientific activity and brought a spirit of healthy criticism and has a great scope for the future. It also recognised ISCA's role in bringing both official and unofficial scientific workers in

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[452] Printed material (1 box) 1938, "printed material relating to the meeting of the Indian Science Congress Association" (Bodleian Library, Oxford).
[453] Dr. M. S. Krishnan's in the Proceedings of the Forty-Third Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1956.
[454] Ibid.
[455] Proceedings of the Fifty-Ninth session of the Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1973.
[456] Proceedings of the Twenty-Fifth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1938.
[457] Proceedings of the Seventeenth Indian Science Congress, Calcutta: Indian Science Congress Association, 1929.

various branches of natural science together and enabling exchange of views.[458] ISCA's sectional meetings provided a snap-shot of the research undertaken in respective disciplines and also indicated new areas of research that required emphasis. The members of ISCA contributed immensely towards knowledge production and advancement of sciences which increasingly became recognised world-wide. A letter addressed to Sir Howard Kennard contained extract of scientific activities undertaken in various scientific disciplines by Indians. It recognised all important discoveries undertaken by Indians in different sciences. A special volume of the Cambridge University Press contained original papers of Indian mathematician Srinivasa Ramanujan.[459]

P. C. Ray was the fore-runner of original chemical research in India. He discovered mercurous nitrite in 1894. After which he wrote two volumes of 'History of Hindu Chemistry'. His papers appeared in the Journal of the Chemical Society of London. He contributed 123 papers in during 1896-1916 to various societies (Ray, 1958, p.150). His colleague at Presidency College, J. C. Bose's paper 'Polarisation of Electric Ray by a Crystal' in 1895, was a pioneer. His papers appeared in rapid succession mostly in Proceedings of the Royal Society of London (Ray, 1958, p. 123). During 1894-1897, he published around ten papers on electro-magnetic waves. On the physics of physico-physiology, he published twenty-two paper during 1898-1902. Followed by forty-six scientific papers related to life of plants until 1916. All these scientific papers were published in both national and international journals (Gupta, 1964, pp. 111-116).

A number of Bose's and Ray's students[460] at Presidency College who were also associated with the Science Congress contributed immensely towards original research in their respective fields. At the Congress of Universities of the Empire in 1926, he cited examples of the Hindu intellect and also stressed that within a span of a decade of its foundation even with the lack of

[458] Letter from H. J. Seymour, Esq. to Sir Howard Kennard, dated 3rd December, 1930 (The British Library, London).
[459] Letter from H. J. Seymour, Esq. to Sir Howard Kennard, dated 3rd December, 1930 (The British Library, London).
[460] Rashiklal Datta published several papers from 1910. J. N. Rakhshit has forty papers to his credit. According to S. S. Bhatnagar, Dhar was credited for systematic research in physical chemistry. He published about 140 papers from 1912. Their works were reffered by workers of same field in chemical journals of America, England and Germany Bhatnagar also added that the credit for initiation of research in colloidal chemistry was undertaken by J. N. Mukherjee (Ray, 1956, pp. 137-151).

institutional facilities the colleagues at the University College of Science like Raman, D. M. Bose, P. N. Ghosh, S. K. Mitra, B. B. Ray, Dr. Ganesh Prasad, S. K. Bannerjee, N. R. Sen and Dr. B. B. Dutt had made a mark in their respective fields (Ray, 1958, pp. 166-168). Between 1888-1970, Raman published about 400 original scientific papers (Pisharoty, 1982, pp. 91, 92). Meghnad Saha had eighty-eight scientific papers to his credit along with about 31 articles on various aspects of astronomy, astrophysics and spectroscopy (Chatterjee and Chatterjee, 1984, pp. 111-118). In 1926, his research papers were referred to or quoted atleast 225 times by other astrophysicists in an year (Salwi, 2002, p. 36). In the introduction of his book on theoretical astrophysics Roseland wrote that Saha's work and his ideas formed the core for subsequent work in the field (Karmohapatro, 1997, p.1). During 1920-1945, S. S. Bhatnagar along with his collaborators had published a total of 169 papers in national and international journals and taken out 26 patents in India and United States (Bhatnagar, 1988, pp. 23-30). Apart from these, S. N. Bose, S. K. Mitra, P. C. Mahalanobis who were closely associated with ISCA have significantly contributed towards advancement of knowledge in their respective fields.

The post-Independence era saw strides in scientific advancement and discoveries in various scientific fields and ISCA became a crucial forum for display of these S&T engagements. There was a significant increase in numerous universities, institutes of technology, agricultural universities and national laboratories covering spectrum of science, engineering, technology and medicine. There is a significant infrastructure for S&T in the country. Indian scientists are well-recognised and regarded on an international plane.[461] The achievements in milk production, self-reliance in nuclear energy, ability to launch remote sensing and communication satellites, capacities in biotechnology, modern base for biodiversity preservation, generated capabilities to deal with environmental issues and carrying out contemporary research on climate change, meteorology and oceanography, medical research significantly increased which reduced the total and remarkable achievements were made in anti-TB, new cholera vaccines and malaria control, disease burden, advanced material for nuclear, space, defence , aeronautics, IT emerging as fasting growing industries[462]. From 1990

[461] Indian Science Congress Association, *The Shaping of Indian Science: Indian Science Congress Association Presidential Addresses, Volume III: 1982-2003*, Hyderabad: University Press, 2003, p. 1982.
[462] Ibid, p. 2033.

‘innovation in S&T’ began to be talked about by scientists during ISCA sessions. Yashpal devoted a part of his address to self-reliance, non-alignment and innovation in S&T. He explained the what innovation in S&T meant.[463] Mashelkar believed that knowledge held less value without innovation. Therefore, he strongly voiced for an ‘innovation centred India’ during his address in 2000. The human resource remained central to all aims and achievements of S&T. As discussed above, liberalization of economy necessitated global competitiveness and excellence and concerns about the education were raised. Although, system of higher education in S&T led to formation of significant base. There was a need for change in institutional structure of R&D and S&T institutions to gain HR base.[464]

Although, Nehru during his ISCA inaugural sessions had reiterated on the quality of science was important along with its quantity. We see greater emphasis on quality of S&T education and research with globalization and internationalisation of science. Bhargava and Chakrabarti indicated a low quality-to-quantity ratio in science in India and also believed that vast majority of papers did not significantly add to the existing knowledge (Bhargava and Chakrabarti, 2003, pp. 102-103). P. N. Srivastava in his presidential address viewed that analyses of the publications by Indian scientists in international journals indicated that they have contributed to every branch of science though to a limited extent. According to him, India occupied the eighth rank in the citation index. He also added that although individual excellence existed, collectively it was not critical to make a mark on global standards, which is also true about science-based technology. Although India’s is recognised internationally for its capabilities in atomic energy, remote sensing, missile technology and space and computer science, it isn’t evident in international patent. According to him, overall performance and excellence of post-Independence science was less significant internationally than before. Besides this, he strongly voiced for creating conditions for greater accountability among scientists.[465]

[463] Proceedings of Seventy-Seventh annual session of the Indian Science Congress, Part II, Presidential Address, Calcutta: Indian Science Congress Association, 1990.
[464] Proceedings of Eighty-Eighth annual session of the Indian Science Congress, Part II, Presidential Address, Calcutta: Indian Science Congress Association, 2003.
[465] Proceedings of the Eighty First annual session of Indian Science Congress Association, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1994.

4.3.4. Launch of journals and communication channel for specialists

Scientific journals are an important indicator of scientific productivity. A well-accredited journal was a scientific necessity and was seen as a great impetus to research.[466] Prior to the twentieth century, scientific journals were practically non-existent and most of the researches done in India were published in journals abroad.[467] A handful of Indian journals existed where 'natives' of Bengal published their papers.[468] But, Indian scientific journals were considered irregular and inferior in their quality of research by the scientific community abroad. The discovery of mercurous nitrite by P. C. Ray was published in the Journal of the Asiatic Society of Bengal (JASB), the discovery was praised across the world (Ray, 1958, pp. 91,92). JASB's reputation was evident from the review of Ray's discovery which noted that copy of JASB scarcely had place British chemical libraries. But, Ray's work was worthy of note (Natesan, 1918, pp. 14). By the last quarter of the nineteenth century, scientific papers by Indians were published in journals abroad.[469]

With a couple of exceptions, there was total absence of periodicals published in India which commanded wide circulation and influence comparable to those of Europe and America.[470] The Bulletin of the Calcutta Mathematical Society, was listed among the recent works on mathematics in Nature on February 29, 1912. The most striking part of Nature's report was the emphasis it held on the need for publication of the summary of current mathematical literature, with abstracts of principal papers which was practised by the Calcutta Society's Bulletin. It published summary of principal mathematical journals, reviews, lists of papers under

[466] Visvesvaraya in his presidential address at ISC in 1923. See Proceedings of the Tenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1923.

[467] Krishna, V. V. (1997). "The Scientific Community in India", Jacques Gaillard, V.V. Krishna and Roland Waast (eds.), *Scientific Communities in the Developing World*, New Delhi: Sage Publications.

[468] These included Transactions of the Medical and the Physical Society of India, Journal and the Proceedings of the Asiatic Society of Bengal, Transactions of the Agricultural and Horticultural Society of India, The Indian Annals of Medical Science, Indian Medical Gazette, Records and Memoirs of the Geological Survey of India (Roy, Sen, 2010, pp. 1850-1856).

[469] According to Roy and Sen's study, the first paper was published by Gopaul Chunder Roy in 1874 in the Glasgow Medical Journal. P. N. Bose's papers were published in the Geological Magazine and Quarterly Journal of the Geological Society of London in 1880. During 1880-1888, Ashutosh Mukherjee's papers were published in Messenger of Mathematics, Quarterly Journal of Mathematics, Nature. P. C. Ray papers were published in the Proceedings of the Edinburgh Chemical and Royal Society, Journal and Proceedings of the Chemical Society of London. J. C. Bose's papers were published in numerous journals abroad until 1900 (Roy, Sen, 2010, pp. 1850-1856).

[470] Proceedings of Tenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1923.

‘Societies and Academies’, ‘Notes and News’, ‘New Publication’. Nature doubted the continuity of the Bulletin, while emphasising on the delayed publication of the Bulletin of 1909. It also doubted if Calcutta mathematicians could undertake the heavy task and also stressed for a chronicle unique to Europeans, so that that the European mathematicians do not have to send requests to Calcutta for the lists of papers they themselves had written which would be humiliating for the Europeans.[471] P. Lukis in his address at the Third All India Sanitary Conference emphasised on the foundation of the Indian Journal of Medical Research. He added that there was no reason of shame regarding its content and style. Although the publication was successful, he added that the literary works contributed to the journal shouldn't cease that would lead to a similar demise like Paludism. He wished to increase the publication of the journal to more than four times in a year.[472] Raman ran several journals and before his death opined that the Academy journals shouldnt die as they reflect the quality of science undertaken in the country (Ramaseshan, 1988, p. 19).

This certainly attests to limited number of scientific journals in India. According to Sen, during 1901-1913, there were thirty-three periodicals which included journals, reports, proceedings, etc. (Sen, 2005, p. 90). As a result of which most of the scientists in the late nineteenth and early twentieth century published their scientific research in foreign journals and they faced numerous problems, which will be discussed in the next paragraph. There was an increase in the number of scientific publications from the second decade until India’s Independence. It was also highlighted that the number of scientific periodicals increased in the 1930s with the foundation of numerous institutions (Patra and Muchie, 2017, p. 127). Sen opined that during 1914-1938, 458 were started. Although, he underlined that a decline during 1914-1918 as a result of the impact of the war after which a steady growth is seen. While, 1939-1947 about 184 journals came up (Sen, 2005, pp. 60, 61, 90).

At the same time, another problem that the scientific community in India faced was the undue delay and misappropriation of their publication at the hands of the foreign scientific journals. The growth in number of research papers resulted in delay in their publication. Meghnad Saha noted that J. C. Bose submitted his note 'On the electric response of inorganic substances' to

[471] Nature, 1912, pp. 580, 583.
[472] Proceedings of the Third All India Sanitary Conference, 1913, pp. 1,2.

the Royal Society in 1901. The paper was communicated to the Society by Sir Martin Forster and was read on 6th June. As a result of opposition from Sir John Burdon Sanderson who was a leading electro-physicist, the paper was not published until a detailed paper was published by the Journal of the Linnean Society in 1902. Later, Bose submitted a series of papers on similarities of electric and mechanical responses of plants and animals in 1904. The papers saw a similar fate and Saha added they now figured in the archives of the Society[473][474]. Saha's paper was accepted by the American Astrophysical Journal, it wasnot published because he couldn't pay the cost. The idea of the paper was wrongly credited to an American astrophysicist (Salwi, 2002, p. 22).

According to Raman's biographer one of the aims of the Academy was to start a scientific journal that would enable him and his students to publish their work reducing the dependence and delay caused by the foreign journals. Although he was aware of the limited circulation and lower visibility among foreign scientists, of the Indian journals. Therefore, he decided to get three hundred reprints of the paper and distribute them among scientists across various laboratories around the world (Pisharothy, 1982, p. 35). He was the President of the Academy and personally looked after the publication of its proceedings. He acted as a referee for most of the papers (Pisharothy, 1982, p. 36). Raman viewed that scientific finding should be promptly published as a result he started the Indian Journal of Physics in Calcutta and the Proceedings of the Academy of Sciences when he moved to Bangalore (Jayaraman, 2017, p.32). The letter from H. G. Seymour, Esq to Sir Howard Kennard higlighted that the Indian Journal of Physics had an international circulation by 1929. It also noted the steady increase in publication and frequency of the Indian Journal of Chemistry[475]. These also included periodicals, proceedings of various societies and academies of science. There were a number of journals and proceedings of the scientific societies, associations and academies of science which came up during this period. These included the journal of the Indian Chemical Society, Indian

[473] Meghnad Saha, Sir Jagadish Chunder Bose, 1856-1937, Obituaries Notices, Records of the Royal Society. (The Royal Society, London).

[474] Bose's papers were published by scientific societies with undue delay and some of his researches were also misappropriated by some scientist as their own. As a result, he wrote the results with great pain and published two books, Plant response (1906) and Comaparative Electro-Physiology (1907) as early as possible (Gupta, 1964, p. 54).

[475] Letter from H. J. Seymour, Esq. to Sir Howard Kennard, dated 3rd December, 1930 (The British Library, London).

Botanical Society, India Psychological Association, etc. The proceedings of the Indian Science Congress contained abstracts on the scientific works pertaining to different scientific fields. Alongside, proceedings ISCA had a number of other publications. It published a series which dealt with twenty-five years' progresses in scientific disciplines during its silver jubilee years.

During the period of study with the foundation of numerous scientific societies and academies of science which has been adequately discussed in the previous sections, their journals also came up which were largely discipline-centric. Visvesvaraya in his presidential address in 1923 opined that a successful journal could be initiated with an organised effort and cooperation of the scientific community and financial support. He added that all the good work produced in India needed to appear in a single publication. He went on to add that the journal of the Indian Science Congress could become a common ground for study and development of all scientific disciplines and could become a valuable scientific review in India.[476] The Indian scientific workers increasingly began demanding a journal similar to 'Nature' in Britain. As a result of which the journal, *Current Science* came up and ISCA played a critical role in its inception. The scientists associated with ISCA were critical in the foundation of the Indian Science News Association and publication of the journal, *Science and Culture*.

[476] Proceedings of the Tenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1923.

Table: 4.4. Scientific Journals (1914-1947)

S. No.	Name of the Journal	Name of the institution to which journal is affiliated	Year of inception
1.	Journal of Indian Botanical Society	Indian Botanical Society	1922
2.	Journal of Institution of Engineers, India	Institution of Engineers, India	1922
3.	Journal of Indian Chemical Society	Indian Chemical Society	1924
4.	Indian Journal of Psychology	Indian Psychological Association	1926
5.	Indian Medical World (Journal of the Indian Medical Association)	Indian Medical Association	1930
6.	Journal of the Indian Ceramic Society	Indian Ceramic Society	1928
7.	Journal of the Geological, Mining and Metallurgical Society of India	Geological, Mining and Metallurgical Society of India	1929
8.	Journal of the Institution of Chemists	Institution of Chemists	1929
9.	Proceedings of the Academy of Sciences of the United Provinces of Agra and Oudh Sectional A and Section B	Academy of Sciences of the United Provinces of Agra and Oudh	1930
10.	Current Science	Current Science Association	1932
11.	Proceedings of the Indian Academy of Sciences, Section A and Section B	Indian Academy of Sciences	1934
12.	Proceedings of the Indian Society of Soil Science	Indian Society of Soil Science	1934 (ceased publication after 1949)
13.	Proceedings of the Physiological Society of India	Physiological Society of India	-
14.	Proceedings of the National Institute of Sciences of India	National Institute of Science of India	1935
15.	Science and Culture	Indian Science News Association	1935
16.	The Calcutta Geographical Review	Calcutta Geographical Society	1936
17.	Indian Journal of Entomology	Entomological Society of India	1939
18.	Indian Journal of Genetics and Plant Breeding	Indian Society of Genetics and Plant Breeding	1941

Source: Compiled from numerous literature

Numerous journals associated with various societies came up during the period of study. The Indian journals for example, the Journal of Indian Chemical Society began to be appreciated even outside India. The then President of the Chemical Society of London. Professor Wynne congratulated P. C. Ray for the Society's venture. The "Nature" published a report[477]

> "The great work in chemistry which has occurred in the Indian Empire during the past ten years had led to the establishment of an Indian Chemical Society, the first issue of the quarterly journal of the Society has now appeared. There are thirteen papers, and only one of these is published under the English name. The remaining papers are published by Indians and come from all parts of the Indian Empire. Four of these emanate from University College of Science, Calcutta, and this is as it should be, because for past any years, this institution has been the back-bone of chemical research in India."

The journal Current Science[478] was a result of the resolution passed at the special meeting held during the 1932 session of ISCA. Its inception was a combined effort of the stalwarts of Indian science which included C. V. Raman, Birbal Sahni, Meghnad Saha, Martin Forster and S. S. Bhatnagar who were closely associated with ISCA. Its parentage and annual donation came from the ISCA. "Rupee Fund" was also initiated to secure financial position before the launch of the journal and rates of advertisements were also fixed the following months. *Current Science* noted that it wasn't officially connected with the Congress. However, it was started as a result of discussions during Congress's annual meeting in 1932 (Current Science, 1933, p. 193). The journal was unique and an important one as no other journal was published in India at that time that catered to all branches of scientific work[479]. It was realised that a publication of this nature would assist in coordinating research and in supplying up-to-date scientific information to the scientific workers as well as among those interested in science and progress and development of science in general within the country. L.L. Fermor in his presidential address in 1933 noted the success of the journal and underline no dearth of material suitable

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[477] Indian Association for the Cultivation of Science (1876) "A Century" Calcutta: Indian Association for the Cultivation of Science.

[478] Current Science owes its origin to the genius and foresight of Dr. M. O. Forster. He presided over the inaugural meeting convened to consider the founding of the journal. In 1931, he as the Director of Indian Institute of Science, Bangalore issued a questionnaire with a view to elicit the amount of support which an Indian science news journal would receive. It received an encouraging response and thereafter the matter was placed before a meeting of the Indian Science Congress Association. The proposal was accepted by the members in 1932. A working committee was constituted to work out the details of the journal and the matter was consulted by a number of scientists thereafter. It was cumulatively decided that a monthly journal would be published under the name of "Current Science".

[479] Current Science *Vol I, (July 1932-June 1933)* and *Vol. (July 1933-June 1934)* D.E.P.

for publication. Although the University of Madras and IISc made grants towards the maintenance of the journal, it was suggested that ISCA which was regarded as the parent of the journal could make annual grants. But, the Congress itself wasn't a profitable organisation and was largely dependant on donations and the Asiatic Society (Proceedings of the Twentieth Indian Science Congress, 1933). The journal became a medium for discussion and communication on a number of issues concerning science and scientific activities within the country as a whole. It is a leading inter-disciplinary science journal of India till date.

Meghnad Saha and P. C. Ray who were both General Presidents and Sectional Presidents of sessions of ISCA established the Indian Science News Association in 1935. The objective was to disseminate scientific news, in order to achieve this the Association started publication of the journal *Science and Culture.* Further, it also organised symposiums, seminars, endowments and memorial lectures. The first council of the Association included P. C. Ray, U. N. Brahmachari and Meghnad Saha. The Association received personal donations from Brahmachari and Ray. Apart from individual scientists, institutions like University College of Calcutta, IACS, ISCA along with few others extended their support. Science and Culture started as a monthly journal for natural and cultural sciences. A number of editorial written by Saha himself along with other leading scientific intelligentsia in *Science and Culture* addressed to various problems associated with post-war organisation of research during 1939 and 1942[480]. Thus, the period saw sprawling of numerous journals catering to different disciplines of science. Apart from these journals mentioned above, there were many scientific societies, academies which published their proceedings, transactions, etc. which showcased the contributions made by the scientific workforce of the country. During 1914-1938 a total of 940 periodicals including journals, data periodicals, proceedings, etc., while during 1939-1947 there were about 360 new periodicals. It was opined that the experience of the two war did affect the publication of new periodicals which was compensated by the steady growth in the post-war period (Sen, 2005, pp. 60, 61, 90). According to Patra and Muchie, maximum number (more than 50) of scientific papers were published before Independence Proceedings of the Indian Academy of Sciences, Section A followed by Indian Academy of Sciences

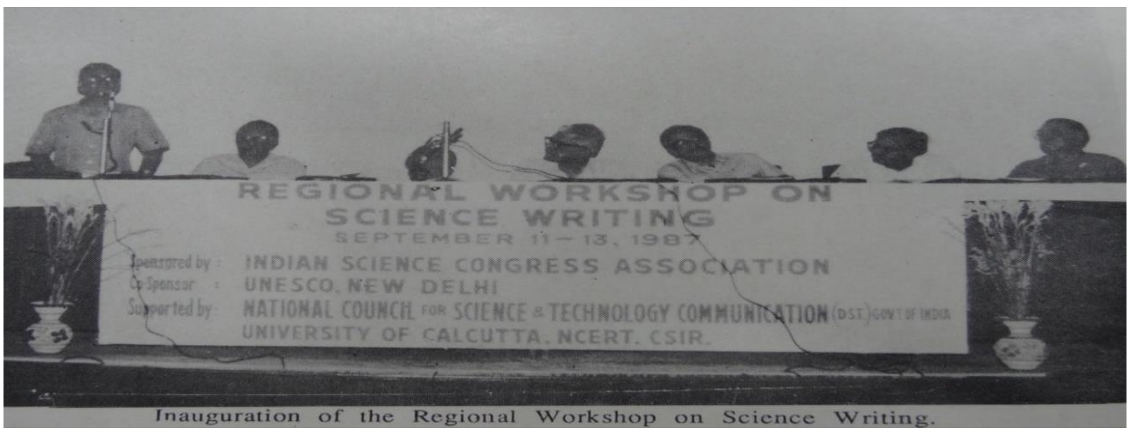
[480] Indian Science Congress Association, *The Shaping of Indian Science: Indian Science Congress Association Presidential Addresses, Volume I: 1914-1947*, Hyderabad: University Press, 2003.

Section B in India. Apart from these two, only Journal of Indian Ceramic Society figured in to top twenty journals (Patra and Muchie, 2017, p. 127). Certainly, there was a marked increase scientific journal. However, scientists have been concerned about their quality in the post-Independence era. Bhargava and Chakrabarti indicated that although there were about 1900 publications in India, there was a lack of good-quality world ranked journal in India (Bhargava and Chakrabarti, 2003, p. 103).

Besides its proceedings, ISCA's had a number of publications which became a great communication channels for specialists to discuss the progresses made in different branches of science doing the period of its existence. During the silver jubilee session of the Congress, it published progresses made in twenty-five years in sciences, each volume representing a science. Similarly, a decade of science in India was also published. In 1966-1967, Association's started its journal, *Everyman's Science* as a half-yearly venture which became bi-monthly in 1974-1975. The efforts were made to transform it into a monthly journal from 1975. ISCA increasingly evolved as a forum which enabled both scientific community, those interested in S&T and to gain access to information about the advances and achievements made in S&T. During its sessions, it organised the 'Science Communicators' Meet' (also called the Vigyan Sancharak Sammelan' in which academicians, activists, journalists, film-makers, scientists, science communicators, etc. who were members of the Congress were invited for professional growth of science communicators. ISCA's workshops, symposiums, group discussions, joint meetings, general and special lectures enabled greater communication between the specialists of different fields.

As ISC saw a cross-section of scientists from different disciplines across the country, it emerged as the a medium of communication among them. During the platinum jubilee session, 'Regional Workshop on Science Writing' was organised in collaboration with UNESO, New Delhi, supported by DST, CSIR and NCERT. Its objective was to identify science writers and deliberate on the criteria of science writing which would be relevant both for India and its neighbouring countries. In the workshop science writers from India, science writers from Bangladesh, Pakistan, China, Sri Lanka, Nepal, Indonesia and Thailand participated, along with science journalists, communicators from newspapers, periodicals, television, radio and different organisations took part. The recommendations of the workshop included setting up of national organisation of science writing with encouragement from UNESCO which could facilitate exchange of information and experiences in the region. A need for a ‘Media Resource Centre’ was to be started at participating countries which could enable fast and effective links for media outlets for reliable S&T information. It also emphasised improving exchange of information among science writers and foster efficient and competent specialist translation services. It strongly recommended reflection of socio-economic needs of the masses of the participating countries.[481]

Figure 4.3. Workshop on Science writing organised during Seventy-Seventh ISC



Source: Picture taken from the Proceedings of the Seventy-Seventh ISCA session.

4.3.5. Peer evaluation systems and recognition

ISCA evolved a peer evaluation system. Its sectional committees and sectional president reviewed the papers received under each section, before these papers were read at ISCA sectional meetings during its annual session. By 1930s, its sectional meetings also provided scope for real-time peer-evaluation system where, young researchers read their papers in presence of noted-scientists of their field. The assessment of the actual quality of papers and the review process followed by the reviewers of the sectional committee was beyond the scope of researcher’s capability. However, Vasantha and Banerjee’s study on the development of chemistry section of ISCA attest to poorly-edited Proceedings, unclassified abstracts, one-line

[481] Annual Report of the Indian Science Congress Association, 1987-1988, Calcutta: Indian Science Congress Association, pp. 29,30.

abstracts which according to them hinted at a loose and informal review system.[482] Fermor in his presidential address demanded a review of the selection of the papers for presentations by the selection committees. [483] Srivastava in his presidential address noted a nature and shortfall of the peer review system in S&T.[484]

The election as General President of ISCA was seen as distinction for scientists in India. This is evident from numerous addresses made by General and Sectional Presidents of ISCA where they recognised their election as an honour. Anderson in his book also remarked that Saha's reputation rose after his election as the President of the Physics Sections of ISC in 1925 (Anderson, 2010, pp. 44). The is a growth in rewards/awards and recognition in numerous S&T fields. ISCA instituted awards for recognising efforts in science. The executive and sectional committee proposed award of prizes for scientific manufacturers during ISCA sessions, which had been organising exhibitions of scientific apparatus.[485] It also instituted numerous awards to honour, encourage and recognize scientists for their research and discoveries in various fields of science. These awards were made mainly through special endowments donated by individuals or groups as well as from ISCA's funds. The first award lecture named B. C. Guha Memorial Lecture was held during 1965-66. The number of such awards and endowment lectures increased in the following decades. In 2003, twenty-nine awards including six new millenium plagues of honour were given to scientists across various disciplines.[486] Besides these, young scientists award and best poster prizes were also initiated to encourage scientists. For the seventieth session, ISCA selected eight young scientists for Young Scientists Awards, who were given a certificate of merit and cash prize along with the contingent grant.[487] Twenty-five young scientists received this award 2003.[488] There were

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[482] Vasantha, A. and Banerjee, D. K. (1991). "Organsation of the Chemistry Section of the Indian Science Congress, 1914-1947" in Kumar, D. (ed.). *Science and Empire: Essays in Indian Context, 1700-1947*, Delhi: Anamika Prakashan.

[483] Proceedings of the Twentieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1933.

[484] Proceedings of the Eighty-First annual session of Indian Science Congress, Calcutta: Indian Science Congress Association, 1994.

[485] Proceedings of the Thirty-Third Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1946.

[486] Proceedings of Ninetieth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 2003, pp. 145-150.

[487] Proceedings of the Seventieth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1983.

[488] Proceedings of the Ninetieth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 2003, pp. 134-142.

twenty-six best poster prizes given in 2003.[489] There were more than forty awards, memorial lectures and fellowships given by ISCA from the time of inception of awards until 2017. The growth in awards in a clear indication of progessionalisation of S&T fields.

Besides, ISCA's attempts to award the efforts made by scientists. Increasingly, Indians began to be recognised for their scientific contributions internationally. By the first decade of twentieth century, very few Indian scientists were visible in the international sphere. As the Indian scientific community began contributing to knowledge production and advancement in pure and applied sciences, they were increasingly recognised nationally and internationally. The election as fellows of the Science Academies in India increased. Even, international societies and academies of science conferred numerous awards, medals, etc. P. C. Ray and Bose's researches was internationally recognised as was evident through the excerpts from various journals in India and abroad (Ray, 1958, p. 124). The Indian science community represented the country at various international platforms. The intellectual attainments of Indian scientists and their recognition internationally with election as Fellows of the Royal Society was underlined.[490]

The Fellowship of the Royal Society of London was considered one of the most coveted honour for the scientists. An extract from Krishnan's diary observed that Raman was confident about their discovery and believed that FRS was not out of his reach (Choudhuri, 2018, p. T223). Until 1947, twenty-four nominations were made for the FRS. Eleven out of these were elected as the Fellows.[491] About twenty of the nominated scientists had been associated with ISCA as General Presidents, Sectional Presidents, members of the council or executive body. Even in during the post-Independence era, most of the elected FRS were associated with ISCA. Until the inception of ISCA only one Indian, Ardaseer Cursetjee was chosen as the FRS in 1841 who was not a scientist in the true sense. With the adoption of the new statues for the Society, eminence in a field of science became primary criteria for the election. After ISCA's

[489] Ibid.

[490] During the inaugural proceedings of the twenty-seventh session of ISC, Governor of Madras underlined an increase in number of Indian scientists' election as FRS. See Proceedings of Twenty-Seventh Indian Science Congress, Calcutta: Indian Science Congress Association, 1940.

[491] These included Srinivasa Ramanujan, Jagadis Chandra Bose, C. V. Raman, Meghnad Saha, Birbal Sahni, K. S. Krishnan, H. J.Bhabha, S. S. Bhatnagar, S. Chandrashekhar, P. C. Mahalanobis and S. K. Mitra.

inception, S. Ramanujan was the first Indian to become FRS in 1918. The nominations of Indian scientists were made by British peers. P. C. Ray and his student N. R. Dhar were nominated thrice and twice respectively, but couldn't be successful.

Choudhuri opined that the story around the unsuccessful nominations of these internationally recognised scientists was a mystery which need to be studied (Choudhuri, 2018, T227). The criteria for the election as well as unsuccessful nomination of eminent scientists indicate that election of FRS could not be seen as the sole evidence of recognition of Indian scientists. Therefore, apart from election as FRS, a number of Indian scientists received awards and medals abroad. The presence of numerous delegates from international societies and associations of science is a clear indicative of ISCA's fame during the period of study. A number of Indian scientific workers were sent on delegations and conferences abroad. Raman was elected as FRS in 1924. In 1928, he was given the Matteucci Medal by the 'Societa Italiana Della Scienza' of Rome and knighted by GOI in 1929. The Hughes Medal of the Royal Society, London and Nobel Prize at Stockholm was conferred on him in 1930. Raman also received an Honorary Doctorate in Paris in 1932 (Pisharothy, 1982, p. 24). He became honorary fellow and member of various international academies and societies.[492]

[492] He became the honorary member of the Duestsche Academy of Munich, Hungarian Academy of Sciences, Royal Irish Academy, Royal Philosophical Society, Glasgow and Zurich Physical Society. He was also a honorary fellow of the Optical Society and Mineralogical Society of America (Pisharoty, 1982)

Table 4.5. Election of Indians as Fellows of the Royal Society (1914-1992)

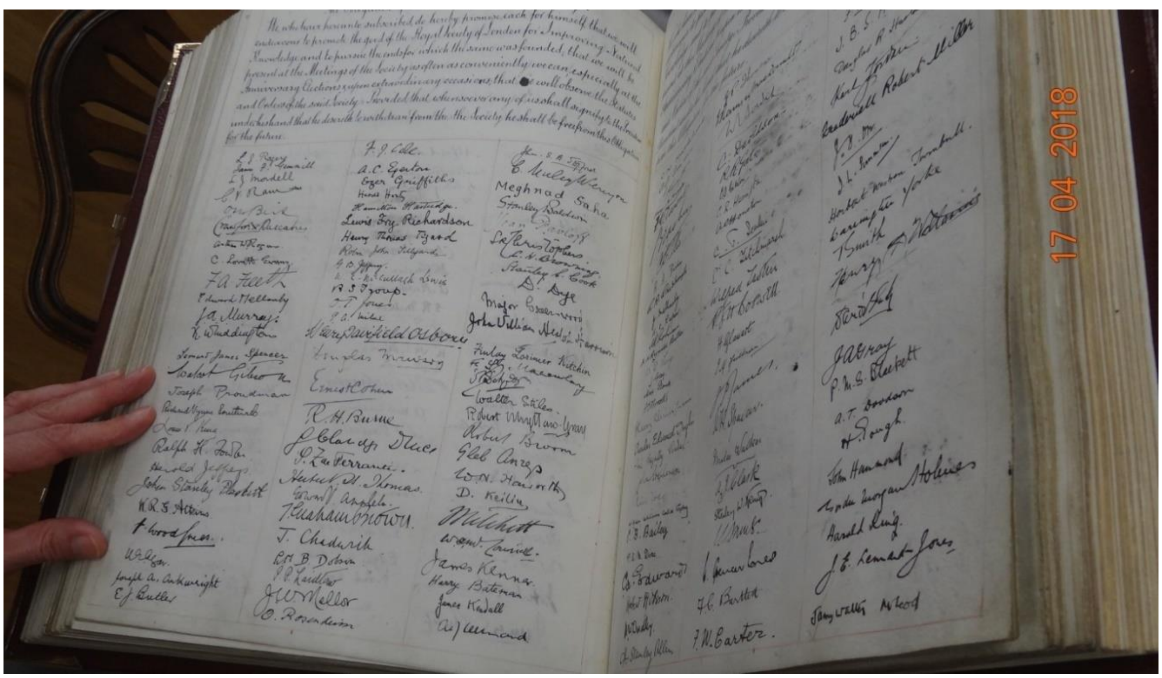
S. No.	Name of India Scientist	Year of Nomination	Year of Election
1.	Prafulla Chandra Ray	1914-1922, 1934-1938	-
2.	Srinivasa Ramanujan	1918	1918
3.	Jagadis Chunder Bose	1914-1920	1920
4.	Debendra Nath Mallik	1919-1923	-
5.	Chandrashekar Venkata Raman	1922-1924	1924
6.	Meghnad Saha	1925-1927	1927
7.	Nilratan Dhar	1927-1931, 1932-1936	-
8.	Birbal Sahni	1932-1936	1936
9.	Sudhansu Kumar Banerji	1933-1937	-
10.	Kariamanikkam Srinivasa Krishnan	1936-1940	1940
11.	Shanti Swarup Bhatnagar	1937-1941, 1942-1943	1943
12.	Homi Jehangir Bhabha	1941	1941
13.	Upendranath Brahmachari	1942-1946	-
14.	Subramanyan Chandrashekhar	1942-1944	1944
15.	Prashanta Chandra Mahalanobis	1942-1945	1945
16.	Karm Narayan Bahl	1943-1947, 1948	-
17.	Daulat Singh Kothari	1944-1948, 1950	-
18.	Suri Bhagvantam	1945-1945, 1950	-
19.	Sisir Kumar Mitra	1945-1949, 1950-1954, 1958	1958
20.	Satyendra Nath Bose	-	1958
21.	Jnanendra Nath Mukherjee	1945-1949, 1950	-
22.	Rames Chandra Ray	1945-1949	-
23.	M. O. Parthaserathy Iyengar	1947	-
24.	Tiruvenkat Rajendra Seshadri	1948-1952, 1960	1960
15.	Krishnasami Venkatraman	1948	-
26.	Panchanan Maheswari	-	1965
27.	M. G. K. Menon	-	1970
28.	Harish Chandra	-	1973
29.	Gopalasamudram Narayana Ramachandran	-	1977
30.	Devendra Lal	-	1979
31	Autar Singh Paintal	-	1981
32.	C. N. R. Rao	-	1982
33.	Sivaramakrishna Chandrasekhar	-	1983
34.	Obaid Siddiqui	-	1984
35.	Vulimiri Ramalingaswami	-	1986
36.	Dr. Coluthur Gopalan	-	1987
37.	T. R. Seshadri	-	1988
38.	A. P. Mitra	-	1988
39.	Man Sharma	-	1990
40.	Govind Swarup	-	1991
41.	Roddam Narasimha	-	1992

Source: Compiled from Fellows Directory available at The Royal Society, London.

Figure 4.4. First page of the Charter book of the Royal Society of London

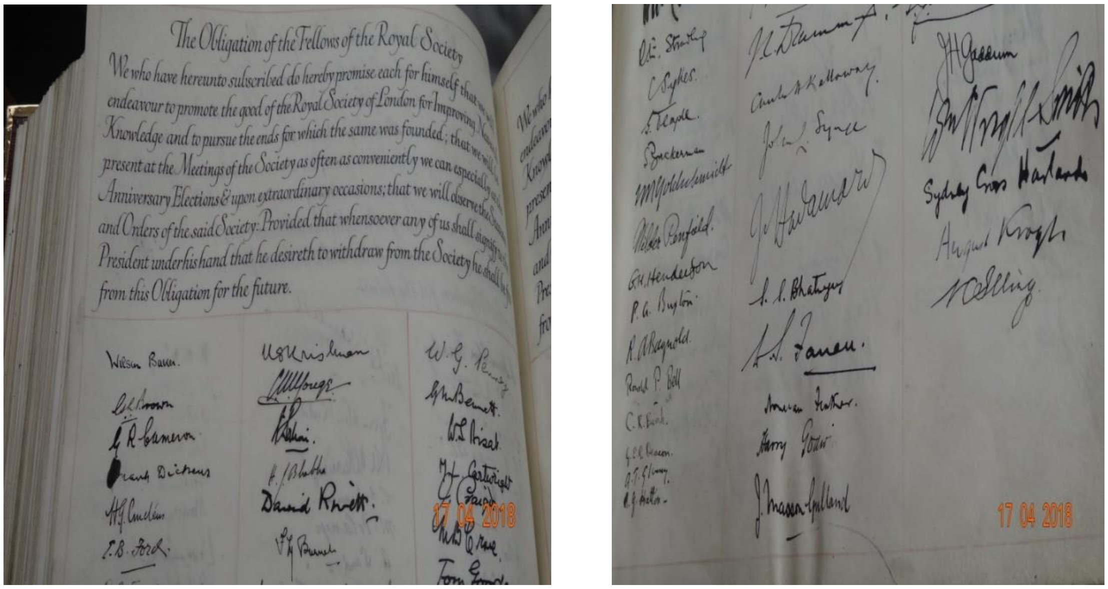
Source: Picture taken at the Royal Society of London.

Figure 4.5. C. V. Raman and Meghnad Saha's signature (left page) and ISCA's founder J. L. Simonsen's signature (right page) in the Charter Book of the Royal Society of London



Source: Picture taken at the Royal Society, London.

Figure 4.6. S. S. Bhatnagar (left), K. S. Krishnan and H. J. Bhabha's signature in the Royal Society's Charter Book



Source: Picture taken at the Royal Society, London.

Raman's confidence and his assessment of his scientific discoveries can be viewed through these instances. During the felicitation dinner of Raman after his election as FRS, Ashutosh Mookerjee asked him 'What's next?' and he replied 'The Nobel Prize' (Pisharothy, 1982, p. 25). The decision of the Nobel Prize was held secretly and the prize is awarded by mid-December, Raman had anticipated his possibility and booked his sea voyage well in advance in July (Pisharothy, 1982, p. 25). A European scientist who visited the California Institute of Technology narrated that he had met an Indian scientist who had 'imagined' that he was going to discover the quantum effect in the scattering of light and would win a Nobel Prize for India. The interesting this is that this man did make is discovery and won the Nobel Prize six years later. In 1925, Raman wrote a letter to G. D. Birla who was an industrialist. He wrote that he needed money for a spectrograph which would enable him to win a Nobel Prize[493] for India (Ramaseshan, 1988, p. 14). Later, Raman was against getting approbation from foreigners. He, therefore, refrained from recommending senior Indian scientists for Fellowships of prestigious foreign Societies. He himself resigned from FRS (Pisharothy, 1982, p. 36).

[493] The letter written on December 16th 1930 underlined that Raman bursted into tears when he was confered the Prize. He in his speech added that he believed that he got the Prize largely because of the German influence. He also talked about the great work done in impressive laboratories in Russia. See Letter from A. W. Kennard to Mr. Seymour, dated 16th December, 1930. (The British Library, London).

Apart from election as FRS, a number of Indian scientists represented Indian scientific community and were invited on international forums as representatives of scientific advancement in India.[494] Most of those who were elected had made immense contribution to the field of science and were at some point of time of their career were deeply associated with ISCA. All these certainly indicated a marked increase in scientific productivity of the scientific workers in India as well as an increasing recognition and fame for their efforts by the international scientific community transforming the almost non-existent community consciousness of the Indian scientific workers into a viable scientific community. However, it is interesting to note that after C. V. Raman who received Nobel Prize before Independence, only three Indian origin scientists received Nobel Prize after Independence given growth in S&T infrastructure. Har Gobind Khurana received the Nobel Prize in 1968 for interpretation of the genetic code and its utility for protein synthesis.[495][496] Followed by S. Chandrasekhar and Venkatraman Ramakrishnan who received Nobel prize in Prize and Chemistry in 1983 and 2009 respectively. P. N. Srivastava, General President of ISCA's Jaipur session in 1994 also noted the lack of Indian scientists in the global context and tried to understand the reasons and make recommendations for its remedy. He identified the lack of co-existence of teaching and research and their separation between research institutes and universities as an important reason for limited examples of excellence in science on global level.[497]

4.4. Conclusion

The role of ISCA in the emergence of scientific community, which lay at the core of professionalisation of science in any country is adequately discussed. This chapter underlined that ISCA certainly emerged as a significant actor in professionalisation of science from the

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[494] Meghnad Saha was invited to the Volta centenary celebrations. In 1945, P. C. Mahalanobis was elected as the fellow of the Royal Society, London in 1946 and in the following year he was appointed a member of the Statistical Commission of the United Nations. The foreign societies conferred the Back award and Lyell Medal on D. N. Wadia for which he later received Padma Bhushan. D. N. Wadia was prominent in foundation of Ceylon Association of Science and Geological Survey of Ceylon (Stubblefield, pp. 552).

[495] Proceedings of Eighty-Third Indian Science Congress, Calcutta: Indian Science Congress Association, 1996, p. 67.

[496] Also see, P. M. Bhargava and Chandana, Chakrabarti, *Saga of Indian science since Independence: in a nutshell*, Hyderabad: Universities Press, 2003, pp. 102, 103.

[497] Proceedings of the Eighty-First annual session of Indian Science Congress Association, Calcutta: Indian Science Congress Association, 1994.

time of its inception. It provided the climate for professionalisation and emerged as the single most important platform for institutionalisation of science, which could be seen as a precursor to its professionalisation. ISCA members contributed immensely to the foundation of numerous scientific departments, science courses, university chairs, specialised institutes and laboratories, etc. Similarly, ISCA lay at the core of organisation of various S&T fields which is evident in the role it played in the growth of numerous scientific and learned societies, academies of science. It made attempts for to diversify and promote S&T fields and maintained a balance between pure and applied sciences constantly reiterating promotion of basic sciences from the time of its inception. Although, its members did underline the importance of social sciences, it did not receive the required attention in its sections. ISCA provided an eco-system for foundation and flourishing of numerous scientific institutions. Thus, leading to the diversification of S&T institutions in India. It also contributed immensely to the establishment of numerous scientific journals most of which few continue till present. The members of the Science Congress contributed towards knowledge production. It also provided a forum for initiation of peer-review system and also instituted awards for greater recognition of Indian scientists for their contribution towards science nationally. The election of numerous Indians as FRS and as members of international scientific societies attest to their recognition internationally.

During the post-Independence era, with the emergence of numerous specialised societies and associations, ISCA continued as the most diverse platform for showcasing and communicating advances made in various S&T fields as well as gaining information about the international progresses made in S&T research, both within the specialists and the general public. Its sections absorbed a wide plethora of new and existing S&T fields. It evolved as an important platform also for showcasing the challenges faced by emerging S&T and voicing suggestions and recommendations for furthering their professionalisation. With increasing international competitiveness aggravated as a result of globalization, it evolved as a critical platform for recognising the obstacles faced by Indian scientific institutions and provided required recommendations and suggestions for furthering excellence at global level and infusing accountability of scientists both in universities and research institutions.

Chapter 5

ISCA and Discourses on National Socio-Economic Issues of India

5.1. Introduction

The previous chapter discussed ISCA's role in insitutionalisation and professionalisation of science in India. It underlined the part played by ISCA and its members in foundation of S&T departments, science courses in colleges and universities, specialised research institutions and national laboratories. It provided research environment and a climate for flourishing of numerous S&T institutions. During the post-Independence era, ISCA continued its efforts in making recommendations for maintaining quality teaching and research and a conducive 'science culture' in scientific establishments. By 1940s, its sectional meetings catalysed organisation of numerous S&T fields through foundation of disciplinary scientific societies. During ISCA's annual sessions many scientific societies and academies organised their annual meeting simultaneously. After WWI and especially during 1930s when national movement was gaining momentum, the need for industrialisation to achieve self-containment was realised. Therefore, numerous sections and sub-sections representing diverse S&T fields, critical for addressing issues pertaining to socio-economic needs of the people as well imperatives of national reconstruction, evolved at ISC. ISCA voiced the proposal for foundation of academies of science for greater consolidation of scientific work in India.

ISCA was central to the foundation of numerous scientific journals like *Science and Culture* and *Current Science* in India, which is a clear indicator of scientific productivity. ISCA emerged as the sole platform that enabled personal intercourse among scientific workers across various S&T fields, which provided scope for inter-disciplinary research through cooperation and coordination between various scientific disciplines. By the time of Independence, it emerged as a viable organisation which saw the participation of leading Indian scientists including young and amateur scientific workers. ISCA initiated the peer-review system. Members of ISCA were critical for knowledge production and increasingly became recognised nationally and internationally for their contribution. This is evident in the election of Indians as fellows of societies and academies of science both, national and international. ISCA also instituted awards and endowments lecture for encouraging and honouring the efforts of both young and senior scientist. ISCA certainly provided a research eco-system and catalysed initiation of numerous themes of researches and established a communication network among specialists of varied fields.

The present chapter tries to assess ISCA’s role in recognising concerns pertaining to national reconstruction and addressing socio-economic issues faced by the country. It attempts to understand ISCA's role in mirroring general problems like health, food, water, population, famines, natural disasters, poverty, etc. in India, which continue to create problems for India till date. The chapter also endeavours to underline ISCA’s standpoint on the challenges that emerged as a result of application of sciences in various sectors. It also analyses ISCA's role in recognising the world as largely one economic and cultural unit and its stance on the misuse of S&T discoveries for destruction of mankind after the experience of the World Wars. Further, the chapter seeks to understand how ISCA acknowledged the reciprocal relationship between science and society and focused on the importance of the social obligation of the scientific community and social relations of science and scientists.

5.2. General Awareness and Scientific Thinking

From its early history, annual meetings of the science congress stressed on generating awareness about science among the public. One of the objectives of the Congress was to obtain a more general attention to the cause of both pure and applied science. It also sought for the removal of any disadvantage of the public kind which could impede its progress.[498] It seems to be in congruence with this objective, that the popular (later known as public lectures), were organised from the third session of ISC to attract general public attention.[499] However, initially how ‘popular’ were these in the true sense of reaching out to the public, with regard to their content and attendance cannot be ascertained. It was believed that the promotion and advancement of science could be achieved by arousing the interest of the

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498 The General President’s Address given by Ashutosh Mookherjee during the First session of Indian Science Congress in 1914 in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. I, 1914-1947, p. 2.

499 Proceedings of the Third Indian Science Congress in the Journal and Proceedings of the Asiatic Society of Bengal, Calcutta: Asiatic Society of Bengal, 1916.

general public not just by highlighting that scientific investigations could help in welfare of mankind, but also by seeking support of mankind in the provision of facilities and especially provision of finance. He called the Congress a peripatetic body which met annually in principal cities of India, so that greater awareness of its activities and needs could be disseminated.[500]

ISCA increasingly became a medium for asserting the importance of critical thinking and inculcating it for the welfare of the society. The ignorance of the common people who saw diseases as 'visitations of malign spirits which could be warded off by magic'[501], was considered an importance impediment towards health and hygiene of the people of India. Scientists associated with ISCA like Ray and Saha emphasised on the importance of scientific knowledge and scientific spirit within the society. Ray identified a period of intellectual stagnation in India, where reason was bound by faith and was heavily dependent on *shashtras* which wasn't open to criticism. He added that the study of science was significant for the culture of Indian youth and strongly voiced the need for scientific knowledge and inculcation of the scientific spirit. This according to him, could liberate the intellect and was essential both for individual and national growth of the country and its culture.[502] Ray's autobiography provided a testimony of orthodoxy among Indians.[503] Very early in his life, Saha was aware of the social atmosphere developed an aversion towards caste-based division of society, untouchability and superstitions prevalent in India.[504] Most of his scientific articles in *Science and Culture*, were meant for the common people which played a critical role in popularising science in India (Karmohapatra, 1997, p. 112). Saha's quest for scientific and rational thinking in the society could also be seen in his efforts towards calendar reforms. Saha knew that alamac-makers' calendar, used for civic and religious purposes was unscientific.

[500] L. L. Fermor's presidential address. See Proceedings of the Twelfth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1925.
[501] W. B. Bannerman's address at the Third session of the Congress in the Proceedings of the Third Indian Science Congress in the Journal and Proceedings of the Asiatic Society of Bengal, Calcutta: Asiatic Society of Bengal, 1916.
[502] Proceedings of the Seventh Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1920.
[503] During his experiments at the Presidency College, Ray used samples of burnt bones which was a pure chemical compound. He swallowed it in the process but, when he asked his students to do the same, some did it and some hesitated to shake off their orthodox notions (Ray, 1958, p. 79).
[504] He was against caste system and untouchability. As he belonged to a certain caste, he was not allowed to enter the kitchen and touch cooked food in the mess (Karmohapatro, 1997, p.16). Saha developed an aversion to religious rituals when a village priest did not let him sit on the dais during durga puja (Salwi, 2002, p. 15)

Therefore, he undertook calendar reforms on scientific and mathematical calculations (Chatterjee and Chatterjee, 1984, pp. 81-85).

The assembly of scientists during the Congress was seen as a great opportunity for usefulness and benefit of India provided its members regarded themselves as evangelists, spreading the gospel of scientific truth. Through experimental training, India could be transformed into an 'empire of reason'.[505] The social backwardness, customs, traditional outlook, etc. were identified as obstacles for planning in India. Science was seen as the solution for superstitions and deadening customs and traditions in India. The spread of spirit and methods of science was continuously reiterated.[506] Through a number of addresses, he made during the inaugural sessions of the Congress, he underlined the importance of cultivating scientific way of thinking was critical for the cure of various problems facing the country, general well-being of the people in the society and the world at large.

> The scientific approach and temper are and should be a way of life, a process of thinking, a method of acting and associating with fellow men. The scientific temper points out the way along which man should travel. It is the temper of a free man (Nehru, 1946, p. 624).

During the inaugural address at the Forty-Third session of the Indian Science Congress held at Agra on January 2nd, 1956, Nehru said[507]

> Men and women should consider the basic approach to all the problems. By a basic approach to problems, I mean the basic temper of science, of reasonableness, the temper of peace. These approaches were very important to end and solve the problems facing them (Singh, 1986).

It was believed that domination of preconceived notions, superstitions, ignorance usually clouded reasoning and obstructed objective and rational thinking. They also stood in the way

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[505] The presidential address given by M. O. Forster during the Twelfth Indian Science Congress in the Proceedings of the Twelfth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1925.

[506] Vice Chancellor of University of Madras during opening proceedings of Twenty-Seventh ISC. See Proceedings of the Twenty-Seventh Indian Science Congress, Calcutta: Indian Science Congress Association, 1940.

[507] Jawaharlal Nehru Address during inaugural address at the Forty-Third session of the Indian Science Congress held at Agra on January 2nd, 1956 in Baldev Singh's Book Jawaharlal Nehru on Science, Speeches delivered at the Annual Sessions **of** the Indian Science Congress, 1986, p. 52.

of adoption of scientifically-established ways for improving socio-economic conditions.[508] Hora believed that although India faced religious and cultural difference, inter-group and inter-personal differences and demographic problems, until 1954 only J. H. Hutton who was a cultural anthropologist had addressed its session in 1935. It is evident that ISCA certainly had neglected the social sciences beyond the activities of the committee of science and society which will be discussed in the next section. As Indian society was believed to be a tradition-bound and largely superstitious society. The need for inculcation of scientific temper and its penetration across every aspect of society, across politicians, academicians, administrators, managers, farmers, etc. was necessary.[509] During ISCA's session in 1974, creation of more modern and science minded society, free from superstitions and narrowness was consider the penultimate goal of Indian science.[510] It was believed that scientific way of thinking would help the people of the country to secure benefits of S&T. Individual scientists like J. C. Bose made efforts towards greater popularisation of science. He was a strong votary of vernacular languages for science and his biography highlighted that he wrote a number of scientific papers in Bengali. His wife founded a Fund of Rs. 3000 in his name in the Bangiya Sahitya Parishad with the object of introducing Bengali synonyms of english words used in scientific literature for encouragement of science to be written in Indian languages[511] (Gupta, 1964, pp. 60-63).

ISC was considered critical for extending the dissemination of scientific knowledge among youngsters beyond urban area into the villages. The emphasis was to accentuate their usually dormant originality, scientific potentiality and genius.[512] ISCA's attempt towards bringing the

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508 J. N. Mukherjee presidential address 'Science and Our Problems' during ISC session in 1952 at Calcutta in in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. II, 1948-1981, pp. 649,650.

509 Indira Gandhi inaugural address at the ISC session in 1972 in the Proceedings of Fifty-Ninth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1972.

510 Indira Gandhi's inaugural address at the ISC session in 1974 in the Proceedings of Sixty-First Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1974.

511 The Kannada Sahitya Parishad of the Kannada Literary Academy owed its existence to the foresight of Visvesvaraya. He desired the Academy to give special attention to the preparation of easy books on science in Kannada (Rao, 1973, pp. 30-42).

Raman reiterated the need for higher education among women as he believed no nation could rise if half of its population was sunk in superstitions (Pisharothy, 1982, p. 81).

512 First women General President, Asima Chatterjee's address 'Science and Technology in India: Present and Future' during ISC's session in 1975 at Delhi in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, Vol. II, 1948-1981, 2003, p. 1029.

rural areas within its fold, could also be seen during the platinum jubilee session of the Congress. It organised a special meeting with some voluntary organisation in order to discuss diffusion and dissemination of information pertaining to S&T especially in the rural sectors.[513] In 1988, C. N. R. Rao saw the possibility of transformation of Indian society, diffusion of scientific temper in the society and discuss communication in science in the ISC sessions. Rao also identified it as a forum where general public could be informed about the developments in various S&T departments.[514] R. A. Mashelkar in his address in 2000 emphasised on 'knowledge centred society' as one of the Panchsheel of the new millennium.[515]

The public lectures now transformed into Nobel Laureate's lectures during ISC, increasingly enjoyed greater participation among scientists, young research scholars and school students. ISCA made efforts to assimilate the school children through the forum on Science and School Students, which was initiated during the Eighty-Fourth Indian Science Congress. Through its various programmes, forum tried to inculcate scientific methods and awareness about science among school students.[516] It aimed at creating an interest in the young minds to pursue a career in science. It gave an opportunity for the young students to interact face to face with international scientists which could motivate them to pursue a career in science[517]. The Forum later transformed into a Children Science Congress during ISC sessions. A focused programme on Science for school children was organised during the Ninetieth Science Congress at Bangalore. It aimed to encourage and motivate budding scientists from different parts of the country to take up science. It gave an opportunity to learn the advances made in S&T through interactive sessions and lectures by eminent scientists both from India and abroad and participate in exhibitions.[518] A. P. J. Abdul Kalam addressed the children and in an

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513 Annual Report of the Indian Science Congress Association, 1987-1988, Proceedings of the Seventy-Fifth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1988, p. 30.

514 Proceedings of the Seventy-Fifth annual session of the Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1988.

515 Proceedings of the Eighty-Eighth annual session of the Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 2000.

516 It organised various programmes like symposiums, science model contests and extempore speech competitions in which school students from various schools in Delhi participated. There were 110 participants displayed sixty-five projects. While seventy-seven students participated in the speech competition across thirty-six schools in Delhi. The winners were awarded certificate of merit and prizes.

517 Proceedings of the Eighty-Fourth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1997.

518 The science for school children programme saws the participants from two major national events viz. 146 children from National Science Congress coordinated by Karnataka Rajya Vijnana Parishad and twenty children

interactive session with the children in which urged them to develop spirit of enquiry and scientific temper. A nature trail visit to IISc and Bangalore and Visvesvaraya Technological and live show on snakes was arranged to explain the unique features of snakes and their ecological importance. The programme aimed at inculcating an understanding of science through experimentation and critical thinking among students. The session also saw a lecture demo which encouraged students to make 3D models of DNA.[519]

During 1965-66, Association began organising popular science lectures to popularise and advance science. Through these, it engaged in a year-round effort, rather than restricting its activities merely to an annual meeting. In 1988, these lectures were organised at seventeen centres across the country.[520] With the foundation of regional chapters in 1986-87 in different parts of India, these were restructured and aimed towards greater involvement of young scientists in the wider S&T activities. They held symposia, seminars and organised popular lectures on the focal theme and themes of current interest. The regional chapters also organised exploratory excursions for young scientists in groups to visit labs, R&D organisations, industries for developing interest in scientific and research activities. The Madras, Guwahati and Chandigarh regional chapters arranged a number of these activities along with seminars, discussions and lectures in 1988.[521] For greater involvement of the general masses, an S&T exhibition was organised during the seventy-seventh session. It saw the participation from various research laboratories, R&D government agencies and numerous public and private sector industries. They displayed their R&D activities to arouse interest among the common people. These exhibitions were attended by scientists, general public and the student community.[522] These were later called ‘Pride of India’ exhibition which showcased the S&T strides of the country during the Ninetieth Science Congress. These continue till date, as under the public outreach commitment, various scientific institutions displayed their R&D activities, which was attended by scientists, students from various schools across the city or

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National Competition on science exhibition conducted by NCERT along with many across various schools in Bangalore in which the best exhibits were awarded.

[519] Proceedings of Ninetieth Indian Science Congress, Part I, Official Matters, 2003, Calcutta: Indian Science Congress Association, pp. 161-167.

[520] Annual Report of the Indian Science Congress Association, 1987-1988, Proceedings of the Seventy-Fifth annual session of the Indian Science Congress, Calcutta: Indian Science Congress Association, 1988, pp. 30,31.

[521]Ibid, pp. 24,25.

[522] Proceedings of the Seventy-Eighth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1991.

even the state, apart from the student delegates of the Children Science Congress and the general public.[523]

5.3. ISCA and Role of Science and Scientists in Society

As discussed in the previous chapters, ISCA helped in mitigating the spatial and specialised isolation of the scientists, Mukherjee added that ISCA enabled scientific workforce to get acquainted with the practical needs of the country.[524] These meetings were arranged in different parts of the country, hence provided scope for scientists to gain an understanding of their socio-economic and political conditions. The sessions gave ample scope for personal intercourse between scientists and various stake-holders of the government, which enabled them to gauge the general needs of the country and problems faced by its people. The excursions organised during its annual meetings, also gave them an opportunity to recognise the issues which science could solve. During ISCA session in Bombay in 1924, delegates visited various institutes, hospitals, factories, mints, press, etc.[525] Numerous functions, movie screenings were also arranged which enabled greater intercourse and understanding of larger context of the city.

ISCA has helped crystallising the role of science and scientists in society. Although by 1930s, the social implications of science was increasingly discussed by scientists like J. D. Bernal. The core of the present chapter will be ISCA's continued commitment to socio-economic and its responsive to them. It emphasised on the responsibility and obligation of scientists and relation sciences shared with society. With proliferation of scientific disciplines and its specialisation and sub-specialisation, from 1930s ISCA increasingly became concerned about the isolation discipline-centric expertise created. The problem of scientists working in 'ivory towers' and sense of greater social obligation of science and scientists were voiced during ISC's sessions.[526] During the same session, the president of chemistry section, Prof. H. B.

[523] Proceedings of the Ninetieth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 2003, p.132.
[524] Proceedings of the First Indian Science Congress, Journal and Proceedings of the Asiatic Society of Bengal, Calcutta: Asiatic Society of Bengal, 1914.
[525] Proceedings of the Eleventh Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1924.
[526] Meghnad Saha's General President address. See Proceedings of Twenty-First Indian Science Congress, Calcutta: Asiatic Society of Bengal, Calcutta: Asiatic Society of Bengal, 1934.

Dunnicliff underlined that the chemists needed to realise greater responsibility towards the community and develop a spirit of service.[527] Similarly, during the twenty-sixth ISC in 1939, application of scientific discoveries for betterment of human life.[528] The Vice-Chancellor of Mysore University during the opening proceedings of twenty-seventh ISC in 1940, reiterated an increasing sense of responsibility among the scientists. A discussion was organised during the same session on the importance of chemistry for service of the nation.[529] Wadia feared about science pursued in laboratory and the field, increasingly becoming a specialists' job and getting divorced from the life of the people. He added that awaken social obligation of science.[530] We see a resonance of this concern in the activities and addresses of its members on numerous occasions during ISC sessions evident its activities and its members addresses even during the post-Independence era. Nehru in his numerous speeches during the opening proceedings of ISC before and after Independence underlined the social responsibility of science and scientists which he considered critical for solving various problems facing the country and national reconstruction (Singh, 1986). M. S. Thacker in his presidential address in Madras noted that scientists had immense responsibility towards society. He emphasises on 'social understanding of science'. With the rapid creation and application of technology in society, he indicated that promotion of public understanding of science was the primary duty of the scientists, engineers and technologists.[531]

Congress drew a lot of people for use of science towards benefit of the people.[532] Most of ISCA's presidents stressed the need for choosing addresses that were more general in nature, considering its diverse composition and reach. It can be viewed as yet another attempt by ISCA to move away from specialisation and arouse greater general attention. An analysis of General Presidents attest to an assemblage of scientists from universities, research institutions, specific organisations, government departments and ministries along with industrialists,

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[527] Ibid.
[528] Proceedings of Twenty-Sixth Indian Science Congress, Calcutta: Indian Science Congress Association, Calcutta: Asiatic Society of Bengal, 1939.
[529] Proceedings of Twenty-Seventh Indian Science Congress, Calcutta: Indian Science Congress Association, 1940.
[530] See D. N. Wadia's presidential address 'Mineral's Share in War' in Proceedings of the Thirtieth Indian Science Congress, Second Circuit, Calcutta: Indian Science Congress Association, 1943.
[531] M. S. Thacker address 'Grammar of Scientific Development' in Proceedings of the Forty-Fifth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1958.
[532] Proceedings of the Sixtieth session of the Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1973.

policy-makers, political leaders, administrators, etc. ISCA's presidents belonged to diverse fields with varied expertise. This is visible in the choice and scope of their presidential addresses as well. An assessment of the subject-matter of presidential addresses of the general presidents of ISCA, illustrated that a large number of these address were 'generic' in the nature. They dealt with utilisation of science for the benefit of the people and role of science and scientists in solving issues that affect the society and country at large. Some of these include S. S. Bhatnagar's 'Give Science a Chance', Nehru's address in 1947 on 'Science in the Service of the Nation'.[533] During the Sixty-Sixth session, three discussions were organised on various themes indicating application of sciences in India for social welfare. Wadia noted that scientists and social scientists and their knowledge and tools had to be mobilized for shaping 'New India'.[534] These continued during the post-Independence era as well. Many addresses dealt with impact that service of sciences could have on the nation and its people. Mukherjee in 1952 discussed 'Science and our Problems'[535], Sunder Lal Hora's address was titled 'Give Scientists a Chance' indicating their role in life of the nation.[536] It is in this context, the foundation of the sub-committee of Science and Social Relations and Forum of Economic Development by ISCA, attests to the importance it attached to the role of science and scientists in dealing with socio-economic issues of the country. Even after the introduction of the focal themes in 1976, the choice of most of its themes reflected ISCA's recognition of the significance of science and social relations. The themes saw the resonance of the national issues faced by the people of the country and the larger global concerns that India faced with the globalization of Indian economy, on which scientists from various fields could coordinate and integrate their efforts.

[533] The General President's Address given by S. S. Bhatnagar during the Thirty-Second Session of Indian Science Congress in 1945, in Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. I, 1914-1947, Hyderabad: Universities Press, 2003, pp. 536-547.
[534] Proceedings of Thirty-Sixth Indian Science Congress, Part IV, Discussions, Calcutta: Indian Science Congress Association, 1949.
[535] Proceedings of the Thirty-Ninth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1952.
[536] Proceedings of the Forty-First Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1954.

5.4. Committee for Science and its Social Relations

In 1943, Wadia's presidential address centred around the social obligations of science. He underlined the need for application of science to the problems of daily living and the social needs of the common people. He lauded the initiation of the sub-committee on Science and its Social Relations during ISC's session in 1939 in Lahore, which aimed to study the influence of science on India and collected data relating to effects of Science on society in India. Its foundation was seen in in conjunction with the sister organisations like BAAS and AAAS along with the International Council of Scientific Unions. The resolution of the special meeting of the general committee which was convened to consider the question of science and its social relations, led to its foundation as an experimental measure to suggest topics for joint discussion and lectures relating to the influence of science on society in India.[537] Its objectives included educating the members of ISCA and gaining attention of government departments, through symposia on various subjects underlining the lag between science and its application to human welfare and ways through which this could be addressed. It aimed to gain greater public attention and work with various sectional committees and inter-university boards, on social application of science through research papers, articles to journals and newspapers and education.[538] The proposal for a National Academy of Social Sciences was drawn by the sub-committee of Science and its Social Relations and presented before the executive committee of the Indian Science Congress.[539]

During the pre-Independence era, the committee saw the participation of Meghnad Saha, D. N. Wadia, S. N. Bose and Nehru. Dr. Ashok Jain, Convenor of Committee on Science and Society noted that before Independence it was a forum for discussing plans for science, science education and all aspects of interface between science technology and society.[540] The impact of industrialisation on society in India was discussed in 1589 and the social implication

[537] Proceedings of Thirtieth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1943.
[538] Annual Report of Indian Science Congress Association of 1947 in Proceedings of the Thirty-Fifth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1948.
[539] Proceedings of Thirtieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1943.
[540] Proceedings of the Eighty-Fifth annual session of the Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1998, p. 147.

of technology was selected as the theme for symposium for the next year session.[541] In 1969, discussion on place of computers in society and S&T in human welfare. Thus, we see that the contemporary climate and requirement of the society got reflected in the symposiums organised by the committee.[542] With the introduction of the focal themes, its activities remained largely restricted to the making recommendations around the theme.

ISCA's Forum for Economic Development was initiated in 1967. It got transformed into the Committee on Science for Economic Development. The first meeting of the newly established committee was held in 1972.[543] The problem of unemployment in rural India was discussed by the committee in 1976.[544] There is an overlap seen in the activities and the composition of the committee members of this committee and the science and its social relations. As a result, they were amalgamated into one section called committee on science and society in 1988. The contribution of the committee can also be gauged in the following sections where specific issues faced by India is thoroughly discussed.

The efforts were increased during 1990s to expand the activities of the committee, but it eventually ceased to exist by the end of the twentieth century. It organised symposia, discussions and papers were presented on varied aspects of science and society. The importance of science as an integral part of society was emphasised by ISCA through its committee. During ISCA's session in 1992, 'views from the Press' which sought to understand the problems faced by the media was arranged as a bold experiment focusing on the importance of science communication.[545] The papers presented under this committee in 1993 included those on science and democracy, science and problems of peace, S&T and quality of life, etc. Numerous historians and sociologists participated in this section and decided that efforts had to be strengthened to encourage more concentrated research on science and society.

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541 Proceedings of the Forty-Fifth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1958, pp. 50, 51.

542 Proceedings of the Fifty-Sixth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1969, pp. 60, 61.

543 Proceedings of the Fifty-Ninth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1969, p. 59.

544 Proceedings of the Sixty-Third Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1976, p. 79.

545 Proceedings of the Seventy-Ninth annual session of the Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, Part I, Official Matters, 1992, p. 105.

The committee recommended increased research in the field of science, technology and society studies through introduction of courses in IITs, professional colleges, universities by seeking funding for research and fellowships from concerned institution and agencies. However, the committee became intermittent[546] with decline in its activities.[547] As a result, it ultimately ceased to exist after ISCA's session in 2002.

5.5. Industrialisation and Planning

India's socio-economic issues lay at the core of the grave problems like poverty, starvation, unemployment, indebtedness.[548] Since, ISCA's inception the problems of health, hygiene, starvation, mal-nutrition, famine, population, unemployment have increasingly been reflected during its annual sessions. ISCA's role in recognising and its efforts in tackling most of these problems will be discussed in detail in the following sections. The centrality of science for solving general problems of the people was evident from the early meetings of ISCA much before the planning committee was formed to draw a plan for catering to these issues. From the 1920s, scientists associated with ISCA like M. Visvesvaraya, Meghnad Saha visualised the reconstruction of the country through socialist planning and industrialisation. He added that national leadership also advocated socialism as the solution of India's problems and advocated a need for all-round national reconstruction. This commonality in views resulted in collaboration between scientists and nationalist leadership which led to the constitution of National Planning Committee in 1938 (Sinha, 2008, p. 10). The present section endeavours to analyse how various aspects of industrial development in India were reflected and visioned by the scientists associated with ISCA. It also discusses ISCA as a platform for showcasing the benefits that accrue from the association of science and industry.

The First World War started few months after the first session of ISCA. The experience of the War underlined greater need for self-sufficiency and industrialisation, evident in the

[546] Proceedings of the Eighty-Second annual session of the Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1995.
[547] Proceedings of the Eighty-Third annual session of the Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1996, p. 9.
[548] AICC Resolution on the National Congress relating to planning, industries and fundamental rights, 1929. See Abstract of Proceedings and other particulars relating to the National Planning Committee, Bombay: Karnataka Printing Press, 1939.

appointment of IIC in 1916 which examined and reported the possibilities of furthering industrialial development in India. Its report acknowledged greater realisation of the importance of industrial development in the public opinion and policy of the colonial government.[549] It also stressed the advantage of S&T research for the advancement of industrial development in India.[550] Among its committee members was an Indian industrialist, Rajendra Nath Mukerjee who was later elected as the President of the Congress in 1921. ISCA emerged as an important forum for professing centrality of science in industrial development. During its first session, Ashutosh Mookherjee underlined the usefulness of science for the commercial community and industrial regeneration in India.[551] Gilbert T. Walker also believed that scientific training and experimental methods could boost inventions and revolutionalise industrial processes to serve commercial industries.[552] P. C. Ray, General President in 1920, was also the founder of Bengal Chemicals and Pharmaceuticals Works in Calcutta. Although he did face problems initially as 'desi' pharmaceuticals were considered inferior to 'vilayati' drugs (Ray, 1958, pp. 74-90). He felt that India for India to become self-contained, it was crucial to convert its industrial raw materials into material products through the use of both pure sciences and applied science.[553]

The election of R. N. Mukherjee as ISCA's General president itself testified ISC's recognition of the importance of industrial development. He emphasised the significance of scientific investigations for industries and demanded financial assistance from government and industrialists, industries could not prosper without the scientific and technical skill. He recommended free and wider circulation of the papers relating to industries presented at the Congress as it was difficult for commercial bodies to undertake research. He acknowledged that Congress gave impetus to the promotion of scientific discoveries and their application to the development of industries. He added that businessmen were increasingly convinced about role of sciences in development and advancement of industries and opined that research

[549] Report of the Indian Industrial Commission, 1918, pp. xv-xx.
[550] Ibid, pp. 273-289.
[551] Proceedings of First Indian Science Congress, Journal and Proceedings of the Asiatic Society of Bengal, Calcutta: Asiatic Society of Bengal, 1914.
[552] Proceedings of the Fifth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1918.
[553] Proceedings of the Seventh Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1920.

students should live in close association with industries.[554] This could lay at the core of the demand made at ISCA's session in 1941, of a Metallurgical Research Laboratory close to the Tata Iron and Steel Company in Jamshedpur and a Fuel Research Board in the vicinity of Indian School of Mines in Dhanbad.[555] In his address in 1927, J. C. Bose stressed that economic welfare of the country was dependent on agriculture and industries with greater participation of scientifically trained and skilled people.[556] Numerous sections and general presidents underlined use of varied disciplines of science in solving industrial problems. While indicating centrality of sciences in commerce and industries for welfare of the people, L. L. Fermor underlined the importance of geological and engineering sciences for mining, metallurgical industries, hydro-electric plans, railways.[557]

There were scientists like M. Visvesvaraya, Meghnad Saha along with others who were closely associated with Industrialisation and planning in India. In 1920, Visvesvaraya published 'Reconstructing India', highlighting that trade and commerce were 'discouraged' and industries 'penalised' under British supremacy. He strongly criticised IIC for being conceived on wrong lines which gave undue control to the government (Visvesvaraya, 1920, pp. 153-172). He presided over ISCA's session in 1923, where he underlined the importance of scientific research for practical achievements, which simplified the manufacturing process and enabled increased industrial production, while discussing Great Britain's DSIR, established in 1916.[558] In 1925, Visvesvaraya became a member of the Indian Economic Enquiry Committee which reported economic condition of the people and suggested measures for increasing agricultural productivity, development of industries, redistribution of population based on the fertility of tracts, increasing efficiency of labour, machinery and developing country's resources and organizing man power.[559] He published 'Planned Economy for India' in 1936 to reiterate the importance of industries and made numerous recommendations

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[554] Proceedings of the Seventh Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1921.
[555] Proceedings of the Twenty-Eighth Indian Science Congress, Calcutta: Indian Science Congress Association, 1941.
[556] Proceedings of the Fourteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1927.
[557] Proceedings of the Twentieth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1933.
[558] Proceedings of the Tenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1923.
[559] Report of the Indian Economic Enquiry Committee, Volume 1, Government of India, Central Public Branch, Calcutta, 1925.

towards a bold policy for industrial development through his Ten-Year Plan for India (Visvesvaraya, 1936, pp. 37-72).

From 1935, Meghnad Saha wrote numerous articles on industrialisation and influence of Soviet example on Indian national reconstruction, in *Science and Culture*.[560] Both these scientists along with Prof. J. C. Ghosh[561] constituted the National Planning Committee in 1938 under the chairmanship of Jawaharlal Nehru. Initially, Visvesvaraya was appointed as the chairman of the committee but, Saha requested him to step down as he believed that the chairman had to be "top-ranking Congressman", else the decisions of the committee would be merely considered as academic (Chatterjee and Chatterjee, 1984, p. 71). However, when Planning Commission was finally formed in 1950, Saha was not a part of it and neither was the its industrial programme which came in 1953 was different from the original plan (Chatterjee and Chatterjee, 1984, pp. 72, 73). Nehru in his capacity of the NPC chairman was invited to preside over ISCA sessions as its General president in 1938 and 1942.

Nehru stated that the original idea of national planning was industrialisation as it could solve the problems of poverty, unemployment, national defence and economic regeneration. However, the NPC was split on various fronts there was a difference is socialist and big business approach and difference of opinion between those advocating for heavy industries and those who preferred growth of village and cottage industries which could employ large number of unemployed and partially employed, which will be discussed in detail in the following paragraphs. It was emphasised that the defence and key industries would be state owned and public-utilities industries would be under some organ of the government. At the first meeting of the Committee, twenty-nine sub-committees were appointed to investigate and report on specific problems, of which numerous dealt with industry. The members of these committees included university professors, scientists, technicians apart from others (Nehru, 1946, pp. 476-500).

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[560] His editorial articles in *Science and Culture* include 'Electricity- its use for the Public and for Industrialisation' (1935), 'Industries and Scientific Research' (1937), 'Problems of Industrial Development in India' (1937), 'Indian National Reconstruction and the Soviet Example' (1937), 'Congress President on National Reconstruction' (1938) and 'Technical Assistance to Indin Industry by the GOI (1938) (Karmohapatra, 1997, pp. 130, 131)

[561] J. C. Ghosh was an Indian chemist who presided over ISCA's session in 1939.

The presidential address during the silver jubilee session of the Congress in 1938 pointed the progress of industrial research in Great Britain.[562] Saha wrote article in *Science and Culture* emphasising on scientific and industrial research in India. During ISCA's session in 1939, J. C. Ghosh proposed the Board of Scientific and Industrial Research.[563] The exigencies of War highlighted the need for greater coordination between scientific and industrial research for national reconstruction and self-reliance in India. As a result, Board of Scientific and Industrial Research on the lines of DSIR was appointed by the Government of India in 1940. Wadia in his address in 1942 reiterated that the lack of planned liaison between science and industry as a serious handicap of industrialisation in India.[564] An extract from the speech delivered by Sir Henry Craik, Governor of Bengal viewed the establishment of the BSIR as an important landmark in the history of India's industrial development (Bhatnagar, 1988, p.16).

Ardeshir Dalal, committee member of the Board was elected as ISCA's President in 1941. Again, his election being an industrialist testified ISCA's support for industrialisation. The primary function of the Board was the promotion of industrial research and coordination of urgent needs with the long-term policy of industrialisation of the country. He underlined the progress of steel industry through the application of scientific knowledge and research in India.[565] In 1944, Dalal prepared the Bombay Plan along with other industrialists. Later in the same year, he was appointed the President of the Planning and Development Department. According to Bhatnagar, Dalal commanded respect and confidence within scientific and business community. The scientific and Industrial development was increasingly recognised important for economic development.[566] *Our London Letter* on April 6, 1945, reported that Ardeshir Dalal's visit to London was aimed at a meeting with Secretary of State to induce the British government to give Indians free hand in encouraging native enterprises. The report also underlined that the reception wouldn't be ideal as Dalal had previously disapproved of the introduction of British goods into Indian commerce as Indian industrialists could not compete

[562] Proceedings of Twenty-Fifth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1938.
[563] Proceedings of the Twenty-Sixth Indian Science Congress Association, Calcutta: Indian Science Congress Association, 1939.
[564] Proceedings of Twenty-Ninth Indian Science Congress Association, Calcutta: Indian Science Congress Association, 1942.
[565] Proceedings of the Twenty-Eighth Indian Science Congress, Calcutta: Indian Science Congress Association, 1941.
[566] Industrial Planning Underway, Appointment of Industrial Adviser to GOI, 3000/43/28, E&O 4374, 1944, F. No. 96-1-44-Pub (The British Library, London).

against their experience and resources.[567] On 13th May 1945, the *Sunday Dispatch* confirmed his meeting with the cabinet members, which may change the future of India. He aimed to negotiate with British Government for removal of impediments of the GOI Act which could hamper the development of industrial India. He wanted to discuss the supply of capital goods like machinery, machine tools, plants, etc. from Britain to India along with skilled British men to teach and train Indian foremen. He added that India did not aim to become a great exporter rather the aim was to raise the standard of living of the people of the country and be self-sufficient.[568]

S. S. Bhatnagar drew up plans chain of national laboratories. A committee of scientists and industrialists were appointed to recommend steps for scientific and industrial research measures for the promotion of research and viewed that research organisations and private firms needed to suggest.[569] S. S. Bhatnagar in his presidential address during ISCA's session in 1945 highlighted that A. V. Hill's invitation to India during the War was a result of insistence of CSIR. He underlined that it had achieved important results despite inadequate financial assistance from the government and industries and strongly emphasised on fullest support from them. He added the A. V. Hill's visit enabled Indian Scientific Mission to UK, USA and Canada to observe their scientific, industrial and agricultural developments. Bhatnagar who was one of the scientists, emphasised apart from mechanical warfare, scientific research had aided industry and agriculture immensely in addressing basic needs of humanity during the war. He also underlined the centrality of scientific and industrial research in the post-war industry in Britain and strongly voiced for industrialisation in India based on research.[570]

A V Hill attended ISC session in Delhi in 1944. He viewed scientific research as a useful by-product of the ill-wind of war and voiced for funds and facilities to be widely extended. He viewed scientific liaison between America, Britain, India and other dominions of the Empire

[567] Our London Letter on April 6, 1945 in Indian Post-War Industrial Development, Capital Goods required by India, Dalal Visit to UK, IRR/L/E/8/3616, E&) 27/46, Part 10 (The British Library, London).
[568] Sunday Despatch Reporter, May 13th, 1945, in file titled Indian Post-War Industrial Development, Capital Goods required by India, Dalal Visit to UK, IRR/L/E/8/3616, E&) 27/46, Part 10 (The British Library, London).
[569] Industrial Planning Underway, Appointment of Industrial Adviser to GOI, 3000/43/28, E&O 4374, 1944, F. No. 96-1-44-Pub (The British library, London).
[570] Indian Science Congress Association, *The Shaping of Indian Science, Indian Science Congress Association Presidential Addresses*, *Vol. I, 1914-1947*, Hyderabad: Universities Press, 2003, pp. 536-547.

as critical.[571] As a result, delegation of six Indian scientists including Nazir Ahmed, S. S. Bhatnagar, J. N. Mukherjee, J. C. Ghosh, S. K. Mitra, Meghnad Saha went to Great Britain to study their scientific and industrial organisation. S. K. Mitra noted that he was impressed by the mobilization of scientific talent across Great Britain and researches in different fields coordinated to produce fruitful results.[572] Hill also emphasised on the foundation of the central scientific organisation of research with six boards representing medical research, agricultural research, war research, industrial research, survey and natural resources and engineering research.[573]

Bhatnagar pointed that greatest achievement of science during the War was the creation of a new outlook on science by science across the world. He recognised the importance of science and scientists in the post-war period. The fullest consultation and active participation of scientists was considered crucial for planning and development departments across the world. The value of collaboration of pure and applied research was realised and was seen as a great achievement which would have far-reaching effects on human progress.[574]. The role of scientific community and ISCA emerging as an interface between scientists and the government and its role in S&T policy have been discussed adequately in Chapter Three of the thesis. ISCA's Forum for Economic Development organised a discussion on whether resource-based or need-based should be the guideline for formulating the Five-Year Plan for ensuring growth with stability.[575] Industrial development continue to hold a significant part in the discussions of the ISC.

[571] Visit of A V Hill to India and Visit of Indian scientists to this country, Information Department, L/I/1/73, File No. 16/26 (The British Library, London).
[572] Scientific Collaboration between India and Great Britain, Nature, Vol. 154, page 756, Dec 16, 1944, in Visit of A. V. Hill to India and Visit of Indian scientists to this country, Information Department, L/I/1/73, File No. 16/26 (The British Library, London).
[573] Ibid.
[574] S. S. Bhatnagar's talk on March of Science in War-Time at All India Radio, Delhi on May 21, 1945. See Public, File No. F.2/2/45 (The British Library, London).
[575] Proceedings of the Fifty Sixth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1969, p.33.

5.6. Agricultural Productivity and Rural Development

The Congress on numerous occasions advocated for industrialisation and collaboration between science and industry in India, which was reflected in the growth of sections and papers in related scientific fields. J. C. Bose during ISCA's session in 1927 said that economic welfare of the people of India was dependent on both agricultural and industrial progress.[576] At the same time, it strongly urged for expanding agricultural productivity and village and cottage industries, critical for industrialisation in India. Ashutosh Mukherjee during ISCA's first session of ISC emphasized on the importance of science for revolutionalising agricultural methods.[577] The IIC too recommended closer association between industries and agricultural for industrial development, through the application of scientific knowledge and research for utilisation of available resources. The section of agriculture and botany received numerous papers catering various agricultural issues. The sectional president of Agriculture and Applied Botany section in 1919, G. F. Keatinge identified socio-economic conditions of farmers and fragmentation of agricultural lands as major hindrances for agricultural improvement.[578]

Visvesvaraya too identified poverty, lack of education and crude, old-fashioned methods and implements, heavy dependency on rainfalls and absence of scientific agriculture as the reasons for low agricultural productivity (Visvesvaraya, 1920, pp. 4,5, 173-195). Therefore, he believed research and experimental work in agriculture was critical which was restricted to few central institutions, largely controlled by the Imperial and Provincial governments. He added that work of these institutions failed to reach the cultivators. Based on his experience of Japan, he voiced need for agriculturalists to undertake experimental work and initiate work towards agricultural improvement through central experimental farms and rural agricultural societies. He also stressed at better organisation of agriculture and scientific application so that the problem of population and food supply could be catered.[579] Albert Howard, General President of ISC's Bombay session in 1926, emphasized on the importance of application of

[576] Proceedings of the Fourteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1927.
[577] Proceedings of the First Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1914.
[578] Proceedings of the Sixth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1919.
[579] Proceedings of Tenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1923.

scientific knowledge and greater cooperation between various fields of science in solving problems of irrigation, plant diseases, soil quality, etc.[580]

P. C. Ray was convinced about the efficacy of spinning in every rural household and on the lines of Gandhi viewed it as the 'poor man's insurance to famine'.[581] However, his student Meghnad Saha was against the cottage industries and khadi movement (Karmohapatra, 1997, p. 89). Visvesvaraya noted flourishing minor and cottage industries in pre-British India occupation which could not compete with imported goods and suffered a decline, with the opening of foreign trade. He emphasised given the nature of the Indian economy, the small-scale and cottage industries were equally important. He believed that minor industries had to be given a foremost place in any plan for industrialisation (Visvesvaraya, 1936, pp. 37-72). After the Bengal Famine, Visvesvaraya in 1945 stressed on encouraging village industrialisation through grouping of villages for self-improvement and self-sufficiency of villages in India.[582]

As early as 1935, J. H. Hutton emphasised that rural economy required the aid of the scientists. He added that this realisation did not stem from greater population in rural areas but, from the recognition that the rural population was more conservative and greater need for new outlook. He identified that science could be utilised rural economy, diet and town planning for the benefit of the community.[583] On similar lines, ISCA's president in 1937 analysed past and present of Indian villages and underlined the advantages of industrialising the villages. He emphasised that the large-scale industries did not help the villager rather, they drew the labour and brains away from the village. Therefore, he opined for the development of cottage industries closer to agriculture and agricultural products for improving the living conditions of the villagers and village economies at large.[584] The lack of Mahatma Gandhi's involvement ISCA has been discussed in the previous chapter. Gandhi viewed the expansion of cottage industries as the future of India. He was against industrialisation rather criticised blindly aping

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580 Proceedings of Thirteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal 1926.

581 Proceedings of the Seventh Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1920.

582 The All-India Manufacturers' Organization, Brochure No. 2, Village Industrialisation, Scheme of Developing Industries by suitably grouping villages, M. Visvesvaraya, Bombay, 1945 (The British Library, London).

583 Indian Science Congress Association, *The Shaping of Indian Science, Indian Science Congress Association Presidential Addresses, Vol. I, 1914-1947,* Hyderabad: Universities Press, 2003, p. 342-355.

584 Proceedings of the Twenty-Fourth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1937.

western industrialisation blindly which according to him displaced small cottage industries and labour and had inherent environment, socio-economic problems (Khoshoo, 1995, pp. 4,5).

According to Nehru the future of India lay in the multiplicity of hydro-electric dynamos rather than spinning wheels.[585] However, Nehru stated that Congress under Gandhi wasn't opposed to big industries. Rather, it favoured co-existence of big industries and cottage industries. In India, there was lack of capital and abundance of labour. Nehru was against against absorption of western techniques without assessment of its impact. He supported heavy machinery and rapid industrialisation to fight pressure on land, poverty, raise standard of living, defense but he voiced for careful planning to curb its harmful impact. As coperatives had played an important role in Russia, even in India with rapid industrialisation a vast amount of field is open for small and cottage industries. G. D. H. Cole, the economist said that Gandhiji's campaign for home-made cloth industry was a practical step to fight poverty and raise the standard of living (Nehru, 1946, pp. 476-500). The socio-economic problems created by fragmentation of lands as well as the problem of land re-distribution after the Partition of India and large-scale migration was discussed during ISCA sessions just after India’s Independence.[586] However, S. L. Hora in address in 1954 had underlined that although India was an agricultural country with grave food problems there had been an absence of address by scientists concerned with agriculture. He also added that representatives from practical disciplines concerning animal husbandry, dairy farming, fisheries, etc. had not addressed the Congress.[587]

The first theme with the introduction of Focal Theme in the Science Congress in 1976 was ‘Science and Integrated Rural Development’. The General President, M. S. Swaminathan believed that although eighty percent of India’s population lived in rural areas, rural development had largely been sidelined. He made numerous recommendations and suggestions for assessment of rural assets and liabilities for planning an integrated rural

[585] Articles on Jawaharlal Nehru, primarily containing condolences on his death. See Daily Telegraph and Morning Post, May 24, 1964 in F236/366 (The British Library, London).
[586] Proceedings of the Thirty-Fifth Indian Science Congress, Part II: Presidential Addresses, Calcutta: Indian Science Congress Association, 1948.
[587] Proceedings of the Forty-First Indian Science Congress, Part II: Presidential Addresses, Calcutta: Indian Science Congress Association, 1954.

development based on scientific utilisation of its human and natural resources.[588] In 1978, M. L. Sircar also underlined that no significant improvement had been made in rural improvement despite steps taken by the government to ameliorate rural distress through small-scale cottage industries. He recognised that beside agricultural productivity, village economy was dependent on flourishing of agro-based industries which had not been given sufficient impetus. He underlined the lack of rural infrastructure and indicated numerous ways that could enable rural development in India.

5.7. Utilisation of Mineral and Natural Resources

The need for agricultural productivity and industrial development for national reconstruction, necessitated exploitation of natural and mineral resources. Thus, we see numerous presidential addresses centering around their scientific exploitation during its early history. Also, there were few addresses centred around its conservation before Independence. However, from the 1960s conservation of natural and mineral resources increasingly gained attention during ISCA's sessions. The IIC Report had stressed proper utilisation of available resources like agricultural products, minerals, forests and fisheries. During the same year, ISCA's General President, Gilbert T. Walker emphasised on the scope of expansion of forests resources through scientific research.[589] In 1922, C. S. Middlemiss also talked about the mineral wealth of the Himalayas, especially water which could be utilised for power generation and irrigation for domestic needs beside industrialisation, machinery and extraction of minerals.[590]

The teaching and research in geology became important, as a result growth was seen in ISCA's section of geology and numerous presidential and sectional presidential addresses dealt with the importance of geology for the service of the nation. The initial activities in geology was restricted to the work of the GSI. However, the importance of mineral explorations diversified the institutions involved a number of earth scientists. Prof. W. D.

[588] Proceedings of Sixty-Third annual session of the Indian Science Congress Association, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1976.
[589] Proceedings of the Fifth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1918.
[590] Proceedings of the Ninth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1922.

West viewed the importance of geology in the service of the nation.[591] L. L. Fermor's address focused on centrality of geology in choice of industrial sites, alignments for railways, development of mining and metallurgical industries as well as understanding earthquakes.[592] In 1939, During joint meeting of numerous ISCA sections emphasised on its importance for uniformity of physiographic divisions in India.[593] At the same time, sections of ISCA dealing with sciences concerned with other resources of the country like botany, zoology also expanded.

The extraction and utilisation of minerals available in the country, required application of sciences. Therefore, engineering especially civil and mechanical became important. ISCA's election of Visvesvaraya who was involved with the survey of hydrological scheme sites in South India in 1923. In 1925, M. O. Forster reiterated importance of mechanical and civil engineering for railways and irrigation in India, which helped in diminishing the consequences of seasonal failures.[594] J. C. Bose's address also underlined that scientific utilisation of available resources could help to solve the problem of poverty. Scientists like P. C. Ray, J. C. Bose, D. N. Wadia during its early years and numerous scientists in post-Independence era like S. S. Bhatnagar underline the importance of the intellectual resource of our country, which had to be properly trained and organised through an effective state policy.

In 1938, Meghnad Saha had noted that economic growth of the country depended on mining and utilisation of resources of the land and harvesting of energy of the rives. At the same time, finiteness of the resources was realised and need for technology to develop renewable sources of energy was felt. It was believed that identification of the problem of energy during ISC session would initiate discussions among scientists and technologists of various fields as it required a multi-disciplinary treatment. There have been numerous committee instituted to report on various aspects of fuel, energy, power, after the Power and fuel sub-committee under Meghnad Saha and River Training and Irrigation sub-committee of which Saha was a member in 1938. He forecasted the energy requirement by the twenty-first century and identified

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591 Indian Science Congress Association, *The Shaping of Indian Science, Indian Science Congress Association Presidential Addresses, Vol. III, 1982-2003,* Hyderabad: Universities Press, 2003, p. 764.
592 Proceedings of the Twentieth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1933.
593 Proceedings of Twenty-Sixth Indian Science Congress, Calcutta: Indian Science Congress Association, 1939.
594 Proceedings of the Twelfth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1925.

prospective energy resources which were renewable and necessitated research in R&D institutions for development of technology for their procurement and utilisation (Chatterjee and Chatterjee, 1984, pp. 66-73; Karmohapatra, 1997, pp. 96,97).

The Proceedings of ISCA indicate references made by its presidents towards conservation of resources as well as utilisation of renewable resources as early as 1927. In his address to the chemistry section, E. R. Watson spoke about economical utilisation of existing fuels and development of measures to tap solar energy for power production.[595] Similarly, Prof. S. K. Roy, president of geology section also addressed the issue of conservation of India's mineral wealth. Ardeshir Dalal address showed that power was most critical for the development of industries. As a result, he demanded proper utilisation and conservation of coal emphasising on a Fuel Research Board in Dhanbad.[596] D. N. Wadia's presidential address titled 'Minerals' share in War' saw the world as one economic and cultural unit. Therefore, he emphasised that resources spent on war had to utilised for the internal development of natural resources for greater security and prosperity.[597] In 1949, UN Conference on Conservation and Utilisation of resources was held, which underlined the international character of mineral resources and importance of gaining knowledge about the supplies of minerals in each country and coordinated efforts for their exploration and development for industrialisation. M. S. Krishnan's address in 1956 discussed 'Mineral Resources and their Problems'.[598]

Energy was increasingly recognised as major requirement both industry for agricultural. 1970s saw an energy crisis, which became a global concern. These global concerns seem reflected at ISCA sessions during the period. Between 1970-1980, atleast three general presidents' addresses dealt with mineral resources, their conservation and strategies for energy use. After the introduction of focal theme in 1976, the very next session's focal theme dealt with 'Survey, Conservation and Utilisation of Resources' presided by Dr. H. N. Sethna. It created a realization about the dwindling natural resources caused by the over-exploitation of the

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[595] Proceedings of Fourteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1927.
[596] Proceedings of the Twenty-Eighth Indian Science Congress, Calcutta: Indian Science Congress Association, 1941.
[597] Proceedings of the Thirtieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1943.
[598] Indian Science Congress Association, *The Shaping of Indian Science, Indian Science Congress Association Presidential Addresses, Vol. II, 1948-1981,* Hyderabad: Universities Press, 2003, pp.743-766.

resources by the developed countries. The need for rational policy for international trade in developing countries was also required for safeguarding natural resources. In this context, it was realised that India's efforts towards exploration, development and conservation of natural resources had been meagre. Although short-term plans were made in the context of the global crisis, there was a complete absence of long-term integrated planning.

The development and conservation of mineral resources and need for alternative renewable energy requirements were flagged by the A.K. Saha. In his presidential address on 'Energy Strategies in India'. He recognised that the aim of the pioneer scientists had largely been to develop energy potentialities and utilize them for agricultural and industrial growth for improving the life of the people of the country. This transformation from the time when its utilisation was primary and its availability was taken for granted to greater realization for its optimum utility, conservation and finding renewable sources of energy is clearly visible in the ISC. The survey, conservation and utilisation was critical for an integrated development of the resources. The need for a balanced approach when compared to over-exploitation of resources in developed countries and under-utilisation in developing countries. ISCA's session focal theme in 1983 was Management and conservation of ocean resources.[599] The emphasis on developing appropriate technology for exploring alternative energy sources and ensured an optimum utlisation of the non-renewable resources and efficient utilisation renewable resources with minimal wastage and recycling of was with less ecological impact. R&D activities for power development through alternative sources of energy.[600] The development of technologies for alternate energy sources was important sustainable energy development which emerged as one of the Millennium Development Goals of the UN in 2000.[601]

5.8. Assessing Impact of Science

ISCA recognised the centrality of S&T in national development and quality of life of the people. It emerged as a forum which strongly voiced against its use for destruction of

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[599] Indian Science Congress Association, *Shaping of Indian Science, Indian Science Congress Association Presidential Address*, 2003, Vol. III, 1982-2003, Hyderabad: Universities Press, 2003. pp. 1348-1350

[600] Indian Science Congress Association, *The Shaping of Indian Science, Indian Science Congress Association Presidential Addresses, Vol. II, 1948-1981,* Hyderabad: Universities Press, 2003, pp. 10334,1035.

[601] Indian Science Congress Association, *Shaping of Indian Science, Indian Science Congress Association Presidential Address*, 2003, Vol. III, 1982-2003, Hyderabad: Universities Press, 2003.

humankind. It also underlined scientists' role towards assessment of impact S&T use for development had on society and environment. Thus, ISCA sessions emerged as the opportune platform for emphasising greater wisdom in its use and only for the benefit of the human kind.[602] As experience of the World Wars, which touched all parts of the globe, had made the dangers of misuse of scientific discoveries visible.[603] Increasingly, both positive and negative side of the scientific work was evident and control of its lethal side was stressed.[604] It was believed that accomplishment of scientific efficiency, without moral uplift-ment led to lust for power which threatened the foundation of civilization. Although it was believed that science and scientists couldn't be blamed for misuse of the scientific discoveries, during ISCA sessions greater responsibility among scientists was reiterated to ensure that science was solely ustilised for human welfare and not for degradation and destruction of humanity.[605] As the world largely evolved as one economic and cultural unit, there was a need to shed an aggressive attitude and develop an earth-wide attitude based on 'humanizing influence of science'.[606]

The benefits of science were questioned on the ground of its utlisation during the two World Wars. It was believed that the perversion of science could be checked by foundation of an international directorate of science which contained economists, engineers and industrialists. He opined that there was an unequal distribution of minerals across the world and a planned international mineral policy could help eliminate the friction and increase greater international cooperation for the ultimate benefit of all and future security of the people. During WWII Wadia's address in 1942 underlined the dangers of the misuse of science and reiterated that pooling of scientific knowledge through pure science was mre important than its

[602] The Dewan of Mysore, Sir Mirza Ismail read out Maharajah's message during the opening proceedings of the Science Congress in 1932. See the Proceedings of the Nineteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1932.

[603] The sectional President, J. P. Mills address during the Congress in 1932. See the Proceedings of the Nineteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1932.

[604] L. L. Fermor's Presidential Address in the Proceedings of Twenty-First Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1934.

[605] The Vice Chancellor of the University of Madras during the opening proceeding of the Congress in 1940. See the Proceedings of the Twenty-Seventh session of Indian Science Congress, Calcutta: Indian Science Congress Association, 1940.

[606] Meghnad Saha's presidential address. See Proceedings of Twenty-First Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1934.

perversion.[607] It was realised at the end of the Second World War that scientists helped in the production of destructive material through scientific research. Therefore, greater sense of responsibility among the scientists could enable them to render post-war reconstruction. It was believed that members of ISC could play a critical role in reconstruction, as India was about to enter a new phase of self-governance which was largely dependent upon the progresses it made in scientific developments.[608] Nehru in many of his speeches before[609] and after India's Independence[610] clearly put forth India's commitment towards peace in the atomic age.

Increasingly atomic energy was viewed as a source of energy for future. As a result, numerous papers and symposia on nuclear fission were seen in ISCA's physics section. Its sessional members suggested foundation of an international organisation to promote full exchange of basic knowledge between scientists of all nations. This could control atomic energy against the destructive use of atomic weapons and promote its use only for humanity. The psychology and educational science section arranged a symposium on the psychological conditions of peace.[611] Nehru demanded greater responsibility among scientists against exploitation of their discovery. Criticisng the Hiroshima bombing, he strongly voiced that India would pave its way as a crusader of peace (Nehru, 1946). His support for science for its peaceful uses have been propagated on several occasions including the future sessions of the Congress. In the annual session of ISCA in 1947, the sub-committee of Science and its Social Relations, underlined use of atomic energy strictly for social welfare. It strongly deprecated restricting knowledge or the secrets of atomic bomb by certain countries and emphasized on scientific research on development and control of atomic energy along with popularisation of its social relations.[612]

The Atomic Energy Committee was chaired by Bhabha, Vikram Sarabhai and H. N. Sethna successively during 1948-1983. They served as sectional and general presidents of ISCA

[607] D. N. Wadia's address in the Proceedings of Twenty-Ninth Indian Science Congress, Calcutta: Indian Science Congress Association, 1942.
[608] The Vice Chancellor of the Mysore University, Mudaliar in the thirty-third ISC. See Proceedings of the Thirty-Third Indian Science Congress, Calcutta: Indian Science Congress Association, 1946.
[609] Jawaharlal Nehru's inaugural address at the Asian Conference in New Delhi on March 23, 1947. See Nehru Papers, Q/26/1/5 (The British Library, London).
[610] In most of his addresses during the inaugural sessions of ISC as well he has stressed on the utlisation of science for the well-being of the people of the country and not for destruction of mankind (Singh, 1986).
[611] Proceedings of Thirty-Third Indian Science Congress, Calcutta: Indian Science Congress Association, 1946.
[612] Proceedings of Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948.

during their respective tenures. In 1955, Nehru suggested Defence Science Organisation, GOI for an objective study of the consequences of the use of nuclear, thermonuclear and other weapons of mass destruction to understand what modern war would look like (Kothari, 1958, p. v). During the same year, Bhabha presided over the first UN Conference on Peaceful Uses of Atomic Energy at Geneva. In his address, he stressed on controlled fusion, which eventually led to declassification of secret work on the subject during the second session of the Conference in 1958.[613] The scientific committee of the UN General Assembly also in 1958, issued a warning about the effects of atomic radiation and believed that cessesation of nuclear weapons would be beneficial for human health as its radiations were bound to have genetical and somatic effects (Kothari, 1958, pp. vi-viii). D. S. Kothri with the help of Bhabha under the suggestion of Nehru wrote the book 'Nuclear Explosions and their Effects' which identified nuclear force as million times more powerful than chemical process and also discussed its effects on environment and health. (Kothari, 1958, p. 1).

India and its scientists' commitment to peace and usage of science primarily for peaceful purposes could also be seen in her involvement with the World Peace Council (WPC). WPC chaired by J. D. Bernal recognised the international crisis initiated by the conflict in Vietnam, and the dangers of its escalation into the Third World War which could largely be a nuclear war. The central aim of these Peace meetings was 'a world without war' by bringing together and enabling exchange between different countries and continents.[614] During its Delhi session in 1961, Sundar Lal Hora reiterated India's traditional and historical commitment to peace and Indian government's pledge towards Panchsheel. He noted that abolition of War with general and complete disarmament was the main objective of the World Peace Movement. He added that questions of stopping nuclear tests, banning manufacture of new nuclear weapons and destruction of all existing piles of such weapons was intimately connected with the general question of disarmament.[615]

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[613] Indian Science Congress Association, *Shaping of Indian Science, Indian Science Congress Association Presidential Address*, 2003, Vol. II, 1948-1981, Hyderabad: Universities Press, p. 647.
[614] Bernal Papers, No. 3 (The London School of Economics and Political Science library, London)
[615] Bernal Papers, No. 12 (The London School of Economics and Political Science Library, London)

With greater emphasis on application of science, the importance of the assessment of its impact was evident from the Proceedings of the Science Congress. Successive famine commissions had urged extension of irrigation works as a protective measure to increase agricultural productivity.[616] In 1926, Howard pointed the need for study of the de-merits and after-effects of scientific application.[617] Similarly, Visvesvaraya too in his report on the Lloyd barrage and canal project in Sindh in 1929, recognised the importance scientific construction and effect of barrage irrigation on sub-soil water level. He added that tendency of water logging causing malarial epidemics, necessitated scientific investigation and research in irrigation and agriculture.[618] Later, Meghnad Saha, during ISCA's Bombay session in 1934 indicated the importance of scientific study before construction of reservoirs, canals, hydroelectric schemes as its lack often led to malarial epidemics. Wadia viewed the introduction of machines and mechanics as a result of advancement of science, in the rural economy as a 'rude' intrusion which disturbed its economic structure and resulted in indifference among general public towards science.[619]

Bhabha gave a popular lecture on atomic energy during ISCA's session in 1959. From the latter half of 1950s we see concerns about its impact on environment and health of the people being raised by other scientists during ISCA sessions. These include popular lectures by Prof. N. B. Roy on 'Atomic Radiation and the Public' and symposium by section of physics on 'Radiation Hazards and Protection in 1957.[620] A symposium on 'damage radiation caused to human chromosomes' in 1973.[621] The health hazards of nuclear energy and decay of nuclear material was discussed during the joint meetings of the Congress in 1980. During the Seventy-Third session, M. G. K. Menon gave a general lecture on environmental consequences of

[616] Memorandum on Irrigation Works in the Bombay Presidency. ex. Sindh, prepared by Mr. M. Visvesvaraya, Executive Engineer, Public Works Department, Bombay, November 1901 (The British Library, London).
[617] Proceedings of the Thirteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1926.
[618] Report on the Lloyd Barrage and Canals Project in Sindh by M. Visvesvaraya and Nawab Ali Nawaz Jung Bahadur, Government Central Press, Bombay, 1929 (The British Library, London).
[619] Proceedings of the Thirtieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1943.
[620] Proceedings of the Forty-Fourth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1957, p. 23, 25
[621] Proceedings of the Sixtieth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1973, p. 31.

nuclear war. The committee of Science and its Social Relations emphasised on pros and cons of the atomic energy and development without destruction.[622]

These concerns come to life in the protests against the development of a reactor in Kaiga. Its planning and execution coincided with world's worst nuclear accident at Chernobyl in 1986. The nuclear technology was increasingly becoming a global concern with regard to its incomplete and unsafe technology. The Indian nuclear history had numerous instances of radioactive spillovers, accidental leakages and frequent malfunctions of the reactors and its auxiliary systems. It was noted that Kiaga's choice as a nuclear site was against the guidelines of the Atomic Energy Commission, since it was situated in an environmentally sensitive zone and received high rainfall. It was increasingly realised that instead of leading to a technological future, nuclear power would push India towards a technological blind alley and that its cost accounting its hazards, would outweigh its benefits. It was underlined that USA, Sweden, Switzerland, Finland, Denmark, Austria and Yugoslavia had rejected a nuclear future. After Chernobyl USSSR, UK and France had faced stiff pubic opposition. As a result, new safer and renewable sources of energy were being opted. The Chernobyl accident resulted in further mobilization against the nuclear projects in Karnataka. It is in this background, that Citizens for Alternatives to Nuclear Energy in Bangalore appealed for immediate moratorium on construction of the Kaiga Nuclear Power Plant in 1988. However, within four months more reactors were installed.[623] In 1998 session in Hyderabad a full day was allocated to celebrating and questioning the achievements of the nuclear power program (Anderson, 2010, p.9).

The impact of use of technology for increasing agricultural productivity was evident in the Green Revolution. ISCA scientists dealt with its various aspects and achievements. Prof. N. R. Dhar in 1975 gave a popular lecture on Green Revolution.[624] There were others who from ISCA's session in 1972, tried to understand the larger picture in the light of its shortcomings. The section of agriculture along with geology and geography jointly discussed the possibilities

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[622] Proceedings of the Seventy-Third Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1986, pp. 36,43.

[623] Booklet 'Why Kaiga?' by Citizen's Arguments Against the Nuclear Power brought out on the eve of national debate on nuclear energy in December 1988 sponsored by Government of Karnataka, Bangalore, p. 2-15. See Bernal Papers No. 12 (The London School of Economics Library, London).

[624] Proceedings of the Sixty-Second Indian Science Congress Part I, Official Matters, Calcutta: Indian Science Congress Association, 1975, p. 27

and limitations of Green Revolution.[625] Dr. P. J. Deoras popular lecture dealt with 'Green Revolution and Pests'.[626] Within few weeks of the Bhopal gas tragedy, the President of India in his inaugural address of ISC, expressed his concerns towards the loss of lives in Bhopal, caused by the tragic incident.[627] The president of the session, A. S. Paintal mentioned that research on high altitude problems could have proved useful for patients who had inhaled methyl isocynate after the accident in Bhopal had polluted the atmosphere. He noted that the Chemical Warfare Committee in 1918 had identified rest, warmth and oxygen as the primary treatment for inhalation of phosgene gas. But, he pointed that supply of oxygen was inadequate and rest was not ensured in Bhopal tragedy.[628] The mathematics section organised a special lecture on 'Bhopal gas leak a mathematical model'. While the committee of Science and its social relations and home science and nutrition along with the section of physiology, arranged a joint session to discuss various aspects of the Bhopal Gas Tragedy.[629] The emphasis on development without assessing its impact on environmental degradation received adequate importance during ISC sessions.

The growth of biosciences and genetic engineering led to greater recognition of risks related to human health and environment as a result of the transgenic products. These started a debated on growing ethical and social issues which had to be resolved.[630] As a result, bioethics term was coined and UNESCO formed an International Bioethics Committee in 1993, which prepared universal guidelines. In her address on 'Biosciences' Manju Sharma shed light on various ethical issues associated with the growth of biosciences and genetics. She also discussed the impact of GMOs on environment and human health and added that ensuring biosafety conformity necessitated awareness and familiarity with the rules.[631] Entwined with

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[625] Proceedings of the Fifty-Ninth Indian Science Congress, Calcutta: Indian Science Congress Association, 1972, p.30.
[626] Proceedings of the Sixty-First Indian Science Congress, Calcutta: Indian Science Congress Association, 1974, p. 47.
[627] Proceedings of the Seventy-Second Indian Science Congress, Calcutta: Indian Science Congress Association, 1985, p. 44.
[628] Proceedings of the Seventy-Second Indian Science Congress, Calcutta: Indian Science Congress Association, 1985, pp. 6-8.
[629] Ibid. p. 54,60.
[630] S. K. Joshi's presidential address. See Proceedings of the Eighty-Fourth annual session of Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1997.
[631] Proceedings of the Eighty-Sixth Indian Science annual session of Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1999.

the problem of internationalization of scientific research and greater international collaboration, has been the problem of IPR. ISCA sessions especially during 1990s reflect the IPR issues and its impact on scientific research and the Indian scientific community. Thus, we see a fair cognizance and reflection of the impact that new sciences, emerging technologies and development could have on the people of the country.

5.9. Environmental concerns and Natural Disasters

Indira Gandhi's tenure saw commitment towards nature conservation. Her awareness about human-nature relationship was usually traced back to her famous speech at the UN Conference in Human environment at Stockholm in June 1972. But, her association with nature dated back to early years of her life (Rangarajan, 2006, pp. 50-64). She emerged as a global champion of nature conservation (Ramesh, 2017, p. 54-92). The first recognition of atmospheric pollution at ISC was seen in a symposium organised by the section of physics[632], few months before the UN Conference. It is during the ISC session in 1973, few months after the Conference that we see its reflection in Gandhi's inaugural address. Her speech could be seen as the real beginning of ISCA's recognition of ecological and environmental crisis, that emerged due to lack of far-sightedness and rapid industrial progress.[633] At another ISCA session, she underlined the dangers of increased pollution because of thoughtless exploitation of nature. Although, she believed that late entry into industrialisation provided scope for India to recast the pattern of industrialisation on the experience of highly industrialised countries.[634]

Beyond PM's emphases, ISCA's general presidents discussed various facets of environmental degradation and ecological imbalance. Mishra noted exponential increase in the problems faced by earth and its environment. This was caused by the need to maintain a balance between population and resources which necessitated automation and led to problems of pollution of land, water and atmosphere. For the first time, the impact of these on the flora, fauna, marine eco-system and wildlife was talked about. It was believed that scientific,

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632 Proceedings of Fifty-Ninth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1972, p. 29

633 Prime Minister's inaugural address in the Proceedings of the Sixtieth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1973, pp. 43-44.

634 Prime Minister's inaugural address in the Proceedings of the Sixty-Third Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1975, pp. 35-41.

economical, technological and political measures for increasing national income caused change in the pattern of life, causing environmental anomalies and depletion of natural resources. There were increasingly seen as detrimental to human existence in the future.[635] The international nature of the problem of pollution and environmental degradation was underlined. The national and international efforts and made towards them were discussed. Greater collaboration and channelization of efforts and resources, across the world on equal terms was needed for growth of the environmental or ecological sciences.

The efforts made in this direction could be seen with the establishment in Vienna of an international institute sponsored by academies across the world. Also, UNESCO's Man and Biosphere inter-governmental programme invited solutions from scientists across the world. At the inter-governmental World Summit in 1992, Indian Prime Minister recognised the problem of continuous eco-system deterioration faced across the world and believed that an integrated solution for environmental and development concerns was required.[636] It was believed that sciences represented at ISCA could play a role vis-à-vis environmental problems. However, the task of scientists in every field was to measure, understand and predict environmental changes for which instruments had to be developed and experiments had to be undertaken. It was noted that through multi-disciplinary research a non-polluting technology could be built, to avoid the mistakes committed by the developed countries.[637] The National Environmental Engineering Research Institute in 1974 which encompassed all domains of R&D domains of environment. The environmental sciences were introduced in various universities and institutes in India. Khoshoo also stressed on awareness about ecological problems and need for formal education in schools and universities and R&D towards environmental problems[638] But, not until 1997, a forum for environmental sciences was

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[635] In his presidential address at the Canterbury Meeting of BAAS, Sir Kingsley Dunham raised the question, "Can our species survive the next hundred years?" quoted in R. S. Mishra's presidential address at the Nagpur session of the Congress, 1974 in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. II, 1948-1981, p. 1019.

[636] [636] General President Prof. U. R. Rao's address 'S&T for Achieving Food, Economic and Health Security' at Patiala in 1996, See Indian Science Congress Association, *Shaping of Indian Science, Indian Science Congress Association Presidential Address*, 2003, Vol. III, 1982-2003, Hyderabad: Universities Press, 2003, p. 1858.

[637] R. S. Mishra's presidential address at the Nagpur session of the Congress, 1974. See Indian Science Congress Association, *Shaping of Indian Science, Indian Science Congress Association Presidential Address*, 2003, Vol. III, 1982-2003, Hyderabad: Universities Press, 2003, p. 1019.

[638] T. N. Khoshoo address Proceedings of Seventy-Third Indian Science Congress, Calcutta: Indian Science Congress Association, 1986, p. 23.

initiated by ISCA, which continued till the turn of the century.[639] A sub-section of Earth system sciences, ‘environmental geoscience’ was seen in 2001 as well.[640] Although, full-fledged section on environmental sciences was initiated in 2003.

Indian government’s recognition of the problem of environmental degradation and nature conservation could be seen in the National Committee on Environmental Planning and Coordination under the aegis of Department of Science and Technology by Gandhi with B. P. Pal.[641] It sought for coordinated planning with the focus on environment for sustainable development (Rangarajan, 2006, pp. 50-64). The need for undertaking social cost benefit analysis before exploitation of non-renewable natural resources was strongly voiced and the ecological consequences was to be an important parameter for decision-making.[642] Since development was based on the exploitation of fossil and nuclear fuels. It is essential to assess the ecological problems like pollution they caused.[643]

This recognition could be seen in the constitution of the Central Pollution Control Board was constituted in 1974. Dr. S. Z. Qasim gave a popular lecture which focused on economic growth without environmental pollution. During the same session, engineering and metallurgy section organised a symposium on economic growth with minimum environmental pollution.[644] The need for solar power as an alternative to fossil and nuclear fuels was also underlined. Other facets of environmental problems were the conflict of interests and the irreversible harm caused if these problems were not catered.[645] The protection from environmental pollution was identified as one of national problems which required an

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[639] Proceedings of Eighty-Fourth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1997.
[640] Proceedings of Eighty-Eighth Indian Science Congress, Part I, Official Matters, 2001, Calcutta: Indian Science Congress Association, p. 125.
[641] B. P. Pal presided over the ISC session in 1971 at Bangalore. He also previously was the sectional president of the agriculture and botany section of the Science Congress.
[642] The presidential address by H. N. Sethna on Survey, Conservation and Utilisation of Resources, during ISC at Bhubaneshwar in 1977. See Indian Science Congress Association, *Shaping of Indian Science, Indian Science Congress Association Presidential Address*, 2003, Vol. III, 1982-2003, Hyderabad: Universities Press, 2003, p. 1081.
[643] R. S. Mishra’s presidential address at the Nagpur session of the Congress, 1974. Indian Science Congress Association, *Shaping of Indian Science, Indian Science Congress Association Presidential Address*, 2003, Vol. III, 1982-2003, Hyderabad: Universities Press, 2003, p. 1020.
[644] Proceedings of the Sixty-Third Indian Science Congress, Part I, Official matters, Calcutta: Indian Science Congress Association, 1976, pp. 38,41.
[645] Ibid.

integrated development of S&T resources.[646] The Department of Environment came up in 1980 followed by environmental laws under the Act of Environmental Protection in 1986. Indira Gandhi presented Technology Policy Statement (1983) by during ISC session. Its objectives lay in the harmony with the environment and aimed at preserving the ecological balance and improving the quality of the habitat.[647] During the same session, Vice President of India voiced for a dynamic and effective management of environmental degradation caused by industrialisation.[648] The environment received recognition in the Sixth Five Year Plan. It wasn't viewed as a sector of national development, rather it was seen as a guiding dimension for plans/programmes in all the sectors. The environmental problems were seen as a result of twin problems in India. One was as a result of poverty and under-development and the other was the negative impact of the process of development. The Plan identified the natural resources and types of pollution and underlined its programmes accordingly.[649] The Seventh Plan realised the importance of environmental management and its planning.[650]

During 1970s-1980s, chipko movement, wildlife protection, forest protection, ecological concerns aggravated by construction of dams largely talked about the conservation of nature (Rangarajan, 2006, pp. 50-64). A symposium 'Nature Conservation with special reference to Wildlife' was organised by the section of Zoology and Entomology in 1970.[651] Greater realization of the consequent impact on the environment and ecological balance of development. Paintal pointed that development and setting up industries in the Himalayan regions involved deforestation for construction of road, buildings, dams and reservoirs which often led to industry pollutants and long-term undesirable effects. Thus, environmentalists were not keen to promote developmental projects in these regions. However, social

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[646] First women General President, Asima Chatterjee's address 'Science and Technology in India: Present and Future' during ISC's session in 1975 at Delhi. See Indian Science Congress Association, *Shaping of Indian Science, Indian Science Congress Association Presidential Address*, 2003, Vol. III, 1982-2003, Hyderabad: Universities Press, 2003, p. 1029.

[647] Proceedings of the Seventieth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1983, p. 48

[648] R. Venkatraman inaugural address in the Proceedings of Seventy-Third Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1986, p. 29.

[649] Indian Planning Commission, Sixth Five Year Plan, 1980-85, New Delhi: Government of India, 1980.

[650] Indian Planning Commission, Seventh Five Year Plan, 1985-90, New Delhi: Government of India, 1985.

[651] Proceedings of the Fifty-Seventh Indian Science Congress (1970), Part I, Official Matters, Calcutta: Indian Science Congress Association, p. 35.

movements like the Chipko had also not stopped deforestation. He stressed that intensive steps had to be taken to maintain the status quo. An emphasis on planned tourism in these areas to avoid damage to ecological sensitive areas had to be made by proposed Department of Mountain Development. The Mountain Research Institute and Department of Environment could also play a major role in eco-development of hilly areas.[652] The schools and colleges were considered critical for gereating awareness about the conservation and sustainable development. At university level, there was a need for holistic approach to environmental sciences teaching. The PG teaching at IITs and few engineering colleges had to be linked to job opportunities which could be ensured by the government.[653]

ISCA through its sections tried to tackle them. The section of botany presided by Prof. H Y Mohan and later the general committee of ISCA, adopted a unanimous resolution which appealed the Government of Kerela and Government of India to reorient the plan for a hydel project in the Silent Valley. The realization of viable alternative possibilities led to the Silent Valley Forest ecosystem being declared as a Biosphere Reserve.[654] Later, declared a National Reserve in 1985 and formally inaugurated by Rajiv Gandhi in 1986. The importance of different sciences in dealing with aspects of environmental degradation and sustainable development were discussed during ISCA's sections presidents' addresses, special lectures, popular lectures, symposia, joint-meetings, plenary sessions.[655]

The environmental concerns occupied fair importance since beginning of the focal theme of the Congress. Some light was thrown of it during ISC's session in 1977. However, a focal theme 'Impact of development of S&T on environment was accepted for 1981.[656] During the

[652] A. S. Paintal spoke on 'High Altitude Studies, Mountain Preservation and Prosperity' during Lucknow session in 1985. See Indian Science Congress Association, *Shaping of Indian Science, Indian Science Congress Association Presidential Address*, 2003, Vol. III, 1982-2003, Hyderabad: Universities Press, 2003, pp. 1376-1384.
[653] The detailed address given by General President 'Role of S&T in Environmental Management'. See Indian Science Congress Association, *Shaping of Indian Science, Indian Science Congress Association Presidential Address*, 2003, Vol. III, 1982-2003, Hyderabad: Universities Press, 2003, pp. 1543-1546.
[654] Proceedings of the Sixty-Seventh Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1980, pp. 60,61.
[655] Proceedings of Seventy-Third Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1986.
[656] Proceedings of Sixty-Seventh Indian Science Congress, 1980, Calcutta: Indian Science Congress Association, p. 58.

session, Sharma in his presidential address discussed the problem of different types of environmental pollution and also made recommendations for curbing it.[657] In 1986, the focal was the role of S&T in environmental management. Yash Pal in 1990 stressed on the possibility of global-warming and the reasons that were pushing towards it. There was a need for sociologists, economists, scientists, technologists, experts in international relations and grass-root workers to co-evolve a 'Planet Assurance Programme' for a sustainable world. Discussions on these aspects were undertaken during the Congress.[658] It was believed that rapid deforestation led to soil erosion, desertification, flooding, changes in rain and climatic patterns, endangering and extinction of bio-diversity. The man-made environmental disaster caused by lack of management of natural resources and loss of bio-diversity appeared on the credit side of the state's ledger.[659] Paroda identified the risks faced by natural resources which caused soil degradation, deforestation, loss of biodiversity, water contamination and its scarcity and climate-change caused due to over-consumption and wastage in rich countries and population pressure in poor countries. Among these were newly emerged threats of climate change and global warming which was caused by green-house gases. It could lead to an increase in sea-level which could cause inundation of low-lying areas and depletion of ozone layer could impact earth's environment critically.[660]

The General President, Dr. T. N. Khoshoo's address focused on the environmental priorities in India and stressed environmental planning and updation of environmental law and need for international collaboration. He also suggested techniques for conservation of biological diversity and control of pollution.[661] The promotion of environmental sustainability increasingly gained importance. It emerged as one the goals set by member states at the global

[657] A. K. Sharma address in 1981 'Impact of the Development of Science and Technology on Environment', in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. III, 1982-2003, pp. 1717-1267.

[658] The address 'Science in Society' given by General President of ISC at Cochin in 1990 in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. III, 1982-2003, pp. 1231-1720.

[659] General President Prof. U. R. Rao's address 'S&T for Achieving Food, Economic and Health Security' at Patiala in 1996 in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. III, 1982-2003, pp. 1857-1861.

[660] The General President, R. S. Paroda in his presidential address at ISC in 2001 'Food, Nutrition and Environmental Security' in in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. III, 1982-2003, p. 2001.

[661] T. N. Khoshoo address. See Proceedings of Seventy-Third Indian Science Congress, Calcutta: Indian Science Congress Association, 1986, p. 23.

summit held at UN headquarters in New York in September 2000. Minister of Department of S&T, Murli Manohar Joshi in 2003, recognised the inability of S&T to make meaningful impact in solving the problem of environmental degradation and stressed on its greater role in this direction.[662] Kasturirangan's address discussed application of eco-technology in solving environmental issues through sustaining productivity, securing biodiversity and maintaining ecological integrity. It recognised that environment issues resulted from high dependence on fossil fuels and use of biomass. Although steps had been taken to develop both conventional and renewable energy sources, development of technologies as alternate energy sources for sustainable energy was crucial.[663] The centrality of environment could also be seen in focal themes for ISC's theme in 2007 and 2008 which centred around 'Planet Earth' and sustainable S&T respectively. Another associated concern was the utilisation of conservation of natural and non-renewable resources and greater emphasis on use of renewable resources, which had lesser impact on the environment. Thus, we see that environmental issues occupied a significant place in the deliberation of ISCA from the 1970s and continue to enjoy the same even in contemporary times with the introduction of a separate section on environmental science.

The natural disasters like floods, earthquakes also occupied a fair space in the discussions of ISCA. As early as 1916, the general president's address gave a scientific explanation of the causation of earthquakes. From the 17th century, Burrard noted that fifty-eight of the sixty-four destructive earthquakes occurred in the Indo-Ganges zone (pp. 24-25 Shaping of Science). The scientific study of earthquakes was further reiterated during ISC after the Great Bihar earthquake in in 1934. The scientific men of different sections discussed the reasons for earthquakes. They believed that successive catastrophic earthquakes in India necessitated appointment of a commission (comprising of geologists, physicists, meteorologists and engineers) which would report to the government on starting an All-India Seismological Society.[664] P. C. Ray and Meghnad Saha were deeply involved with rehabilitation after floods

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[662] Murli Manohar Joshi's address during the opening proceedings of the ISC session in Bangalore in the Proceedings of the Ninetieth Indian Science Congress, Part I, Official Matters, 2003, p. 76

[663] K. Kasturingan address 'Frontier Science and Cutting-Edge Technologies during Science Congress in Bangalore in 2003 in in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. III, 1982-2003, pp. 2035,2037.

[664] Meghnad Saha's editorial. See Science and Culture, Vol 1 No,.2, July 1935, pp. 63,64.

in Bengal. Meghnad emphasised on channelising river water to avoid floods. With an increase recurrence of natural disasters like floods, cyclones, earthquakes, droughts, the need for scientific understanding of their occurance as well as ways to curb and cope with it became necessary. Thus, D. K. Sinha's presidential addresses discussed the need for scientific intervention in disaster management strategy with threats rising from climate change. He underlined importance of an integrated approach based on scientific knowledge for coping with natural disasters.[665]

5.10. Hygiene and Health

The Report of the Indian Plague Commission and other studies attest to increased mortality rate due to diseases. The analysis of the causes of death in India during 1840-1921, identified diseases as the main cause of deaths during this period. It also noted that epidemics in the late 19th and early 20th century lead to loss of millions of lives. Klein opined that the efforts made by the British in public health proved ineffective which resulted in an era of crescendo of deaths. She also elaborated on the causes of deaths and stated that mortality from malaria, plague, cholera, dysentery, and tuberculosis, two severe famines, and the influenza epidemic of I9I8-I9 took a dreadful toll (Klein, 1973, p. 639-659). The IIC reported insufficient, intermittent or decline in labour population, as a result of ravages caused plague or outbreak of epidemic.[666]

ISCA emerged as a forum for underlining importance of medical research and coordination of sciences for fighting diseases and maintaining public health. W. B. Bannerman became ISC's General President in 1915. He had served as a Deputy Sanitary Commissioner in 1891 and was greatly involved with study and cure of plague at the Plague Research Laboratory. His election during the second year of ISC clearly indicate the importance it attached to sanitation, hygiene and public health in India. In order to fight diseases, one of the scourges in India The sanitarians, educated class, revenue officials together could educate the masses in rules of hygiene. The knowledge about hygiene was necessary from the elementary level in schools.

[665] Proceedings of the Seventy-Eighth Annual Session of the Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1991.
[666] Report of the Indian Industrial Commission, 1918, pp. 4, 20.

He also stressed the need for an Indian Bureau of Public Health which could educate the in ordinary rules of health, hygiene education to common people through pamphlets, popular lectures and lantern-slide illustration. The prevention of diseases became the priority wherever possible over their cure[667]. S. R. Christophers in his presidential address in 1930 at Calcutta stressed on the continuity and cruelty of diseases. He had said that diseases occupied the first ever-present sword among the two temporary and episodic ones i.e. war and famines respectively. The rural Bengal was disease ridden in the nineteenth century and wasn't a city of palaces (Sinha, 1928, p.21).

The improvement of health of the Indian labour caught attention in the IIC's report. It also discussed Sanitary Commissioner's proposal which emphasised on the importance of improvement of public health in the development of industries. It noted the loss caused by preventable diseases to both employer and the employed. The organisation of public health could help in tackling it and would also be critical for the industrial labour. The health of industrial workers could not be seen aloof from the general public health as the theyre is a constant movement of labour between the villages and the cities[668].

ISC emerged as a platform for professing medical research and greater coordination between different disciplines of science. Both Bannerman and Roger's addresses underlined the importance of government and private endowments for encouraging medical research. While Bannerman discussed the importance of knowledge of biology and indicated researches undertaken to study the causes and prevention of diseases like plague, malaria, flea[669]. Rogers in her opening message hinted at the hesitation he had in holding the position as 'medical science' has not found place in the scope of the meetings of the Congress. However, medical research was included as a section during the same Congress. The importance of collateral

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667 The presidential address 'Importance of a Knowledge of Biology to Medical, Sanitary and Scientific Men Working in the Tropics' by W. B. Bannerman at the Second Science Congress at Madras in 1915 in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. I, 1914-1947, pp. 6-15.

668 Ibid, pp. 179, 190-191.

669 The presidential address 'Importance of a Knowledge of Biology to Medical, Sanitary and Scientific Men Working in the Tropics' by W. B. Bannerman at the Second Science Congress at Madras in 1915 in in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. I, 1914-1947, pp. 8-14.

sciences in treatment of diseases and the advances made in researches on cholera which resulted in the decline in mortality of cholera was discussed[670].

Christophers and U. N. Brahmachari in 1930 and 1936 respectively discussed the advances made and role played by numerous branches of sciences in understanding the science of diseases which lay at the core of medical research. The medical sciences aimed to control suffering, prolong life and vigorous health. It was no more restricted to the study of disease and became increasingly concerned about the state of health[671]. In 1922, importance of psychology in dealing a boom in neuroses and psychoses as a sad legacy of the war, was discussed. Psychical research had gained attention in the meeting of the British Association in Cardiff in 1920. The inclusion of psychology as a section of ISC was proposed on these lines. Mental health began occupying a critical place and the practical aim of psychology in medicine through psychotherapeutics, psychotheraphy or psychoanalysis opened a new field of research[672]. Thus, we see that ISC widened the contours of medical sciences and also made the distinction between numerous sciences compromising, with emphasis in greater collaboration and cooperation. Mental hygiene is discussed during ISC in 1927.[673]

The Bhore Committee report in 1946 assessed the nature and scope for public health, medical education and research in India. However, it completely sidelined the indigenous medicine. However, the gap was committee's report can be seen filled by R. N. Chopra's address in 1948, *Rationalisation of Medicine in India* can be viewed as significant step towards the cause of public health in India. He voiced for an up-to date health organisation and medical relief on scientific basis for people of India. He identified the shortfalls of both indigenous and western medicine system in India. However, he believed that indigenous medicine couldnot be sidelined in India's health programme as it is economical and catered to a large population as people had faith in the system. Therefore, he believed that a comprehensive and rational

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[670] Leonard Rogers, General President of the Sixth Indian Science Congress delivered his address 'Researches on Cholera' at Bombay in 1919 in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. I, 1914-1947, pp. 68-79.

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[672] C. S. Middlemiss gave an address on 'Relativity' at Madras Science Congress in 1922 in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. I, 1914-1947, pp. 109-111.

[673] First European sectional president of the Psychology section, Lt. Col. Owen A. R. Berkeley in the Proceedings of the Fourteenth Indian Science Congress (1927).

system of public health required partial synthesis of the indigenous and western system of medicine was required. Also, B. Mukherji's address on *Impact of Life Sciences on Man* for the first time after Bannerman in 1915, discussed the importance and researches in biosciences for the future of the country. ISC showcased the progresses made in the health sector. A decrease in infant mortality rate, increased longevity, eradication of small-pox was underlined. However, there was a need for strengthened coupled research with health delivery system. The sub-centres, primary health centres and community health centres had to be made effectively functional[674]. Leonard Rogers in 1919 had stressed on the necessity of medical research workers to work in close proximity with large hospitals to let them work on practical lines.

The importance of developing a comprehensive primary healthcare delivery system in the country was considered essential for health security. The basic healthcare information and assistance were important for remote areas and tele-medicine was considered crucial for timely health-care assistance. The developments in medical technology helped treatment of genetic diseases. The ethical issues, potential risks involved in experimentation and the cost of therapy was a problem that the new bio-sciences faced. It also complained of limited financial resources for health care, clean water and sanitation as against allocation for defence and energy, transport and communication. The last three of which could be privatized. The recommendation included implementation of adequate sanitation measures in urban areas. Also, an increase in R&D allocation for health care from 2 to 6%. The recommendations for strict measure to be strict conformity of the instutied against industries that contributed to environmental pollution and deforestation. The newly established must conform to the environmental norms. The existing industries must be made to implement environmental protection measures.[675]

Also A. P. Mitra in 1989 had discussed the scope of scientific intervention in drinking water mission. The genetic engineering had the potential of alleviating diseases by producing new

[674] P. N. Srivastava's presidential address 'Science in India: Excellence and Accountability' during ISC's Jaipur's session in 1994 in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. III, 1982-2003, pp. 1794,1795.

[675]General President Prof. U. R. Rao's address 'S&T for Achieving Food, Economic and Health Security' at Patiala in 1996 in the book *Shaping of Indian Science, Indian Science Congress Association Presidential Address*, 2003, Vol. III, 1982-2003, pp. 1882,1883.

drugs, better diagnostics. There are scope of genetic engineering doe environmental protection and remediation. Biotechnology is an alternative for highly polluting industries. There was a need to enhance capabilities in recombinant DNA technology which could strengthen efforts toward bio-fertilizers and bio-pesticides. Efforts should be made to use modern tools for conservation of endangered species which had both medicinal and economical value. Traditional knowledge system of medicine along with biotechnological inputs could produce herbal products and plant-based drugs which could have a huge international market. The biomedical research could help in treating Cancer, AIDS, Alzheimer, Parkinson disease, etc. Although biomedical and genetic engineering have started ethical issues Among the earliest successes of biotechnology was the manufacture human insulin. Other products included diagnostic kits, growth hormones, etc. He noted that last two decades has re-emergences of diseases like TB malaria also an increase in AIDS and HIV cases 22.6 million.[676]

The importance of self-sufficiency in drugs and pharmaceuticals at economical cost for the masses through indigenous production was emphasised during the Science Congress. Bengal Chemicals and Pharmaceutical Works Ltd. was the first instance of an attempt at indigenous production of quality chemicals, drugs and pharmaceuticals. However, its preparations struggled immensely to compete with the *vilayati* preparations which were considered superior (Ray, 1958). Although, the preparation of pharmaceuticals in India was unsatisfactory.[677] The Government of India appointed a Drug Enquiry Committee in 1930, of which Chopra was a member, to enquire into the extent to which chemicals and drugs of impure quality or defective strength are imported, manufactured or sold in India and suggest recommendation.[678] Chopra highlighted acute shortage of drugs faced during Second World War. B. Mukherji in his presidential at the Physiology section in 1942 emphasised on the need for a laboratory primarily for drug research which was reiterated by Chopra in his address in 1948. The Central Drug Research Institute came up in Lucknow in 1951.

[676] General President S K Joshi's address. See ISCA, *Shaping of Indian Science, Indian Science Congress Association Presidential Address, Volume III:* 1981-2002, Hyderabad: Universities Press, pp. 1894-1896.
[677] Indian Medical Gazette, Vol. LXIV, 1929, p. 389.
[678] Indian Medical Gazette, Nov. 1930, p. 640-642.

Bhore Committee had shed light on shortage of drugs and medical appliances caused by the war, which caused disruption of the medical relief organisation. However, the report sidelined the indeginisation of manufacture of drugs, pharmaceuticals and medical equipment on the grounds of high cost of production, non-availability of raw material and speacialised character of few appliances whose manufacture could take too long for India coupled with the difficulties of patents. However, an ad-hoc committee formed under Chopra's leadership was suggested by the Bhore Committee. The Panel for Fine Chemicals, Drugs and Pharmaceuticals represented by leading scientists and representatives of important drug manufacturers and chemical engineers from USA, submitted the report in 1946. Their report underlined manufacture of all essential drugs and its availability for the masses at economic price. Chopra's address on similar lines emphasised drug research. Although he recognised importance of assistance from western countries, he strongly emphasised on research of indigenous materia medica though training in India He suggested compilation of Indian pharmacopoeia and reiterated need for permanent pharmacopoeia committee for rationalization of medicine in India. He underlined the importance of drug standardization and drug control to curb adulteration.

India targeted complete eradication and control of diseases like HIV/AIDS, kala-azar, leprosy, lymphatic filariasis and polio. The discovery and advances made in biosciences revolutionized production of vaccines, enzymes which could play a critical role in immunization and prevention of infectious as well as carcinogenesis and auto-immune diseases. Increasingly from the 1970s the health hazards caused due to environmental pollution was discussed during ISC sessions.

5.11. Food and Nutrition

The Indian Empire (except Burmah, the eastern parts of Bengal and Sindh), experienced recurrent famines during the eighteenth and the nineteenth century. It was identified as one of the primary causes of death in India (Klien, 1973, pp. 639-659).[679] It was believed that the

[679] See Report of the Indian Industrial Commission, 1918, pp. 4,5.

problem of food supply was fundamental for the material progress of the country.[680] Since its early history, lack of adequate food and problem of mal-nutrition among the Indian population had caught adequate attention during the sessions of the Science Congress. Increasingly, the scientific research was considered crucial for solving these problems facing the country.[681] Beside food crisis, the problem of mal-nutrition received adequate attention of the Congress. By the fourteenth session, section on nutrition emerged within the section of agriculture. However, it was observed that it had not catered to the problem of nutrition aptly.[682] Later, it emerged as a sub-section of the Medical and Veterinary research.[683] The studies in nutrition was identified as a chief development in medical research in India.[684] The importance attached to the problem of nutrition by the Science Congress could be seen in a various general discussions and joint meetings arranged by distinct sections[685]. The sections of medical and veterinary research with physiology organised a general discussion on the problem of nutrition in India during ISC's twenty-third session. It emphasized a need for a "Indian" dietary standard as nutrition lay at the core of numerous diseases. It recognised intimate relation between nutrition, agriculture and public health. A need for a formation of a central committee for coordination of nutritional investigations in different centres in India was put forth along with a national food policy. As a result, an "Indian Nutrition Committee" was set up for coordination of nutritional work at various centres.[686]

The problem of starvation and nutrition was recognised by scientists and political leaders[687] before the Independence. However, the experience of the Bengal Famine and greater

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[680] Dr. Gilbert J. Fowler quoted in M. Visvesvaraya's presidential speech at the ISC session in 1923, in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. 1, pp.130.
[681] Ibid. pp. 129,130.
[682] Proceedings of Fourteenth India Science Congress, Calcutta: Asiatic Society of Bengal, 1927
[683] Proceedings of Twenty-Sixth Indian Science Congress, Calcutta: Indian Science Congress Association, 1939.
[684] The sectional president of Medical and Veterinary research, Lt. Col. H. H. King address in the Proceedings of Nineteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal,1932.
[685] The section of medical research in cooperation with the Society of biological Chemists organised a discussion 'Nutritional Diseases in India'. The section of Physiology with Society of Biological Chemists organised a discussion on 'Diet and Adaptation to Climate. See Proceedings of the Twenty-Fifth Indian Science Congress, Part IV, Discussions, Calcutta: Indian Science Congress Association, 1938, pp. 46,47, 50-52.
[686] Proceedings of Twenty-Third India Science Congress, Calcutta: The Royal Asiatic Society of Bengal, 1936.
[687] Jawaharlal Nehru in a message sent on the occasion of the Silver Jubilee of the ISC held at Calcutta in 1938 had said that India was a rich country inhabited by starving people (Singh, 1986, p. 2).

recognition of the problem internationally[688] was also evident at the Science Congress during those years. Although Bengal had seen severe famines in 1770 and 1886, it was believed that the Famine of 1943 had no parallel in history, as a result of which many thousands of people had starved and perished. It was viewed as a man-made catastrophe, which was aggravated by visitations of nature.[689] McDougall's memorandum underlined the importance of the science of nutrition for health and collaboration between health and agriculture for solving the problem of nutrition and increasing food production. Thus, the United Nations programme for tackling the problem of food through Agriculture American was proposed. In 1943, D. Roosevolt convened a UN Conference on Food and Agriculture where he said

> Agriculture the basic of all human activities, agriculture basic of all human needs, twice the people involved as compared to others field of activity, all people vital interest in food, adult to get nourishment too important for all over the world. Primary responsibility of all nations to have food and nutrition for all, all nations can achieve this if we all work together.

The recommendation for a permanent UNO was accepted by forty nations in 1945 at Quebec and FAO was formed. A year after its creation, it convened a Special meeting on Urgent Food Problems in Washington on May 1946. The meeting not only tackled the immediate food crisis but also prepared a set of proposals for dealing with old-age issues related to food production. Its task included dealing with world censuses, plants pest control and emergencies with food relief (Phillips, 1981, p. 1-7).

FAO's foundation attested to recognition of the importance of agriculture and freedom from hunger across the world. M. Afzal Husain who was the member of the Famine Enquiry

[688] There were numerous works in the post-depression period, especially in 1930s across the world relating to nutrition. Therefore, there was a growing trend internationally to increase the production of food to meet the nutritional needs of the population.

[689] The period 1931-1941 saw a twenty percent increase in population without rise in net sown area. It was underlined that the economic troubles of Bengal was largely due to pressure of land by increasing population. Narayan added that there was a deficit in rice tonnage even during peace times and had to import rice from Burma. However, with the loss of Burma to Japan in 1942, meant a loss of food for nine million people. The government did not stop the export of food and did not build central grain reserves. There were no efforts made to increase nation's food supply. With the loss of Burma, a stream of evacuees poured into Assam and especially Bengal which attracted a large proportion of labour force as a result of numerous war industries (Narayan, 1944, pp. 1-19). The winter crop of 1942 was not satisfactory and there was an unrest in the rice market by the beginning of 1943 and saw a six hundred percent rise in price of rice by May, 1943 which couldn't be afforded by a large population of day-labourers, petty agriculturalists, artisans, traders, etc. As a result, they started migrating to nearby towns and cities, by July 1943, the streets of Calcutta saw groups of people begging for food (Das, 1943, pp. 1-11).

Committee addressed the Science Congress as its General President in 1946. His minute on the report of the Famine committee showed strict similarity with his address at the Congress. He noted short supply of rice and insufficient production of protective food like pulses, milk, meat, fish, fruits and vegetables. There was a need felt for the change in traditional diet which was largely was low on nutrients necessary for health. These required a change in cropping pattern, introduction of high yielding crops and scientific rather than traditional food policy with fulfilled the nutritional requirements of the people.[690] On similar lines his presidential address during ISC's session in 1946 also discussed 'Food Problem in India', which had become an important problem across the world with increasing population. He invited cooperation from the scientists in providing the solution to urgent problems and devised solution already enumerated in the minute of the Report mentioned above. The centrality of the problem could be seen on its emphasis across various sections, joint meetings, discussions held during the same session. The chemistry section emphasized on food technology, nutritive value of ghee and vitamins. The agriculture and botany sections held joint discussions and reviewed the effects and results of 'Grow more food campaign'[691]

Bengal Famine in India was seen to have been caused as a result of culmination of the larger economic condition during normal times rather than a sudden accident like an earthquake and a flood[692]. The famine had killed millions in Bengal and other parts of India which was aggravated by the burden of the War and the policy of the government leading to slow starvation which certainly was the cruelest death (Nehru, 1946, p. 498). The Bhore Committee also touched on various aspects of nutrition problem in India. The Report quoted Dr Aykroyd's observation on the insufficient and ill balanced diet which was typical of the food consumed by millions in India, who was the Director of the Nutrition Research Lab in Coornoor. The diet of the population is seriously defective in terms of quantity and quality[693][694].

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[690] Minute by M Afzal Husain, 'Science or Tradition' on the Report of the Famine Enquiry Committee. See, IOR/L/E/8/3321, E&O 6064/45 (The British Library, London).

[691] Proceedings of Thirty-Third Indian Science Congress, Calcutta: Indian Science Congress Association, 1946.

[692] Professor P. C. Mahalanobis who was the Statistical Adviser to the Government of Bengal gave an address to East India Association titled The Bengal Famine' The Background and Basic Facts. See, IOR/L/E/8/4283, E&O/2134/1946, pp. 333-345 (The British Library, London).

[693] National Institute of Nutrition (NIN) was founded by Sir Robert McCarrison in the year 1918 as 'Beri-Beri' Enquiry Unit in a single room laboratory at the Pasteur Institute, Coonoor, Tamil Nadu. Within a short span of

Nehru viewed famines as 'India's Sickness' (Nehru, 1946, 498) and identified India as an 'hungry starving country', where providing food for all was of primary concern for the government[695]. In an address in 1949, Nehru declared

> I desire to make it perfectly clear that whatever happens, whether there is a cyclone or an earthquake, we are determined to stick to the target date of 1951, after which we shall not import food grains for consumption.[696]

Apart from recognising the problem, ISC became a platform for showcasing how sciences and scientists could help in solving these problems. Mahalanobis in his address showed how statistics could help in solving food crisis and how based on statistical data, a rational food policy could be framed. Apart from attaining food sufficiency by 1951, there was a need for providing basic necessities of life like clothing, housing to the people which had to be kept in pace with the rising population[697]. The food security and nutritional diet continued to be discussed during ISC sessions in post-independence era. The Committee of Science and its Social Relations organised a symposium on 'Food and World Population' in 1948[698]. However, Hora believed that magnitude of the problems of malnutrition, diseases, santitation and housing had not been reflected in the election of the President.[699]

A symposium on 'Nutritional Disorders in Man and Animal' and 'an approach to mal-nutrition in India' were organised by sections of Medical and Veterinary Research in 1957[700] and 1970[701] respectively. The sectional president of Chemistry, B. Sanjiva Rao address revolved

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seven years, this unit blossomed into a "Deficiency Disease Enquiry" and later in 1928, emerged as full-fledged "Nutrition Research Laboratories" (NRL) with Dr. McCarrison as its first Director. It was shifted to Hyderabad in 1958 (Report of the Health Survey and Development Committee, 1946, pp. 54-60).

[694] See, Report of the Health Survey and Development Committee, 1946, pp. 54-60

[695] Nehru's presidential address during the Thirty-Fourth session of the Science Congress before Independence held at Delhi on Jaunary 3rd 1947 (Singh, 1986, p.5).

[696] Nehru quote in Mahalanobis presidential address during the Thirty-Seventh ISC at Pune in 1950 in the book Shaping of Indian Science, Indian Science Congress Association Presidential Address, 2003, Vol. II, 1948-1981, p. 625.

[697] Op, cit. p 5., Ibid. p. 629.

[698] Proceedings of the Thirty-Fifth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1948, p. 51.

[699] Proceedings of the Forty-First Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1954.

[700] Proceedings of the Forty-Fourth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1957, p. 25.

[701] Proceedings of Fifty-Seventh Indian Science Congress, Part I. Official Matters, Calcutta: Indian Science Congress Association, 1970, p.35.

around the conservation of vitamin, improvement in storage and cooking quality of rice[702]. While General President of the Forty-Sixth session, A. L. Mudaliar, underlined the neglect of dietetics in the early twentieth century, he noted the R&D in scientific study of preparation, preservation and supply of safe food-stuffs. The sectional president of Anthropology and Archaeology, Prof. M. L. Chakrabarty discussed ‘Place of Nutrition in the Growth of Man[703]. The mutual dependence of anthropologists and nutritionists in understanding the food habits and diet of the people is visible in a discussion of ‘Growth and Nutrition’ arranged jointly by Sections of Anthropology and Archaeology with Medical and Veterinary research[704].

However, Hora complained that India faced enormous food problems and malnutrition. But few scientists concerned with agriculture and malnutrition addressed the Science Congress. Although, various solution through animal husbandry, dairy farming and fisheries were implemented but, no representatives of these disciplines were elected to the Presidential chair[705]. Atleast three sectional president’s vis—a-vis, Medical and Veterinary Sciences, Agriculture Sciences and Physiology dealt with various aspects of mal-nutrition and food requirement in India, which recognised it an impediment in National Development and tried to provide solutions to it[706]. We see addresses on nutrition and food supply by various sectional presidents in the following years as well[707]. Its connection to health was also dealt with in numerous popular and special lectures[708] as well as strategies for food supply during 1970s was jointly discussed by sections of statistics and agriculture sciences[709].

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702 Proceedings of the Thirty-Fifth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1948, pp. 259-270.

703 Proceedings of the Forty-Sixth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1959, pp. 3-5, 122-138.

704 Proceedings of the Forty-Ninth Indian Science Congress, Part IV, Late Abstracts, Discussions and Members, Calcutta: Indian Science Congress Association, 1962, pp. 99-101.

705 Proceedings of the Forty-First Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1954, pp, 2-3.

706 Proceedings of Fifty-Seventh Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1970, p.195-244.

707 K. N. Sharma’s address to the section of Physiology in Proceedings of Fifty-Ninth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1972, pp. 270-290.

708 Like N. R. Dhar’s popular lecture ‘Food and Health’ in Proceedings of Fifty-Ninth Indian Science Congress, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1972, p. 28.

709 Ibid. p. 30.

During the first year of the introduction of focal theme in 1976, popular lecture and a number of symposia and joint meetings talked on various facet of nutrition largely centred around the focal theme of rural development[710]. The introduction of focal theme also coincided with the emergence of a Forum for Home Science and Nutrition to cover particular disciplines of science and discussed topics pertaining to the focal theme[711]. It was reported that the as a result of an increase in the activities of the Forum, it was raised to the status of a statutory committee. Thus, forum got reorganized in 1988 as Committee for Home Sciences. It organised a two-day session. It also emphasised on the importance of home scientists in community development[712]. The forum scope was not restricted to the syllabus and vocalization of courses of home sciences. Rather, the forum also sent recommendations concerning women's rights with respect to succession, divorce and guardianship of children well as energy education and instruction in IGNOU in regional languages[713]. The committee organised session on 'Home Science and Quality of life' and on fast foods. A total of fifty-eight papers were presented. It made six recommendations relating to the focal theme along with three others relating to aspects of home science and family life[714]. The study of Home Science was seen critical for development of need-based technology along with popularising and transfer of technology into the community leading to income generation and better quality of life[715]. Although the committee wasn't seen in 2002. Although, various aspects of food security and nutrition entwined with health occupied fair attention even after the introduction of focal themes in popular, general and special lectures as well as symposia and joint meetings. But, it formed the central focus of the themes of the Science Congress only in 1990s. Only twice the focal theme revolved around food and nutrition primarily in 1996 and 2001. The United Nations Millennium Declaration had committed to combat hunger. Ensuring food and nutrition for a country with one billion population was seen as a major challenge

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710 See Proceedings of the Sixty-Third Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1976, pp. 38-42.
711 Proceedings of the Sixty-Third Indian Science Congress, Part I, Official matters, Calcutta: Indian Science Congress Association, 1976, p. 37.
712 Proceedings of the Seventy-Fifth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1988, pp. 122-124.
713 Proceedings of the Seventy-Ninth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1992, p. 107.
714 Proceedings of the Eightieth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1993, pp. 97,98.
715 Proceedings of the Eighty-Second Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1995, pp. 119-123.

which required an integrated strategy with use of genetic (with the growth of emerging technologies in biosciences and genomic research), information and communication and eco technology[716].

5.12. Population

ISC identified the problem of population growth and viewed that scientific investigation and research was crucial for understanding and tackling it. As early as 1918, the importance of statistical application to gauge the problem of population was noted[717]. Visvesvaraya in his address also identified population as one of the future concerns for India which demanded urgent scientific investigation and research[718]. Venkatraman noted that the stress of population had increased the dependency on agriculture in rural areas[719]. The population of India saw a marked increase. It was believed that if the tendency continued, the rate of population increase could multiply further. Hill estimated that the population could touch 650 million by 1970. Thus, need was felt to remain prepared for such a rise in population increase and efforts be made to check the growth of population. The increasing pressure of population had to be seen in congruence with the available food resources. As indicated the need for curbing population growth was emphasised but, ISC hardly saw any discussion on the methods that could be employed to check it. Although, family-planning was supported by the National Planning Committee and Bhore Committee Report. During the very first session after Independence, Committee of Science and its Social Relations organised a symposium on food and world population. The war, famine in Bengal and the partition led to large shifts of population. According to Mahalanobis the density of population was high. He added that the population had increased at about 1.4 percent for the Indian union. Although the war and partition slowed down the increase but still the rate of population increase was high. In 1952 the section of anthropology arranged a discussion of the problem of refugee in the Bengal in the light of the

716 Kasturirangan address See proceedings of Ninetieth Annual Session of Indian Science Congress, Part II, Presidential Address, Kolkata: Indian Science Congress Association, 2003.

717 Gilbert T. Walker's Presidential Address. See Proceedings of Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1918.

718 Visvesvaraya's Presidential Address. See Proceedings of Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1923.

719 Venkatraman's Presidential Address. See Proceedings of Indian Science Congress, Calcutta: Royal Asiatic Society of Bengal, 1937.

large-scale migration caused by Partition.[720] The First Five Year Plan noted that the reduction in birth rate only could stabilize the population. In congruence to this, there was a steady expansion in the field of family planning from the second plan. During ISC in 1969, a problem of population was discussed. During the same session, physiology of family planning and population control was discussed. It was also identified as a problem that need scientific investigation and research for tackling. The national planning was dependent on population. During the very first session after Independence, Committee of Science and its Social Relations organised a symposium on food and world population. ISC sessions became reflective of the social-economic condition prevalent in the society.

With the introduction of the focal theme, the intensification of R&D efforts towards population stabilization was seen as the first step by Swaminathan. He identified and reported the initiation of new areas of research as well as progress made towards population control, which had to be fully supported. These included vaccination against fertility, male contraceptives and immunization with special placenta proteins. A number of discussions, symposiums and lectures centred around the issue of population control and family planning was organised during ISC. During ISC session in 1956 two lectures and a symposium on various aspects of family planning were organised. These included by B K Roy's special lecture on census and new dimensions of social studies. The section of anthropology and archaeology organised role of behavioural scientists in Family Planning. The physiology of Family Planning and Population Control was also arranged during the same session[721]. B P Pal's presidential address recognised that the family planning campaign had to strive to slow down and ultimately reduce the rapid expansion of human race[722] The joint meeting of the sections of physiology and medical and veterinary section discussed the Physiological basis for population control[723]. The section of statistics, physiology and medical and veterinary

[720] Proceedings of the Thirty-Ninth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1952, p. 23.
[721] Proceedings of the Fifth-Sixth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1969, pp. 32,33.
[722] Proceedings of the Fifty-Eighth Indian Science Congress, Part II, Presidential Address, Calcutta: Indian Science Congress Association, 1971, p.1.
[723] Proceedings of the Sixty-Fifth Indian Science Congress, Part I, Official Matters, Calcutta: Indian Science Congress Association, 1978, p. 35.

sciences organised the joint meeting on the population census with reference to 1981[724]. The problems and prospects of population growth in the context of India was jointly discussed by the sections of psychology and educational science and statistics[725].

The International Conference on Population in 1984 at Mexico observed that growth in population in many countries had outstripped the available natural resources and aggravated environmental degradation. Therefore, there for a sustainable development, there was an urgent need for population stabilization. As a result of poverty, more children were seen as more hand to work in rural areas. The birth date had to be controlled by an expansion of the coverage of the family planning programmes. The literacy, education and vocation for women was also considered important along with the need for safe, effective, inexpensive and acceptable contraceptive methods in curbing population growth. It was believed that the population size shouldn't not outgrow the carrying capacity as it population explosion was a time bomb which had not been defused. Zero Population growth was seen as the solution to the well-being of the country. There government needed to evolve a population policy in coordination with all its institutions along with public and private sector. Prime Minister Rajiv Gandhi during his inaugural address in 1988 also emphasized on the need for a safe and socially acceptable means for reducing population growth. Although, population was acknowledged as a problem for development during numerous sessions, it became its focal theme only in 1992. The theme was Science, Population and Development which viewed population dynamics was viewed as a critical variable for development. In 2001, It was acknowledged that Green Revolution had temporarily won the war against hunger. However, continued increase in Indian population was a rising problem. Paroda emphasised on the need for population management. According to him literacy and most importantly female literacy was critical for curbing population explosion in India. He also added that uniform efforts had to be made across all sections of the society. Kasturirangan in his presidential address in 2003

[724] Proceedings of the Sixty-Seventh Indian Science Congress, Calcutta: Indian Science Congress Association, 1980, p.37.
[725] Proceedings of the Seventieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1976, p. 58.

forecasted that population which was one billion was expected to stabilize at 1.4 billion in the following two three decades[726].

5.13. Poverty

In his address in 1921, Vivesvaraya observed that about thirty-one percent of the total population India lived in conditions nearing destitution. He also added that the poorer section of the Indian population had squeezed its basic necessities to bare minimum. He believed that poverty was central to problem of low standard of living and lack of food supply. According to him, it was a preventable disease, largely due to undeveloped resources and untrained population. He added that these problems could be solved by introduction of engineering, agriculture, education and economics of which none of them by then had been included within the scope of the Science Congress. Although they existed in the British Association[727]. With the exception of economics, all the others were later included within the scope of ISC. Bose in his address noted that poverty was a major concern for India. He added that poverty was practically absent in most countries that he had visited. He believed that both industries and agriculture is necessary for the economic welfare of the people in India and in dealing with poverty[728]. Most Prime Ministers identified poverty as a crucial problem that faced India. Rajiv Gandhi quoted Nehru who stressed that the objective of science was to remove all ills of the society. It had to have a social objective before it. According to Rajiv Gandhi the primary social objective was alleviation of poverty. He added that S&T had to be taken to the villages and applied to their most basic problems. The section of botany and psychology and educational science arranged symposium on poverty, poverty alleviation and need for people centred policies and structure.

It was seen that about 100 million out of the total population of 320 million lived in destitution. About seventy-five percent in mud houses with thatched roofs. Poverty in India was seen as a preventable disease which was largely due to undeveloped resources and untrained population. Bose opined that both industries and agriculture is necessary for the

[726] Kasturirangan's address. See proceedings of Ninetieth Annual Session of Indian Science Congress, Part II, Presidential Address, Kolkata: Indian Science Congress Association, 2003.
[727] Visvesvaraya's Presidential Address. See Proceedings of Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1923.
[728] Proceedings of Fourteenth India Science Congress, Calcutta: Asiatic Society of Bengal, 1927.

economic welfare of the people in India and in dealing with poverty. He identified poverty as a major concern for India.[729] Poverty was identified as a critical problem that faced India which was recognised by almost all Prime Ministers of India. During 2001, Paroda also underlined need for alleviating poverty.

5.14. Education and Unemployment

During the very first session of ISCA spread of scientific education was considered one of the tasks of the Association.[730] Although, scientists associated with ISCA have constantly stressed on the importance of scientific teaching and research. There also were instances of the importance of attached to general education in India.[731] During 1940s, the section of educational science had evolved as a part of the section of psychology.[732] This attests to the importance ISCA attached to education. However, even after emerging as a section of ISCA and problems of basic education from elementary to higher education that India faced, there was an absence of an educationist as the President of ISCA.[733] Although most of the sectional presidents of the combined section of Psychology and Educational Science had been psychologists before 1947. During the first session after India's Independence, Dr. Zakir Hussain was elected as the sectional president of this section. He discussed the 'Principles of Educational Reconstruction'. He was also chosen to monitor the progress of the recommendations of the section as well.[734] The election of D. S. Kothari and educationists like Humayun Kabir during two successive sessions of ISCA during 1963 and 1964-65 attest to ISCA's focus on education.[735] However, since then few General Presidents have touched on the general education in their presidential addresses. But we do see a greater focus towards scientific teaching and research. Education occupies a prominent place in the focal theme of

[729] Ibid.
[730] Proceedings of the First Indian Science Congress, Journal and Proceeings of the Asiatic Society of Bengal, Calcutta: Asiatic Society of Bengal, 1914.
[731] Proceedings of the Seventh Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1920.
[732] Proceedings of the Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948.
[733] S. L. Hora Presidential address. See Proceedings of Forty-First Indian Science Congress, Calcutta: Indian Science Congress Association, 1954.
[734] Proceedings of the Thirty-Fifth Indian Science Congress, Calcutta: Indian Science Congress Association, 1948.
[735] See ISCA, *Shaping of Indian Science, Indian Science Congress Association Presidential Address*, *Volume II:* 1948 - 1981, Hyderabad: Universities Press, pp. 872, 889.

the Congress in 1978[736] and 2002.[737]

Before the outbreak of the First World War, there was a growing widespread belief that the basis of employment could be widened through industrial development. We see some mention of the problems of unemployment during ISCA sessions before Independence. However, during the post-Independence many General Presidents' addresses as well as discussions and symposia deal with the problem of unemployment. Schlesinger viewed the student unrest in India as a result of problems faced within the universities. The study also noted that at the time of Independence, the total number of universities were thirteen which increased to forty-five by 1960. The quest for 'white-collar' jobs and greater unemployment among the educated unemployed found their expression in student unrests (Schlesinger, 1963, pp. 218-223). Altbach showed that there were student movements prior to Independence. But they lost momentum with the end of the political struggle. However, with the growth of arts and science colleges and greater accessibility of higher education rural and lower middle-class young graduates aggravated the ever-present problem of unemployment in India. The poor standard of education, inadequate facilities of libraries and laboratories, old-modeled syllabus, poorly trained teachers were identified as some of the others reasons for student unrest in India (Altbach, 1966, pp. 448-460). During ISC session a discussion was arranged on the student unrest in India. In his address in 1976, M. S. Swaminathan opined that the population-unemployment ratio equation would in the future years assume greater importance than than food supply and population equation.

5.15. Conclusion

During the period of study ISC evolved as a mirror for the socio-economic problems that the country faced. It certainly emerged as a forum which tried to cater to these issues through S&T. ISCA played dual role of professionalisation and diffusion. Besides, playing a critical role in professionalisation of science in India, ISCA played most central role in reflecting and responding to the socio-economic issues faced in India. It recognised the role played by

[736] Ibid. p. 1085.
[737] See ISCA, *Shaping of Indian Science, Indian Science Congress Association Presidential Address, Volume III:* 1981-2002, Hyderabad: Universities Press, pp.2014.

science and scientists in assuring general well-being of the people of the country. Its sessions and general presidents' addresses reflected the cognizance of the socio-economic issues like ignorance and affinity to superstitions among the general masses of people. ISCA through its annual sessions tried to generate general awareness among the people and inculcate critical and scientific thinking in the society. Apart from advancement of science, it aimed at diffusion, dissemination of scientific thinking and S&T information. Thus, popularising of science in India. ISCA supported and helped growth and diversification of the community of people interested and involved with science.

The initiation of committee of science and its social relations can be viewed as an important indicator of ISCA's recognition of science and social relations. ISCA members have played a central role in industrialisation and planning in India apart from emphasising on the need for agricultural advancement and rural development. At the core of agricultural and industrial advancement lay the exploitation of natural and mineral resources. ISCA session saw the progression from survey and exploitation of resources to conservation and finding alternative strategies for energy in the wake of the growing global energy crisis.

Besides, underlining central role that scientists and science played in national development, it emerged as a forum which strongly advocated against the use of science and scientific discoveries for destruction of humankind, primarily limiting the boundaries of its use only for the welfare of the society. ISCA increasingly began concerned about the impact of rapid industrialisation and utilisation of S&T on the society and environment. The environmental issues and the need for its management emerged as an important theme from the 1970s. ISCA's activities, evolution of forums on home science, economic development, science and society clearly indicate its commitment towards the larger socio-economic issues of food security, nutrition, health, hygiene, population explosion, poverty, unemployment and illiteracy. The choice of its focal themes after their introduction in 1976 also indicate that most of the themes were in sync with these problems facing the country which continued even after globalistion.

Chapter 6

Perception of Scientists about the Indian Science Congress

6.1. Introduction

The previous chapter tried to situate ISCA within the larger socio-economic context. It assessed the extent to which socio-economic issues and larger political concerns were reflected during ISCA's sessions. The chapter underlined the change in deliberations of its annual meetings after 1976, with the inception of the focal theme which mostly seemed to reflect the larger issues facing the country. The previous chapter underlined that ISCA's sessions mirrored the socio-economic issues like poverty, hunger, mal-nutrition, illiteracy, population explosion and public health. At the same time, it aimed to inculcate scientific thinking and popularise science among the general public. Along with mirroring socio-economic and larger political concerns, it also highlighted the role of science and responsibility of scientists in recognising and addressing them. There was a greater recognition of the impact of 'development' on natural and mineral resources and concerns were raised about environmental degradation. Thus, we see numerous focal themes and general presidents' addresses centred optimum utilisation and conservation of natural resources as well as greater concern for environmental degradation. With economic liberalisation, we see ISCA's general presidents also discussed the importance of quality of human resources, education, problems of brain drain and IPR issues.

The present chapter tries to gauge the perceptions of the scientific community in India about ISCA. The attempt here, is to situate the Congress within the range of views that have emerged over the years about its organisation and structure. The need for such an assessment grew in the light of recent debates that evolved around the annual sessions of ISCA which caught immense media attention. Since the previous chapters have clearly pointed at the roles ISCA has played from the time of its inception until early decade of the twenty-first century. Thus, it would be interesting to understand its composition and contribution in the contemporary times. The participation of its annual's meetings by Indian scientists widely recognised for their scientific research and discoveries both within India and abroad, clearly attest to its viability. Its role in shaping a scientific community in India, institutionalisation and professionalisation of science and mirroring socio-economic issues facing the country have been adequately discussed in the previous chapters. Therefore, it is in this background that it is pertinent to understand views held by the scientists today about its annual meetings. Besides assessing scientists' perception at present, it also tries to assess their views as early as 1960s. Historicising their perception from the 1960s, helps us in gauging continuity and changes within the organisation of ISCA. Recently, ISC annual meetings were under scrutiny on the grounds of its nature of participation, its aims and purpose as well as its structure and organisation

The chapter is largely based on personal visits to its annual meetings and interviews of scientists quoted in digital media, such as blogs of scientists and articles published in *Current Science.* Further, it takes into account the views of delegates gauged from a non-structured interview of school children, graduate and post-graduate students, young research scholars, college and university teachers who were in the early phase of their research career along with senior scientists, etc., taken during ISCA sessions held Mysore, Tirupati and Jalandhar in 2016, 2017 and 2019 respectively. Apart from the observations made during the ISCA sessions, the attempt is also based on few young research scholars, young and senior scientists whom I met at other conferences as well as those from JNU and the Wildlife Institute of India, Dehradun.

6.2. Participation at ISC's sessions

ISC's sessions clearly qualify as one of the most widely attended meetings annually. This is clearly evident in the rising number of delegates who attend Science Congress each year. There was a total of 6000 delegates at the ISC in 2010 (Gopinathan, 2010, p. 886). while the organisers at Lovely Professional University in 2019 claimed that a total of 30000 delegates attended the Science Congress in 2019 at Jalandhar. Iyer highlighted that a 'heartening' number of researchers participated in the ISCA sessions (Iyer, 2000, pp, 538,539). Kasturirangan who the General President of ISCA's session in 2003, opined that the Congress served the wider function of helping the scientific community as there were no other forums that air their aspirations of the community except the Academy meetings which hardly represented and served about 800 fellows (Sen, 2003, p. 490).

R. C. Mehrotra in his address as the President of Local Reception Committee in 1970, had on the increase in number of delegates at ISC. He highlighted that the Congress is increasingly called by many as 'unwieldy social get-together'.[738] This can be attested to by it being increasingly called as 'mela'[739], 'Kumbh-mela'[740], 'annual fair'[741][742], 'magh-mela'[743], etc. by a number of scientists. H. S. Virk went ahead and emphasised on the similarities between kumbh-melas and the meetings of Indian Science Congress. The city of Pune according to Virk during the Science Congress became a sea of humanity. He added that he was relieved that there was no stampede unlike those during kumbhmelas (Virk, 2000, p. 1052). An Indian origin Professor from USA, who was invited for the second time for ISC session saw it largely as a 'Science Fair'. P. Balaram believed that the presence of foreign scientists and Nobel Laureates provided respectability to the Congress (Balaram, 2012, p. 1255).

As discussed earlier, election as General President and Sectional President of ISCA was seen as a mark of distinction by the scientists and the scientific community at large. The rolls of the executive committee, members, General Presidents' saw presence of scientists who were widely recognised for their scientific research like Ashutosh Mukherjee, J. C. Bose, P. C. Ray, C. V. Raman, Meghnad Saha, S. S. Bhatnagar, P. C. Mahalanobis, M. Visvesvaraya, etc. Even during the Post-Independence era, scientists like J. N. Mukherjee, D. M. Bose, S. K. Mitra, M. S. Krishnan, T. R. Sheshadri, M. S. Swaminathan, etc. were elected as General Presidents. However, from the last decade of twentieth century, it was increasingly hinted that "noted" scientists barely attended ISCA sessions. Nevertheless, every year Nobel Laureates were invited for ISCA's annual sessions. The ISC saw participation of a galaxy of 'who is who' of S&T in India (Jain, 1994, p. 334). A scientist at the Wildlife Institute of India, Dehradun had

[738] Proceedings of Sixty Second Indian Science Congress, Part I, Official Matters, Calcutta: ISCA, 1975, pp. 31.
[739] Virk, 2003 p. 240, Virk, 2000, p. 1052; Sen, 2000, p. 290.
[740] Virk, 2000, p. 1052.
[741] Iyer, 2000, pp. 538-539.
[742] Raina,available at https://www.livemint.com/Politics/B7qYIlQ0wM2Mdo4tdvrtxK/Is-the-annual-Indian-Science-Congress-losing-its-relevance.html
[743]Mehrota, 2000, p. 138.

expressed that the Congress was largely attended by senior scientists and science bureaucrats.

Haldane in *Scandal of Bombay Science Congress* mentions that the meetings of the Science Congress do not seem to attract distinguished Indian scientists as it did before (Haldane, 1965, p.24). However, a number of senior scientists equated the national science event as a 'political affair' unworthy of attending.[744] Dinesh Abrol, a retired senior scientist of National Institute of Science, Technology and Development Studies observed that although ISC sessions saw lower participation from professional scientists, it certainly was widely attended[745]. Iyer also identified the 'conspicuous' absence of stalwarts and pioneers in various fields. He tried to address the question of the absence, through his personal conversation with the delegates at the Calcutta and Pune Science Congress sessions during 1995 and 2000 respectively. He identified that the yearly nature of the sessions and the climate prevalent at the time the Congress was held, were the reasons for their absence (Iyer, 2000, pp, 538,539). Similarly, P. Balaram also noticed that very few noted scientists attended the Science Congress. However, he acknowledged the presence of 'well-known speakers' mostly 'stars of their field' during the plenary sessions. (Balaram, 2012, p. 1255; Balaram, 1999, p. 1411). Nobel Laureate, Venkatraman Ramakrishnan underlined that he was told that it was more like a 'mela' and serious colleagues hardly attended the session. After attending the session in Mysore in 2015, he refused to attend any future sessions of the Science Congress.[746] On similar lines, C. N. R. Rao expressed that ISC was no longer attended by serious scientists. According to B. G. Siddharth, Director of the B. M. Birla Science Centre in Hyderabad, Science Congress had become a platform for closely known associates who indulged in the practice of favoritism.[747]

Another reason cited by a number of scientists was that proliferation in number of scientific societies specific to every sub-field and academies which held their specialized conferences could be viewed as another reason for their absence (Balaram, 1999, p. 1411; Tauro and Rao, 2008, p. 1113). A scientist at the Wildlife Institute of India, Dehradun emphasised that inter-

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[744]See https://journosdiary.com/2016/01/17/indian-science-congress-an-annual-ritual-losing-its-meaning/(accessed on May 1,2019).
[745]See (https://www.livemint.com/Politics/B7qYIlQ0wM2Mdo4tdvrtxK/Is-the-annual-Indian-Science-Congress-losing-its-relevance.html(accessed on May 1, 2019).
[746]See https://journosdiary.com/2019/01/10/talks-at-indian-science-congress-need-to-be-vetted-by-serious-committees-says-venkatraman-ramakrishnan/(accessed on May 1, 2019).
[747]See https://timesofindia.indiatimes.com/india/Science-Congress-a-circus-Scientists-split/articleshow/50476408.cms(accessed on May 1, 2019).

disciplinarity and trans-disciplinarity were much talked about but, the scientists increasingly worked in silos. Therefore, other conferences like *Yeti* increasingly became popular and they stopped going to the Science Congress. While assessing the representation of senior women scientists it was found that their participation was almost negligible in the sectional meetings as speakers, presenters, session-chairs, discussants and during plenary sessions of the Congress. Even though there was one female speaker invited each at the Animal and Veterinary and Animal Science Section at the Mysore session in 2016, there were no women scientists at the plenary during the same session. The presence of senior and professional women scientists remained restricted to the Women Science Congress. During the Mysore session's Fifth Women Science Congress, a female physicist of Jawaharlal Nehru Centre for Advanced Research expressed her view that there was a greater need for more women speakers at the ISC rather than holding a separate Science Congress for women. Similar need was emphasised during the Women Science Congress in the following year. However, beyond the Women Science Congress deliberations which remained restricted to a day or maximum two days during the ISC sessions and few plenary lectures and poster presentations, the lesser representation of women scientists in ISC did not seem to be a cause of concern for most scientists.

A similar split in opinion about participation in ISC annual sessions emerged from non-structured interviews taken during ISCA sessions and otherwise. Atleast, nine retired senior scientists and professors claimed that they were life-members and had attended the Congress regularly on most occasions from the time of their association with the Association. Most of them were associated with ISCA from 1970s. However, one of them who had also been a General President of ISCA during one its session recalled his participation as a student since 1957 while another recalled that he attended the first session in 1963 and had not missed any sessions except on occasions when he was out of the country and one otherwise. While the interviews quoted on various digital platform, did bring forth instances where scientists who had been associated or had attended ISCA's session in the past no longer attend it due to a variety of reasons. The professional scientists like Krishna Joshi, Madhavan Nair and Asis Datta said that they had stopped attending and participating in ISC's activities as ISCA was increasingly administered by a 'group of master manipulators who aimed to retain and control the administration'.[748] It might be in this regard that Virk went ahead and underlined that the no office of ISCA should extend beyond five years (Virk, 2003, p. 240). N. R. Dhar who presided over the session in 1961 had said that absence of favour to the friends of the organisers would ensure the success of the future meetings of the Congress (Sen, 2003, p. 970).

The low participation of young scientists was a cause of concern emphasised primarily during the 1960s. This is evident in the observation made by two scientists during ISC sessions in 1960 and 1961. In 1960, Haldane[749] marked that there was a general absence of young scientists during the special and popular lectures, who lay at the core of advancing science in India. He went on to say that the whole set-up of the Congress was an example of repression of young workers by their seniours. He identified it as a regrettable feature of Indian science which lay at the root of the flight of young scientists from India. Nehru in his address during the opening proceedings of the same session had underlined the concern of drain of young scientists to foreign countries for better facilities and pay. Haldane went on to suggest that Nehru should refuse to attend Congress sessions till the injustice to younger generation was remedied (Haldane, 1965, p. 22). N. R. Dhar in 1961 also noted on similar lines that, the 'big guns' of the Nehru regime had disappeared from the field and it was the opportune time for young scientists to work hard and create a brotherhood of science (Sen, 2003, p. 970). In his inaugural address to ISC during the early 1960s, Jawaharlal Nehru repeatedly told the senior scientists to encourage the younger scientists (Singh, 1986, pp.75-90). Certainly, ISC provided a platform for greater encouragement for younger generation scientists.

Recently, ISC session increasingly saw the participation of young delegates. These included school students at the Children Science Congress, graduate and post-graduate college students, research scholars. It also saw participation of college teachers, assistant professors, scientists from institutions across India. The Children Science Congress also known as Rasthriya Kishore Vaigyanik Sammelan began in 1993. A total of eighty-five projects were exhibited by

[748] See https://www.deccanherald.com/content/433504/indian-science-body-accused-irregularities.html (accessed on May 1, 2019).

[749] J. B. S. Haldane was a British geneticist and physiologist. He became an Indian citizen in 1960 and founded the Genetics and Biometry Laboratory at Bhubaneswar (Clark, 1969). He wrote *Science and Indian Culture* which was published in 1965.

young school students from various government and private schools across almost all states of India during Mysore session in 2016. Out of these eight-five projects, atleast thirty-four projects were presented by female students especially from government schools from smaller towns. During ISCA's annual session in 2019, about 120 projects through a national competition were selected and exhibited by school students. These students were accompanied by their science teachers in most cases. Apart from the student delegates of the Children Science Congress, a group of science students of class 12th accompanied by two teachers attended the session.

Among sixty-nine student delegates who were interviewed during ISC session, 33 percent were research scholars while the rest were graduate and post graduate students. Of the total student members interviewed about thirty-nine percent were female students. While the research scholars largely came alone or in a group of two three, graduate and post-graduate students mostly came in huge groups, along with teachers in few cases from across all states in India. A number of students came from science colleges and universities in smaller towns and cities like Kolhapur, Bhopal, Pondicherry, Mysore, Jhansi, Hassan, Varanasi, Lucknow, Bhubaneshwar, Patna, Madhepura, Bodh Gaya, Bihar Sharif, Madya, Sagar, Jamner, Chittor, Coimbatore, Vishakapatnam, Tanjore, Tezpur, etc. There were students of Punjab, Patna, North Orissa, Bhim Rao Ambedkar University, Lucknow, etc. A number of students came from across various colleges in Maharashta. This could be seen in sync with Prof. Dhruv Raina's observation in an interview that ISC gave an opportunity for those from small science colleges in *mofussil* towns and young scientists from villages to get introduced to foreign scientists.[750]

There were very fewer students and research scholars of bigger cities like Delhi, Pune, Chennai, Kolkata, Hyderabad, Bangalore, etc. except in cases when the Congress was hosted in these cities and fewer delegates well-known institutions. This can be attested to by the interview of few scientists. A research scholar from a well-known institution said that her supervisor had discouraged her from attending the session. However, there were atleast five students from IISc, Bangalore who presented their posters at the Mysore session in 2016.

[750]See https://www.livemint.com/Politics/B7qYIlQ0wM2Mdo4tdvrtxK/Is-the-annual-Indian-Science-Congress-losing-its-relevance.html(accessed on May 1, 2019).

Professor from AIIMS opined that he was really happy about the great number of youngsters participating in ISC. When enquired if AIIMS students also attended the Science Congress he answered that ISC was primarily a forum for basic sciences. He added that his students mostly attended specialised conferences with their professors. Atleast six professors including assistant, associate and senior professors from the Wildlife Institute of India, Dehradun said that they along with their students largely attended specialised conferences.

The absence of senior scientists who distance from the Congress certainly caused a ripple effect. As serious researchers saw that senior scientists distanced from the Congress, they could see little opportunity to discuss their research among their peers. It was also highlighted that research scholars from reputed scientific institutions did not take part. It noted that majority of the students came from the universities.[751] K. Vijaya Raghavan, an FRS and currently the Scientific Adviser to the Government of India also noted that best of our scholars did not attend the Congress and kept away from the crowd, chaos and the diverse audience.[752] A former head of DRDO said that ISC sessions looked ‘like an IPL’, which gave scope for youngsters including research scholars and new learners to interact with senior well-known scientists at one platform. Another panelist of the same session chaired by the DRDO head emphasised that it was a great occasion in which he saw youngsters had an active participation. He added that unlike most conferences where the youngsters represented only 25%, ISC saw their participation up to 75%.

6.3. Purpose of ISC annual meetings

Although ISC have evidently served its objective of promotion and advancement of science as indicated in the previous chapters. It is pertinent to evaluate its purpose based on the views held by the young and senior scientists. Increasingly Science Congress is viewed as a ‘mela’ or an ‘annual science fair’ not just because of the large number of delegates who attend it, as indicated above. But, it was believed that it served little purpose for advancement or

[751]See https://journosdiary.com/2016/01/17/indian-science-congress-an-annual-ritual-losing-its-meaning/(accessed on May 1, 2019).
[752]See https://thewire.in/the-sciences/pseudoscience-the-gorillas-in-the-room-are-not-at-the-indian-science-congress(accessed on May 1, 2019).

promotion of science as many opined that serious scientists and research scholars distanced themselves from the deliberations of the Science Congress. When Nobel Laureate, Venkatraman attended the ISC session held in 2015 in Mumbai, he called it a ‘circus’ where very little science was discussed.[753] The quality of scientific deliberations was evident through the papers presented and the lectures delivered at the Congress, as they were at the core of most criticisms faced by the institution. J. B. S. Haldane wrote Scandal of the Science Congress in his book Science and Indian Culture based on his experience of the Science Congress held in Bombay in 1960. He viewed it as an organised conspiracy against originality in Indian Science which suppressed the younger generation scientists. He appreciated the sectional presidents’ addresses, special and public lectures and few papers during sectional meetings at the Congress. However, at the same time, he raised concerns about the quality of papers read during sectional meetings in atleast three cases (Haldane, 1965, pp. 21, 22).

The concern raised by Haldane could be seen reflected in the arguments of Professor P. Balaram and U. R. Rao who believed that the uncertainty of politics in the post-1967 era enabled the emergence of universities as centre of political activities. Prof. Balaram pointed out that this caused a slow-down and deterioration in science, which got reflected in the quality of papers presented at the Congress.[754] He was critical of the quality of the scientific sessions and called its scientific programme ‘long on ceremonies and short on science’ (Balaram, 2012, p. 1255). A scientist at the Wildlife Institute emphasised that ISC hardly brought forth latest research and due to its size it lost focus and compromised on the quality of deliberations. Similarly, Prof. U. R. Rao who was the President of the Congress in 1996, went on to even question the pre-1967 sheen of the Congress. He pointed out that from its inception, the quality of the papers was not good.[755] Another senior scientist was of the same opinion that science hardly happened at the ISC and underlined that its fall started from 1973. However, Rajinder Singh believed that there was nothing to criticise the Congress as it fulfilled its objectives till date and is an important part of India’s science culture (Singh, 2003, pp.

[753]See https://journosdiary.com/2019/01/10/talks-at-indian-science-congress-need-to-be-vetted-by-serious-committees-says-venkatraman-ramakrishnan/(accessed on May 1, 2019).
[754]See https://journosdiary.com/2016/01/17/indian-science-congress-an-annual-ritual-losing-its-meaning/(accessed on May 1, 2019).
[755]See https://journosdiary.com/2016/01/17/indian-science-congress-an-annual-ritual-losing-its-meaning/(accessed on May 1, 2019).

1498,1499). Most of the senior retired scientists viewed ISC as the only platform that enabled a birds' eye view of most scientific disciplines in India and abroad. One senior scientist went on to say the ISC was equivalent to a 'capsule' of science which encompassed all happening in S&T in India. According to them, ISC enjoyed an honoured position.

The inferiority of scientific deliberation at ISC sessions cannot be generalised for all the conference sessions. In the session in 2003, Kasturirangan said that he had ensured the quality of the presentations to ensure that the best came out of the Congress (Sen, 2003, p. 490). Although, Venkatraman was highly disappointed by the Bombay session in 2015. He acknowledged that the next session was 'better'. Manjul Bhargava, a Fields Medalist attended the Mysore session in 2016. He remarked that the 'sessions were better' and complained about the selective reporting of the media which hardly reported excellent sessions and scientific deliberation that took place during the Congress in Mysore.[756] This was similar for the lectures given by scientists during the sessions, there were few extra-ordinary lectures alongside extremely unscientific ones. Shiv Vishvanath believed that during the early years, the lectures presented by scientists were masterpieces of their experience and knowledge and a snap-shot of their views about the future of India. However, it was now reduced to a platform where scientists looked forward to arrange marriages.[757] Balaram also acknowledged that the plenary sessions could be an inspiration for younger scientists who heard it for the first time. However, experienced attendees usually had a déjà vu sense as 'super stars' usually lead speakers got little time to change their lectures and add new material. Numerous invitations also led to their absence from laboratories which affected the quality of their research (Balaram, 1999, p. 1411).

A revival of glorification of Indian tradition and heritage is increasingly seen in the contemporary history of the Congress. Recently, ISC annual sessions are viewed by scientists as a forum for propagating unscientific claims. Nobel Laureate Venkatrama Ramakrishnan in a published interview remarked that the large size of the Congress also caused an extremely

[756]Seehttps://timesofindia.indiatimes.com/india/Need-focus-on-science-Manjul/articleshow/50476403.cms?(accessed on May 1, 2019).
[757]See https://www.livemint.com/Politics/B7qYIlQ0wM2Mdo4tdvrtxK/Is-the-annual-Indian-Science-Congress-losing-its-relevance.html(accessed on May 1, 2019).

uneven quality of talks given, of which he did not even count the few which were 'outrageous and pseudoscientific nonsense'.[758] R. Narasimha of the Jawaharlal Nehru Centre for Advanced Scientific Research, in his editorial published in Current Science on February 25, 2015, identified that at the centre of the Mumbai Congress controversy was a symposium on 'Ancient Science through Sanskrit'. It was organised by a group of Sanskrit scholars and academics. The first controversy was centred on the ancient Indian aviation technology while the other two concerned the Pythagoras theorem and plastic surgery. In the context of these talks at the Science Congress, Narasimha expressed his views noting that there was a need to learn in order to distinguish between science and mythology. He added that the reason-based scientific study of both would be interesting but they shouldn't be mixed (Narasimha, 2015, pp. 471,472). On the quality of talks at ISC, Raghavan said that while very few were superb, some were good and many were unremarkable. He also found some talks, usually one or two – outright preposterous. However, he marked that it was the last section of talks that usually caught the maximum national and global media attention.[759] P. Balaram in his editorial of the Current Science in 2012 had viewed ISC as the only congregation of scientists that attracted media attention (Balaram. 2012, p. 1255).

Anderson observed that the 'scientific temper' movement that began in the 1950s transformed into an appropriation of ancient belief in India. This transformation to some extent is visible in the proceedings and the papers presented during the ISC sessions. Anderson experience of the Hyderabad session of the Congress in 1998 where rose petals were strewn for welcoming Swami Ramachandran after the conclusion of the academic session on Science and Society. Although the lecture on science and spirituality, glorifying India given by Swami Ramachandran was held separately from the Science Congress. But, it was held in the same building and attended by huge crowd. He added that a Swami's presence at the Science Congress thirty years ago which he had attended was unthinkable. However, it was approved and accepted in 1998 (Anderson, 2010, p. 11). This could be seen in the context of a number of patents that US filed on plants and subjects which were traditionally used in India. The

[758]See (https://journosdiary.com/2019/01/10/talks-at-indian-science-congress-need-to-be-vetted-by-serious-committees-says-venkatraman-ramakrishnan/)(accessed on May 1, 2019).
[759]See https://thewire.in/the-sciences/pseudoscience-the-gorillas-in-the-room-are-not-at-the-indian-science-congress(accessed on May 1, 2019).

CSIR was advised by the Prime Minister to re-write the intellectual property rights law, in sync with other countries, to protect India's heritage. which was portrayed in Indian media as an attempt to ignore India's traditional knowledge and heritage (Anderson, 2010, p. 10).

A revival of glorification of Indian tradition and heritage is increasingly seen in the contemporary history of the Congress. Recently, ISC annual sessions are viewed by scientists as a forum for propagating un-proven claims. Nobel Laureate Venkatrama Ramakrishnan in a published interview opined that the large size of the Congress also caused an extremely uneven quality of talks given, of which he did not even count the few which were 'outrageous and pseudoscientific nonsense'.[760] R. Narasimha of the Jawaharlal Nehru Centre for Advanced Scientific Research, in his editorial published in *Current Science* on February 25, 2015, identified that at the centre of the Mumbai Congress controversy was a symposium on 'Ancient Science through Sanskrit'. It was organised by a group of Sanskrit scholars and academics. The first controversy centred on the ancient Indian aviation technology while the other two concerned the Pythagoras theorem and plastic surgery. In the context of these talks at Science Congress, Narasimha opined that there was a need to learn to distinguish between science and mythology. He added that the reason-based scientific study of both would be interesting but they shouldn't be mixed (Narasimha, 2015, pp. 471,472). On the quality of talks at ISC, Raghavan said, 'a few are superb, some good, many unremarkable and a few – usually one or two – outright preposterous'. However, he marked that it was the last section of talks that usually caught the maximum national and global media attention[761]. P. Balaram in his editorial of the Current Science in 2012 had viewed ISC as the only congregation of scientists that attracted media attention (Balaram. 2012, p. 1255).

Raghavan was extremely critical of the talks made by two scientists during the Children Science Congress during ISC session in 2019, which were hardly based on scientifically tenable observation. He believed that such observations made at Congress session could not come to an end if the scientific community did not criticize them.[762] The unscientific claims

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[760]See (https://journosdiary.com/2019/01/10/talks-at-indian-science-congress-need-to-be-vetted-by-serious-committees-says-venkatraman-ramakrishnan/) (accessed on May 1, 2019).
[761]See https://thewire.in/the-sciences/pseudoscience-the-gorillas-in-the-room-are-not-at-the-indian-science-congress (accessed on May 1, 2019).
[762] Ibid.

made by the speakers during the ISC sessions and especially during Children Science Congress in 2019 was criticised and protested against by various scientists and societies.[763] Even ISCA's General President and General Secretary, Manoj Chakrabarti and P. P. Mathur, discredited such unscientific claims. During the same session, a resolution was passed that the abstract of such talks would be scrutinized in the future and if the speakers moved beyond the purview of their abstract, they would be asked to leave the dais.[764] Nobel Laureate, Venkatraman voiced his opinion that abstracts needed to be vetted by serious expert committees. He also added if despite careful screening, unscientific claims are made by the speakers it would be the responsibility of the session chair to stop such a talk.[765]

Numerous suggestions were put forth by scientists for tackling the problem of the quality of the scientific sessions which could be identified as one of the prime concerns of 'serious' scientists. Jain suggested that the number of research papers presented needed to be minimized if not scraped as there were a number of opportunities for such presentations both within India and abroad with the growth of numerous specialised conferences (Jain, 1994, pp. 334). Tauro and Rao also pointed out that every discipline had their associations which held their conferences and enabled scientists of their field to meet and discuss their works and draw out plans for future of their discipline. Therefore, they believed that the disciplines no longer needed the banner of ISC to meet and viewed the Congress as largely redundant. (Tauro, Rao, 2008, p. 1113). While trying to gauge the reason for absence of stalwarts and pioneers of the field during the annual sessions, Iyer emphasised the lack of presentation of new results; as a majority of the research were largely recycled and are largely presented through 'poor quality' slides and were not extempore and were mainly read out from the slides. He along with Taubo and Rao viewed that the sessions of the Congress could be held once in two years (Iyer, 2000, pp. 538, 539; Taubo, Rao, 2008, p. 1113). On similar lines, Virk in the same year opined that the sessions of ISCA could be held once in four years (Virk, 2003, p. 290). According to Iyer, this could enable the participants to prepare better and also conserve the resources involved in

[763]See https://scroll.in/article/908392/chauvanistic-claims-embarrassed-indian-scientists-protest-irrational-comments-at-science-congress(accessed on May 1, 2019).

[764]See https://indianexpress.com/article/india/indian-science-congress-association-to-take-declaration-to-keep-unscientific-speakers-off-dais-5527660/(accessed on May 1, 2019).

[765]See https://journosdiary.com/2019/01/10/talks-at-indian-science-congress-need-to-be-vetted-by-serious-committees-says-venkatraman-ramakrishnan/ (accessed on May 1, 2019).

organising it annually. He suggested that rewards and awards for best papers would bring forth new results. He also suggested prizes and young scientists award for students at various stages of their academic research for encouragement of young scientists (Iyer, 2000, pp. 538, 539). Taubo and Rao also emphasised on restricting the number of days of the conference to two days (Taubo, Rao, 2008, p. 1113). Virk voiced strongly for a strict peer-review of the papers submitted to the Congress which could raise the general standard of the presentations at the Congress and also filter out non-serious delegates from the Congress (Virk, 2003, p. 290).

The most important purpose that ISC increasingly served according to the both young and senior scientists was scope for greater popularisation of science. Majority of the scientists emphasised on ISCA role in popularising science among school children through Children Science Congress and Pride of India Exhibitions. H. S. Virk emphasisied on the similarities between kumbh-melas and the meetings of Indian Science Congress. He recommended that ISC should be organised as *Vigyan mela* for popularisation of S&T amongst Indian masses as he believed it served less purpose for promotion of S&T (Virk, 2000, p. 1052). However, Virk's opinion was criticised by Mehrotra for his lack of recognition of the success of the Congress meeting under R. A. Mashelkar in 2000. He opined that the annual session identified the frontier areas of S&T and played a critical role in forging closer interaction between young and mature students of science. He also believed that the high standard of scientific discussions during the session would become a regular feature of the annual sessions (Mehrotra, 2000, p. 138). During 2000-2003, Sen published a few research articles which underlined the successes achieved by ISCA sessions during the period (Sen, 2001; 2003). Kasturirangan added that the Congress provided the apt forum for children to interact with young and senior scientists and derive inspiration (Sen, 2003, p. 490). Virk based on his experience during Pune session in 2000, strongly appreciated the efforts of the forum for 'Science for School Students' and Children Science Congress (Virk, 2000, p. 1052). Taubo and Rao opined that the Children Science Congress needed to be encouraged as he believed that it achieved more than the bigger Science Congress (Taubo, Rao, 2008, p. 1113). According to Virk, there were extremely long queues for various S&T exhibitions and especially for Kargil exhibition organised by Ministry of Defence (Virk, 2000, p. 1052). Unlike Virik, Gopinathan who reported about the 97^{th} ISC saw the participation and keenness of the children in the long queues to get inside the Pride of India Exhibition as a great mechanism for exposure and interaction between scientists and children. He believed that 'Macmahon and Simonsen had come a long way' (Gopinathan, 2010, p. 886).

The Pride of India Expo and Children Science Congress emerged as critical for popularisation of science. The Children Science Congress organised during the 97th Indian Science Congress in 2010 saw participation of 3500 school students who were selected through a national competition. He added that many students came from remote parts of the country with ordinary backgrounds and from various government schools (Gopinathan, 2010, p. 776). Thousands of school students from across the state visited the exhibits at the Pride of India Expo and Children Science Congress during the ISCA sessions. An official from DRDO said that they wanted to target the younger school students to ignite their interest in science so that they chose science as their career and join their organisation. The DRDO exhibit has the largest crowd and school children were extremely interested in their exhibit. At the Pride of India Expo, a number of government science departments, research institutes, etc. exhibit their research and their work that they undertake as a part of the public outreach commitment as indicated by an exhibitor during the POI Expo. Students who participated in the exhibition at the Children Science Congress mostly said that they saw the Science Congress as a platform which enabled them to learn and exposed them to new scientific discoveries. They got an opportunity to meet, interact and engage with scientists, Nobel Laureates, etc. Among the school children who participated in the Children Science Congress in Mysore, most of them said that they thoroughly enjoyed the Nobel Laureate Lecture. The Nobel Laureate Lectures were appreciated by almost all scientists across the range including younger students to senior scientists. During the ISCA session in Mysore, Manjul Bhargava's lecture was lauded by school students, college students, young researchers, college teachers, professors and scientists.

The craze and value for certificates of participation of the Science Congress was evident by the long queues at the certificate distribution centres. Most attendees including younger students, research scholars and college teachers in their early careers, believed that it would bolster their academic credentials and their CVs. ISCA was an honoured institution in these circles. Dinesh Abrol, who was a senior scientist at the National Institute of Science, Technology and Development Studies agreed to the notion that the congress was more like a mela where students and college teachers go and present a few papers, to bolster their CVs.[766] Another senior scientist mentioned that most students attending the Congress are clueless and many were seen taking excursions to tourist spots or spending time in the lawns. He too considered that students merely considered the certificate of the ISC as good for their CVs. More than 80 percent of the younger generation science students including school students, graduate and post graduate as well as research scholars believed that the exposure they received at the ISC to the variety of recent research undertaken in India and abroad was unmatched as there was a diversity in scientific deliberations in India. They said that the Science Congress was an enriching experience for them especially because it enabled them to interact with scientists at DRDO, ISRO, BARC, CSIR, etc. which was otherwise impossible especially at one platform. Almost all the respondents said that they were inspired by the Nobel Laureates lectures. While some others found few lectures other plenary lectures also inspirational. For the graduate and post-graduate students it was more an exposure and inspiration.

Most researchers who attended these sessions were those working as research assistants with research institutes or other specialised institutions and there were few Ph.D. and post-doctoral scholars. Few researchers brought forth the issue of lesser attendance at sectional sessions. Regarding the usefulness of the sectional sessions it was generally a divided opinion. While most of them emphasised that the sectional meetings provided them a glimpse of recent researches in their field and helped them interact with fellow-researchers and senior scientists of their fields, some of them believed that these sessions could have been more productive with better discussion and review of their paper and poster presentations. While other said that the proceedings of their sections were brilliant. For research scholars, it was mostly an opportunity to know about researches in their field, meeting and engaging with young and senior scientists and forming networks. Balaram believed that personal contact was the most direct way of transfer of information (Balaram, 1999, p. 1411). This can also be attested to by

[766]See https://www.livemint.com/Politics/B7qYIlQ0wM2Mdo4tdvrtxK/Is-the-annual-Indian-Science-Congress-losing-its-relevance.html(accessed on May 1, 2019).

Dhruv Raina's interview published in which he said that ISC played an important key function as it introduced the young Ph.D. students or younger scientists to the ways and workings of international science. He also added that it gave an opportunity for those from small science colleges in *mofussil* towns and young scientists from villages to get introduced to foreign scientists or a possible opening as a post-doctoral researcher in a University. This was viewed to have played a critical role in forging closer interaction between young and mature students of science. He also believed that the high standard of scientific discussions during the session would become a regular feature of the annual sessions (Mehrotra, 2000, p. 138).

Manjul Bhargava, an invited speaker at the Mysore session in 2016 commented that the Congress had a lot of positives. He believed that the purpose of the Congress wasn't limited to individual research as there were many specialised conferences already. He also added that the aim was to enable personal intercourse between scientists across the country which could help chalk out common areas of interest, build collaboration and most importantly making connection with public. He believed that the greatest goal of the Congress was to encourage and inspire the young minds. The Congress was one of the few opportunities that allowed young students from across the country to interact with scientists from across the country or globe. He noted that the Nobel Laureate lectures were packed with young students. He said he personally interacted with hundred students and Congress provided such avenues to them. He added that it was a meaningful experience when young students came up to him and said that they wanted to become mathematicians after listening to his lecture.[767]Most of the scientists I spoke with during the ISCA sessions viewed it a great platform for inspiring the young minds. A professor from AIIIMS went ahead and said that if one is able to inspire even two to three students among the hundreds that attended the lecture, the purpose is achieved. Binay Panda, a scientist at Ganit labs in Bangalore opined that he did not consider the Science Congress as an occasion to showcase *Nature* or *Science* paper, rather he believed that it was a platform to excite the young minds so that they would take up science as a career. According to him it served as a medium to showcase what science could achieve for the society and to claim that science was the sole medium to attain long-term and sustained economic development.

[767]See https://timesofindia.indiatimes.com/india/Need-focus-on-science-Manjul/articleshow/50476403.cms?(accessed on May 1, 2019).

However, he did not view it as a platform to showcase experimental results. According to him it serves as a medium to disseminate scientific information in a lucid way to the public.[768]

6.4 Structure of the ISC sessions

The structure and the organisation of the annual meetings of ISC has increasingly become a point of concern among the scientists. The inaugural of the ISC by the Prime Minister and the presence of politicians in a scientific conference caught the maximum media attention and was increasingly criticised by many scientists. The presence of politicians usually delayed the scientific sessions. Scientists complained that ISC session was a rare occasion where the younger generation students could gain personal contact with senior scientists. However, the segregation of senior scientists as VIPs limited their access and scope for interaction. At the Bombay Science Congress in 1960, Haldane questioned the need for addresses made by governors and vice-chancellors during the session. As he also came to know that Nehru complained of the lack of shade in the *pandal*, he voiced his opinion that the object of science congress to advance science involved discourtesy to some influential people as efficiency was a critical for science not courtesy (Haldane, 1965, pp. 22-25). N. R. Dhar highlighted the insistence and deliberate attempts made by General Secretaries on non-breaking of the tradition of inauguration of the session by Nehru who was described as the Great Mogul. He also added that on numerous occasions, the Congress sessions were delayed to fit in the Prime Minister's time table. However, the attempts made failed, Rajendra Prasad who was the President of India was invited to inaugurate the session. He had conveyed that a number of regular congress members told him that they found the Roorkee session in 1961 as best during the past 20 years which minimum flattery and fuss. He emphasized that the great future of the Congress largely rested on the absence of flattery to the men in power and favour to the friends of organisers (Sen, 2003, p. 970).

H. S. Virk on similar lines believed that ISC needed to get rid of the ritual where the Prime Minister inaugurated the session. Based on his experience of the Congress, he observed that the venue was transformed into a fortress as a result of multiple levels of security checks,

[768] See https://thewire.in/politics/not-a-congress-but-a-big-fat-indian-science-wedding(accessed on May 1, 2019).

which were of great inconvenience to the scientific delegates (Virk, 2000, p. 1052). Unnikrishan too questioned the PM's presence at the National Science Congress. He remarked that it obstructed the schedule of the meeting and jeopardized the event (Unnikrishan, 2003, p. 484). Virk added that the coterie of leaders was largely responsible for the mess at the annual meetings. He also agreed that the ritual of inviting the PM along with other politicians should be done away with (Virk, 2003, p. 240). P. Balaram opined that pomp and show took precedence over substance during the meetings. He added that the inaugural meeting presided by the PM became the *raison d'être* for the meeting (Balaram, 2012, p. 1255). This is evident from the observation made by N. R. Dhar's during 1961. He noted that on numerous instances a number of senior delegates left the premises of the Congress after the inaugural ceremony. U. R. Rao who was the General President in 1996 felt disappointed about the structure of the Science Congress which had been that way. He also underlined that the question of continuing and discontinuing the ritual had been discussed on numerous occasions but, it wasn't easy to change.[769]

The ISCA annual session in 2019 saw the participation of a galaxy of politicians.[770] This caused undue delay in every session. A number of sessions had to re-scheduled and the venue had to be shifted to suit the schedule and security requirements of the politicians. A senior scientist complained about the delay of the scientific sessions as a result of accommodating the politician's schedule. He went ahead and questioned the organisers and reminded that it was an Indian Science Congress that was going on and that time should not be wasted by waiting for politicians as the scientific deliberations got delayed. It has been noted that the inauguration hardly started on time as the chief guest often reached late. There is a lot of photo op with the presentation of mementos by the dignitaries on the dais. There were a number of efforts to do away with these 'time wasting' feudal ceremonies but the practice continues. Sharma suggested that there was a need to re-vamp the science culture for science management, doing science and organizing meeting for scientific deliberations for research teaching and science policy as AAAS did in America (Sharma, 2016, pp. 749-750). The traditional opening address by the Prime Minister predictably reiterates governmental

[769]See https://journosdiary.com/2016/01/17/indian-science-congress-an-annual-ritual-losing-its-meaning/(accessed on May 1, 2019).

commitment to support science and invariably promises to remove the many bureaucratic hurdles that sometimes loom larger than life in the minds of many scientists. The presence of the executive head of government prevails the inaugural event with an importance that is often not commensurate with the quality of the scientific sessions that follow (Balaram, 2012, p. 1255).

There were a number of scientists who pointed that no scientific meetings across the world saw such an elaborate inaugural meeting headed by the Prime Minister. Nobel Laureate, Venkatraman opined that the inauguration by the Prime Minister was unique to India. Although, he believed that it could be seen as a signal of support from the highest levels. He added that there was a running joke among the organisers and scientists as to who gets to share the dais with the PM.[771] Rajinder Singh pointed the ISCA since its inception was held each year under the leadership of distinguished scientists. He also noted that the inauguration at BAAS was also done generally by distinguished scientists. However, he did argue that the inauguration by the Prime Minister was started with good intentions in India. According to him, Nehru's election despite being a politician as the president of ISCA was a result of his deep commitment towards science and a vision for science in India. Singh added that there was no reason to complain about the inauguration of ISC by Nehru for about four-five years after Independence as he truly represented India and the vision he had for science in India. He saw his inaugural addresses for these years as inspiring which dealt with scientific policies and development. Though he highlighted that after some years, it lost lustre.

C. V. Raman criticised the continuation of this practice. Singh quoted V. T. Srinivasan to illustrate Raman's protest. Raman believed that there was no Science Congress in any country that was inaugurated by politicians. He also complained that the organisers could just think of the PM to inaugurate it which was later continued by his daughter. He opined that he was unable to understand the proceedings of the annual Science Congresses. He added that it was difficult to gauge how scientists could go on listening to politicians' speeches at the Science Congress. In this light, Singh said that it was necessary to reconsider if the inaugural sessions by Prime Minister had any effect i.e. positive, negative or no effect on the achievements of the

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[771]See https://journosdiary.com/2019/01/10/talks-at-indian-science-congress-need-to-be-vetted-by-serious-committees-says-venkatraman-ramakrishnan/(accessed on May 1, 2019).

scientific community. Singh added that it should be continued only if it had more positives than negatives. He also added that the practice of VIP culture also needed to be addressed (Singh, 2003, pp. 1498, 1499). Tauro and Rao emphasised that Nehru presented his scientific vision for India at the inaugural meetings of ISC. They also reiterated that the PMs after him lacked scientific temper. Therefore, it had largely become an unwanted and routine affair. They believed that the PM should only be invited if he presented his vision of Indian science (Tauro and Rao, 2008, p. 1114).

Scientists have raised concerns about the way the ISC meetings were conducted. Unnikrishnan underlined the VIP syndrome and highlighted separate facilities for "VIP" scientists with regard to food pandal, hotel and conveyance facilities (Unnikrishnan, 2003, p. 484). Virk agreed with Unnikrishana and saw the VIP syndrome as a British legacy (Virk, 2003, p. 240). Venkatraman was extremely critical of distancing the VIPs into separate tents as it gave no opportunity for younger scientists to interact with them.[772] Binay Panda a scientist at Ganit Labs opined that the Congress looked like a top-down and protocol driven meeting to him as badges mentioned 'delegate', 'student delegate', 'Invited Guest', 'VIP', 'VVIP', etc.[773] This clearly indicated the bureaucratic old school thought that a scientist at Wildlife Institute mentioned about the working of ISCA. A Scientist at the Wildlife Institute expressed that ISC saw a lot of lobbying and the selection process wasn't transparent. Many senior scientists including U. R. Rao had accused ISCA of manipulating election, few grabbing control and numerous politics in the working of the association. A number of scientists suggested that the ISC sessions needed a change in the way they were conducted (Tauro and Rao, 2008, p. 1114). Similar picture emerged during my interviews with the scientists at the Wildlife Institute. Most of them remarked that the ISC needed to adapt to current time and give up its old school of thought.

Haldane in his analysis of the Science Congress highlighted a number of loopholes in the way the Congress were arranged. He highlighted that the lack of adequate lanterns and a disturbed

[772]See https://journosdiary.com/2019/01/10/talks-at-indian-science-congress-need-to-be-vetted-by-serious-committees-says-venkatraman-ramakrishnan/(accessed on May 1, 2019).
[773]See https://thewire.in/politics/not-a-congress-but-a-big-fat-indian-science-wedding(accessed on May 1, 2019).

microphone hindered the presentations made by scientists. He did appreciate many other arrangements. However, He wrote that, 'Sometimes a discussion was arranged at the time when papers were supposed to be read. Even when the sectional president adhered to the programme, the order of the papers were not predictable'. He added that he could not listen to one of those twenty-five papers which he wished to listen to. As a result, the Congress had limited use for himself and Indian science too (Haldane, 1965, pp. 22, 24). In a number of instances the scientific sessions that were delayed were mostly caused by the inauguration sessions which were usually attended by the politicians. According to a student of Lovely Professional University (LPU), during the 2019 session, the Science Communicators Meet which was to be inaugurated by Mr. Ravi Shankar Prasad; the Union Law and Justice Minister was swapped with the inauguration of Women Science Congress which was inaugurated by Textiles Minister, Mrs. Smriti Zubin Irani to suit the politicians schedule. However, the ministers' flight got delayed and as a result, the session got delayed by about an hour. The students of LPU sitting in the hall weren't allowed to leave for lunch as after Irani's programme got over, the Law Ministers' session began. The Science Communicators also saw the presence on the dias of the Punjab Unit Chief of the ruling party, Mr. Shwait Mallick. Apart from such circumstances, some sessions were cancelled without prior notice. The chief guest of the valedictory session of the Women Science Congress was MHRD Minister, Mr. Prakash Javadekar.

A senior scientist emphasised that the ISC was 'full of rituals of inaugurations and valedictories which consumed a considerable amount of ISC's time'. The arrangements and the manner in which ISC is conducted and managed which involved such huge number of attendees and viewers, depended immensely on the host institution. While most regular attendees of the Congress called the session at LPU 'well-arranged and managed'. The students of LPU informed that senior students were called back from their vacations officially on the ground that their attendance in the ISC was mandatory and would be counted for their academic session. The students told that they were given a proper schedule and they were to deposit their attendance slips after the session got over to the teacher in-charge monitoring them in the lecture halls or auditoriums. This seemed to be the reason for full attendance during most scientific sessions. While delegates apart from LPU students seemed limited in most of the scientific sessions.

The school children at the Children Science Congress mentioned that as a result of sessions overlapping with their exhibition timings, they could not attend many Plenary or sectional sessions that they wished to. Apart from them, about fifty percent of the younger delegates, college and university professors as well as senior scientists voiced their concerns about the overlapping sessions which did not allow them to attend sessions that interested them. The younger generation science scholars also said that the sessions were hectic and due to the distances involved in moving from one lecture hall to another, they missed most of the sessions. They also complained that many of the times after they reached the lecture hall, they were told that the venue of the scheduled session had been shifted or the session was cancelled.

6.5. Conclusion

An analysis of the perception held by scientists in the contemporary times attest to diversity in the views about the annual meetings of the Science Congress. It is interesting to note that ISCA's activities were largely viewed through its annual sessions. One of the strongest perceptions that emerges about these sessions has been about the quality of papers and scientific deliberations during these meetings. The scientists have raised concerns about the shadowing of the importance of the scientific sessions by the 'ceremonies' like inaugurations and valedictory sessions mostly centred around PM and ministers' presence. Quite a number of scientists viewed ISCA's annual meetings as 'science fairs' or 'mela'. However, seniour or retired scientists who had been attending science congress for more than three decades, believed that it was a 'one-time capsule' for knowing all the happenings of Indian science as well as progress in S&T abroad. Central to most of these views was the recognition of the scope that these annual sessions provided to instil and inspire the younger generation.

The Children's Science Congress was seen as a very useful platform for inculcating scientific thinking and an interest in science among school students. At the same time, the Pride of India Expo also provided platform for the scientific institutions to showcase their research and communicate it to the general public which included large number of school students under their public outreach commitment. One of the most celebrated even of the annual sessions was the presence of the Nobel Laureates and the scope it provided for interaction with them. Thus, one of the seniour scientist went ahead to add that he believed that 'melas' had their own significance and everyone present got something from the experience. A diversity is seen in its participation, attendance and purpose that ISC sessions served. Some senior scientists questioned the large crowd that attended the session, which they believed blurred the target group that ISC sessions primarily wanted to address. Though scientists of noted institution do not encourage their research scholars to attend the Science Congress but, ISCA certainly enjoys its heritage and prestige.

The chapter explicitly brings forth the paradox where amidst the criticism it entails, it certainly served some purpose for every group which is reflected in huge number of delegates attending the session every year. Although its sessions see lesser number of scientists from well-known scientific institutions and organisations, except those senior scientists invited as speakers at plenary sessions, a vast majority of its delegates came from smaller, towns and cities. ISC provided a critical platform for providing exposure and inspiring those delegates as well as school children, graduate and post-graduate students who rarely would get an opportunity to attend a specialised professional conferences. The analysis also underlined numerous recommendations about the organisation and structure of the Association. Along with the opinion of scientists in contemporary history, the chapter also referred to opinions of scientists about its annual meetings from the 1960s. Regardless of growing criticism ISC receives each year, it certainly serves a wider forum and emerges as an important annual event for inspiring and instilling among young researchers and college students from smaller towns, cities an interest in science.

Chapter 7

Summary and Conclusions

This Ph.D. thesis, which investigates the social history of more than a century old ISCA (established in 1914), is in fact the first ever systematic investigation of its role and function within the existing writings on the social history of science in India. Understanding the social history of ISCA assumes considerable importance given the British colonial context and the ways in which this important professional body has become a symbol of struggle against British science administration towards the establishment of nascent Indian science community during 1914 and 1940s. This is even more important for a country like India where modern, western science emerged as a part of colonial science enterprises during the British Raj. The study of social and historical context within which science institutions, particularly professional societies, journals, intellectual associations and other bodies emerged becomes relevant to understand the paradigm of the way professional and intellectual standards were established in the country especially the minor scientific communities.

The thesis on ISCA and its socio-historical context justifiably caters to the noticeable gap in literature of social history of science, which clearly indicates an almost neglect of studies on scientific societies in the social history of science in India. After the foundation of the Royal Society of London in 1662 primarily, during the nineteenth century, numerous scientific societies came up across Europe, Britain, America, Russia, Australia and New Zealand. The studies on BAAS, AAAS, ANZAAS provided a good background to understand their historical development as well as the critical part played by them in the formation of scientific communities, growth of scientific disciplines, institutionalisation, professionalisation and popularisation of science in their respective countries. In line with these studies and in consideration of an absence of a comprehensive study on ISCA, the present research endeavored to understand its social history and the part played by it in the professionalisation of science in India during the period of study. ISCA came up much later than its counterparts in Britain, American. In this background, the study tried to gauge numerous roles that it played during the hundred years of its existence, since the time of its inception in 1914. Chapter 1 clearly underlines the objectives, research questions and research methodology. Through its various chapters, the thesis has tried to situate ISCA on a scientific map of India and analysed its role in shaping a scientific community, professionalisation of science and mirroring the social, economic and larger political concerns faced by India during the period of study. It endeavoured to assess ISCA's role/purpose in the twenty-first century and perception about it participation and structure primarily through an analysis of views held by the scientific community in India about ISCA.

During the colonial era, the colonial administration created several professional bodies and societies but almost all these bodies in a large measure were structurally linked to colonial objectives of economic exploitation. The chapter that explores the growth of scientific societies clearly assesses the context of the institutional efforts made by the British and Indians towards institutionalisation of science in India. Most colonial scientific societies evolved as 'European enclaves' and were seen to served their quest for intellectual gains from oriental knowledge and the imperialist 'agenda' for better administration and profit maximisation from their Indian colonial operations. Towards the end of 19th Century several well-known Indian scientists such as P.C Ray returned from Britain and clearly felt the absence of professional climate for research and intellectual advancement of science. Among the Indian endeavours, most crucial contribution from these well-known Indian scientists was the establishment of Indian Association for Cultivation of Science which aimed towards cultivation and advancement of science among Indians.

For a multilingual country like India, the major challenge was translation and popularisation of modern science. The challenges faced by nationalist/Indians' endevaours/institutions led to its scope being limited to popularising science through lectures and influencing translations during its first two decades. The scientific societies before ISCA provided little or no scope for cultivation and advancement of science among Indians, let aside any scope for professionalisation of science in India. The lack of professional climate, scientific autonomy and relevant institutional space led to the first foundational steps leading towards the establishment of ISCA in 1914 for promotion and advancement of science in India through greater intercourse between scientific personnel in India of diverse fields. It also aimed towards popularisation of science among the general public. Although, it was conceptualised by two English chemists, its scope, objectives and locale were much beyond/diverse than the earlier societies. It's objectives largely centred around promotion and advancement of science in India. Detailed exploration of the context of creation of ISCA is covered in the Second Chapter.

ISCA emerges as the most important forum for building, inculcating and strengthening 'community' consciousness among scientific workforce in India, leading to the formation of a scientific community in India, which lay at the core of professionalisation of science. Chapter III underlines the transformation of the largely scattered, discipline-centred and European dominated scientific workforce into a nascent scientific community in India. The effort of Indian scientists in universities during the last decade of nineteenth century, towards advancement of science led to the formation of research groups, which was the genesis of scientific community in India. During 1920s and 1940s, we see a proliferation of scientific research groups around ISCA's members from the universities. The annual sessions of ISCA held in different parts of the country each year helped in mitigating the spatial isolation faced by scientists and also emerged as the body of scientists which enabled confluence of scientific workers from numerous S&T institutions and varied disciplines. This helped to curb the isolation caused by specialisation within S&T fields. The marked growth in ISCA's membership, participation of leading Indian scientists, honour associated with its presidentship and local reception of visiting scientists establishes its prestige as a professional society. The honour attached with its presidentship and local reception is evident from the inaugural session and presidential addresses. ISCA emerged as a platform that not only shaped a viable scientific community in India but, also enabled a steady stream of scientific discourse between Indian and foreign experts. Thus, providing scope for forging connections between national and international scientific communities. In the post-Independence era, ISCA's role transformed into serving an important channel for collocation between the government and the scientific community. It provided a forum for impressing the claims for the development of S&T as well as the institutional, financial and professional aspirations of the scientific community upon the government. ISCA also emerged as a podium for announcement of S&T policies.

ISCA, leading scientists mostly ISCA's members and related institutions connected to it, created a climate of professionalisation of science in India. The fourth chapter postulates that ISCA evolved as an important actor and agency in the professionalisation of science. Until India's Independence it lay at the core of insitutionalisation and professionalisation of science in India. Its members were critical for initiation of science departments, courses in universities. ISCA's sectional meetings and members enabled progress of different specialism of science and supported organisation of various S&T fields through formation of numerous disciplinary societies. More than twenty-five scientific societies in physics, chemistry, geology, maths, biology, psychology and several disciplines took birth within the annual meetings of ISCA or were conceptualised by its members during 1920s and 1940s. The science journals from these societies also sprang up during the period. ISCA became the central figure in the foundation of Science Academies in India for the consolidation of all scientific activities. The proposals for these academies, CSIR and scientific journals like *Current Science* and *Science and Culture* were discussed during ISCA's sessions. They lay at the core of the establishment of national laboratories and foundation of the ISCA's sessions provided common ground for intra- and inter-disciplinary collaboration and progress. ISCA served as a crucial communication channel between specialists. It evolved a peer-review system and enabled real-time discussion between noted and amateur scientists. ISCA and its members were critical for creation and advancement of knowledge in various S&T fields and introduction of 'new' sciences during the post-Independence era. It instituted awards to honour and encourage scientists. Indian scientists and ISCA's members were increasingly recognised and rewarded for their contribution towards advancement of S&T abroad. Even in the post-Independence era with the emergence of numerous specialised societies and association, ISCA continued to provide the most diverse platform for showcasing advances made in various S&T fields as well as gaining information about the international progresses made in S&T research. It emerged as a critical platform for recognising the obstacles faced by Indian scientific institutions and providing required suggestions for furthering excellence at global level and accountability of scientists both in universities and research institutions with increasing international competitiveness as a result of globalisation.

Besides these, ISCA since its inception aimed at diffusion and dissemination of science among the people. The fifth chapter asserts ISCA's role in recognising role of science and scientists in general well-being of the country. Its general presidents' addresses during the annual sessions reflected its cognizance of national socio-economic issues. ISCA through its annual sessions tried to generate general awareness among the people and inculcate critical and scientific thinking in the society. Apart from advancement of science, it aimed at diffusion, dissemination of scientific thinking and S&T information. ISCA supported and helped growth and diversification of the community of people interested and involved with science. Thus, popularising of science in India. ISCA members have played a central role in industrialisation and planning in India, along with emphasising on the need for agricultural advancement and rural development. In the wake of the global energy crisis, ISCA session's focus saw progression from survey and exploitation of resources to conservation and finding alternative strategies for energy. Besides, underlining central role that scientists and science played in national development and tackling national socio-economic isssues, it emerged as a forum which strongly advocated against the use of science and scientific discoveries for destruction of humankind, primarily limiting the boundaries of its use only for the welfare of the society. From the early 1970s, ISCA increasingly began concerned about the impact of rapid industrialisation and utilisation of S&T on the society and environment. ISCA's activities, evolution of forums on home science, economic development, science and society clearly indicate its commitment towards the larger socio-economic issues of food security, nutrition, health, hygiene, population explosion, poverty, unemployment and illiteracy. The choice of its focal themes after their introduction in 1976 also indicate that most of the themes mirrored these socio-economic needs and were in sync with these problems facing the country which continued even after globalisation.

In the backdrop of multiple roles that ISCA has played during a period of study. The views of the scientists about ISCA has been assessed to draw contemporary relevance for the study An assessment of the opinions of individual scientists about ISCA presents a diversity in their views, which has been discussed in Chapter VI. Many senior scientists have been critical of the large crowd that attended the session, which they believed blurred motto of its annual sessions. But, on the other end of the spectrum were those who still consider ISCA as an important forum for young scientists and believed that it was a ‘one-time capsule’ for knowing all the happenings of Indian science as well as the international progress. Though there is a large section of the scientists who viewed it’s sessions as largely science ‘fair’ or ‘mela’. However, there is a greater concern of the clouding of the scientific deliberations of the professional body by the larger ‘ceremonies’ inaugural and plenary sessions of the Congress. No matter the amount of criticism it entailed, it certainly seemed to have served purpose for every group which is reflected in the huge attendance and diversity in its participants. ISC certainly is a critical platform for providing exposure and inspiring younger population who came from science colleges and universities from smaller, towns and cities, who usually were unable attend specialised conferences.

The study established that ISCA played multiple ‘roles’ during hundred years of its existence. Although, its objectives remain similar to those indicated a century ago, its roles have evolved as a result of its historical context. The early two decades of ISCA, particularly upto 1920s and 1930s laid the basis for the part it could play in giving birth to nascent scientific community and creating a much-needed forum for bringing them together and infusing a purpose and a sense of urgency for working towards promotion, advancement of science as well as its utilisation for solving the problems that the country faced. ISCA justifiably emerged as an important actor which until the Independence, had given shape to a nascent scientific community involved with institutionalisation and professionalisation of science as well as recognising the role science could play in society.

A systematic social and historical exploration of ISCA in this Ph.D. thesis clearly demonstrates the transformation and change is its role and perceptions held within the scientific community about this important body. The evolution of ISCA as a prestigious body of science and scientific community clearly asserts its efforts towards intellectual struggle and professional role until 1940s. During the post-Independence era, it emerged as an interface between the scientific community and the government and showcased national socio-economic issues. ISCA’s annual meetings became increasingly focused on transactions between the political elite (Prime Minister) who inaugurates the ISCA every year and the scientific bureaucracy. One of the important perceptions of scientists is the lack of scientific quality of scientific papers presented during the contemporary meetings of ISCA. There is a change from its intellectual struggle and professional role until 1940s, towards greater cognizance and discourses on national socio-economic issues with the introduction of the focal themes and greater emphasis on quality of science with internationalisation of scientific research. In the contemporary times with numerous specialised science forums, there is a wide perception both among some leading scientists and other educated elite on the dilution of ISCA as a very important professional and scientific body. It is seen more as a customary scientific gathering. However, given the large participation from various disciplines that ISCA's annual sessions enjoy, it continues to play a critical role in disseminating and popularsing science among younger generation mostly school students and young researchers primarily belonging to colleges and universities of smaller towns and cities across India.

The present study emerges as one of the earliest studies that engages solely with social and historical background of ISCA and its professional role. The present Ph.D. thesis had a somewhat bounded objective of confining more towards pre-independence era as compared to the post-Independence era. More specifically to the link between nascent birth of Indian science community and the role ISCA played through its various activities and professionalisation. Though, the study has endeavoured to assess ISCA's role during the post-Independence era, given the limitations of time, effort and Ph.D. bounded constraints, the present study could not get into a detailed systematic investigation into the transformation of ISCA after 1947. This could form a very interesting academic study for further research. What the present study has done is to barely scratch the transformational layer that was evident from the perceptions of some scientists about ISCA.

Biblography

1. Primary Sources

a. <u>Official Publications of the Indian Science Congress Association</u>

*(Most of the Annual Reports/Proceedings of ISCA were available at ISCA's Headquarters in Kolkata. The data from few initial years' proceedings were collected from the Asiatic Society of Bengal, Kolkata).

Annual Report 1989-1990, Calcutta: Indian Science Congress Association, 1991.

Annual Report of the Indian Science Congress Association, 1987-1988, Calcutta: The Indian Science Congress Association, 1988.

Proceedings of Fiftieth Indian Science Congress, 1963, Calcutta: Indian Science Congress Association, 1963.

Proceedings of Forty-First Indian Science Congress, 1954, Calcutta: Indian Science Congress Association, 1954.

Proceedings of Forty-Ninth Indian Science Congress, 1962, Calcutta: Indian Science Congress Association, 1962.

Proceedings of Nineteenth Indian Science Congress, 1932, Calcutta: Asiatic Society of Bengal, 1932.

Proceedings of Seventy-Seventh annual session of the Indian Science Congress, 1990, Part II, Presidential Address, Calcutta: Indian Science Congress Association, 1990.

Proceedings of Sixty-Fifth Indian Science Congress, Part I, 1978, Official Matters, Calcutta: The Indian Science Congress Association, 1978.

Proceedings of Sixty-First Indian Science Congress, 1974, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1974.

Proceedings of Sixty-First Indian Science Congress, 1974, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1974.

Proceedings of Sixty-First Indian Science Congress, 1974, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1974.

Proceedings of Sixty-First Indian Science Congress, 1974, Part IV, Late Abstracts, Discussions, List of Members and Index, Calcutta: The Indian Science Congress Association, 1974.

Proceedings of Sixty-Fourth Indian Science Congress, 1977, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1977.

Proceedings of Sixty-Fourth Indian Science Congress, 1977, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1977.

Proceedings of Sixty-Fourth Indian Science Congress, 1977, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1977.

Proceedings of Sixty-Fourth Indian Science Congress, 1977, Part IV, Late Abstracts, Discussions, List of Members and Index, 1977.

Proceedings of Sixty-Second Indian Science Congress, 1975, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1975.

Proceedings of Sixty-Second Indian Science Congress, 1975, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1975.

Proceedings of Sixty-Second Indian Science Congress, 1975, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1975.

Proceedings of Sixty-Second Indian Science Congress, 1975, Part IV, Late Abstracts, Discussions, List of Members and Index, Calcutta: The Indian Science Congress Association, 1975.

Proceedings of Sixty-Seventh Indian Science Congress, 1980, Calcutta: Indian Science Congress Association, 1980.

Proceedings of Sixty-Sixth Indian Science Congress, 1979, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1979.

Proceedings of Sixty-Sixth Indian Science Congress, 1979, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1979.

Proceedings of Sixty-Sixth Indian Science Congress, 1979, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1979.

Proceedings of Sixty-Sixth Indian Science Congress, 1979, Part IV, Late Abstracts, Discussions, List of Members and Index, 1979.

Proceedings of Sixty-Third Indian Science Congress, 1976, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1976.

Proceedings of Sixty-Third Indian Science Congress, 1976, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1976.

Proceedings of Sixty-Third Indian Science Congress, 1976, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1976.

Proceedings of Sixty-Third Indian Science Congress, 1976, Part IV, Late Abstracts, Discussions, List of Members and Index, 1976.

Proceedings of the Eighth Indian Science Congress, 1921, Calcutta: Asiatic Society of Bengal, 1921.

Proceedings of the Eightieth Annual Session of the Indian Science Congress Association, 1993, Part IA, Official Matters, Calcutta: The Indian Science Congress Association, 1993.

Proceedings of the Eightieth Annual Session of the Indian Science Congress Association, 1993, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1993.

Proceedings of the Eighty-Eighth Session of the Indian Science Congress Association, 2001, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 2001.

Proceedings of the Eighty-Eighth Session of the Indian Science Congress Association, 2001, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 2001.

Proceedings of the Eighty-Eighth Session of the Indian Science Congress Association, 2001, Part III, Advance Abstracts, Calcutta: The Indian Science Congress Association, 2001.

Proceedings of the Eighty-Eighth Session of the Indian Science Congress Association, 2001, Part IV, Late Abstracts, Discussions, List of Members and List of Index, Calcutta: The Indian Science Congress Association, 2001.

Proceedings of the Eighty-Fifth Session of the Indian Science Congress Association, 1998, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1998.

Proceedings of the Eighty-Fifth Session of the Indian Science Congress Association, 1998, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1998.

Proceedings of the Eighty-Fifth Session of the Indian Science Congress Association, 1998, Part III, Advance Abstracts, Calcutta: The Indian Science Congress Association, 1998.

Proceedings of the Eighty-Fifth Session of the Indian Science Congress Association, 1998, Part IV, Late Abstracts, Discussions, List of Members and List of Index, Calcutta: The Indian Science Congress Association, 1998.

Proceedings of the Eighty-First annual session of Indian Science Congress, 1994, Calcutta: Indian Science Congress Association, 1994.

Proceedings of the Eighty-First Session of the Indian Science Congress Association, 1994, Part IA, Calcutta: The Indian Science Congress Association, 1994.

Proceedings of the Eighty-First Session of the Indian Science Congress Association, 1994, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1994.

Proceedings of the Eighty-Fourth Session of the Indian Science Congress Association, 1997, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1997.

Proceedings of the Eighty-Fourth Session of the Indian Science Congress Association, 1997, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1997.

Proceedings of the Eighty-Ninth Indian Science Congress, Part III, Abstracts, 2002, Calcutta: Indian Science Congress, 2002.

Proceedings of the Eighty-Ninth Session of the Indian Science Congress Association, 2002, Part I, Official Matters, Kolkata: The Indian Science Congress Association, 2002.

Proceedings of the Eighty-Ninth Session of the Indian Science Congress Association, 2002, Part II, Presidential Addresses, Kolkata: The Indian Science Congress Association, 2002.

Proceedings of the Eighty-Second Session of the Indian Science Congress Association, 1995, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1995.

Proceedings of the Eighty-Second Session of the Indian Science Congress Association, 1995, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1995.

Proceedings of the Eighty-Second Session of the Indian Science Congress Association, 1995, Part III, Advance Abstracts, Calcutta: The Indian Science Congress Association, 1995.

Proceedings of the Eighty-Seventh Session of the Indian Science Congress Association, 2000, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 2000.

Proceedings of the Eighty-Seventh Session of the Indian Science Congress Association, 2000, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 2000.

Proceedings of the Eighty-Seventh Session of the Indian Science Congress Association, 2000, Part III, Advance Abstracts, Calcutta: The Indian Science Congress Association, 2000.

Proceedings of the Eighty-Sixth Session of the Indian Science Congress Association, 1999, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1999.

Proceedings of the Eighty-Sixth Session of the Indian Science Congress Association, 1999, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1999.

Proceedings of the Eighty-Sixth Session of the Indian Science Congress Association, 1999, Part III, Advance Abstracts, Calcutta: The Indian Science Congress Association, 1999.

Proceedings of the Eighty-Third Session of the Indian Science Congress Association, 1996, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1996.

Proceedings of the Eighty-Third Session of the Indian Science Congress Association, 1996, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1996.

Proceedings of the Eighty-Third Session of the Indian Science Congress Association, 1996, Part III, Advance Abstracts, Calcutta: The Indian Science Congress Association, 1996.

Proceedings of the Eighty-Third Session of the Indian Science Congress Association, 1996, Part IV, Late Abstracts, Discussions, List of Members and List of Index, Calcutta: The Indian Science Congress Association, 1996.

Proceedings of the Fifteenth Indian Science Congress, 1928, Second Circuit, Calcutta, Asiatic Society of Bengal, 1928.

Proceedings of the Fifth Indian Science Congress, 1918, Calcutta: Asiatic Society of Bengal, 1918.

Proceedings of the Fifty-Eighth Indian Science Congress, 1971, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1971.

Proceedings of the Fifty-Fifth Session, 1968, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1968.

Proceedings of the Fifty-Fifth Session, 1968, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1968.

Proceedings of the Fifty-Fifth Session, 1968, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1968.

Proceedings of the Fifty-Fifth Session, 1968, Part IV, Late Abstracts, Discussions, List of Members and Index, Calcutta: The Indian Science Congress Association, 1968.

Proceedings of the Fifty-First Indian Science Congress, 1964, Calcutta: Indian Science Congress Association, 1964.

Proceedings of the Fifty-Ninth Indian Science Congress, 1972, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1972.

Proceedings of the Fifty-Ninth Indian Science Congress, 1972, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1972.

Proceedings of the Fifty-Ninth Indian Science Congress, 1972, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1972.

Proceedings of the Fifty-Ninth Indian Science Congress, 1972, Part IV, Late Abstracts, Discussions, List of Members and Index, Calcutta: The Indian Science Congress Association, 1972.

Proceedings of the Fifty-Ninth Session of the Indian Science Congress, 1973, Calcutta: Indian Science Congress Association, 1973.

Proceedings of the Fifty-Seventh Indian Science Congress, 1970, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1970.

Proceedings of the Fifty-Seventh Indian Science Congress, 1970, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1970.

Proceedings of the Fifty-Seventh Indian Science Congress, 1970, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1970.

Proceedings of the Fifty-Sixth Session, 1969, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1969.

Proceedings of the Fifty-Sixth Session, 1969, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1969.

Proceedings of the Fifty-Sixth Session, 1969, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1969.

Proceedings of the Fifty-Sixth Session, 1969, Part IV, Late Abstracts, Discussions, List of Members and Index, Calcutta: The Indian Science Congress Association, 1969.

Proceedings of the First Indian Science Congress in Journal and Proceedings of the Asiatic Society of Bengal, Calcutta: Asiatic Society of Bengal, 1914.

Proceedings of the Fortieth Indian Science Congress, 1953, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1953.

Proceedings of the Forty-Fifth Session, 1958, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1958.

Proceedings of the Forty-Fifth Session, 1958, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1958.

Proceedings of the Forty-Fifth Session, 1958, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1958.

Proceedings of the Forty-Fourth Indian Science Congress, 1957, Part 1, Official Matters, Calcutta: The Indian Science Congress Association, 1957.

Proceedings of the Forty-Second Session, 1955, Part IV, Late Abstracts, Discussions, List of Members and Index, Calcutta: The Indian Science Congress Association, 1955.

Proceedings of the Forty-Sixth Session, 1959, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1959.

Proceedings of the Forty-Sixth Session, 1959, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1959.

Proceedings of the Forty-Sixth Session, 1959, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1959.

Proceedings of the Forty-Sixth Session, 1959, Part IV, Late Abstracts, Discussions, List of Members and Index, Calcutta: The Indian Science Congress Association, 1959.

Proceedings of the Forty-Third Indian Science Congress, 1956, Part 1, Official Matters, Calcutta: The Indian Science Congress Association, 1956.

Proceedings of the Forty-Third Indian Science Congress, 1956, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1956.

Proceedings of the Forty-Third Indian Science Congress, 1956, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1956.

Proceedings of the Forty-Third Indian Science Congress, 1956, Part IV, Late Abstracts, Discussions, List of Members and Index, Calcutta: The Indian Science Congress Association, 1956.

Proceedings of the Fourteenth Indian Science Congress, 1927, Second Circuit, Calcutta: The Asiatic Society of Bengal, 1927.

Proceedings of the Fourth Indian Science Congress, 1917, Calcutta: Asiatic Society of Bengal, 1917.

Proceedings of the Hundredth Annual Session of the Indian Science Congress Association, 2013, Part I, Kolkata: The Indian Science Congress Association, 2013.

Proceedings of the Nineteenth Indian Science Congress, 1932, Third Circuit, Calcutta: The Asiatic Society of Bengal, 1932.

Proceedings of the Ninetieth Session of the Indian Science Congress Association, 2003, Part I, Official Matters, Kolkata: The Indian Science Congress Association, 2003.

Proceedings of the Ninetieth Session of the Indian Science Congress Association, 2003, Part II, Presidential Addresses, Kolkata: The Indian Science Congress Association, 2003.

Proceedings of the Ninetieth Session of the Indian Science Congress Association, 2003, Part III, Advance Abstracts, Kolkata: The Indian Science Congress Association, 2003.

Proceedings of the Ninetieth Session of the Indian Science Congress Association, 2003, Part IV, Late Abstracts, Discussions, List of Members and List of Index, Kolkata: The Indian Science Congress Association, 2003.

Proceedings of the Ninety-Fifth Session of the Indian Science Congress Association, 2008, Part III, Advance Abstracts, Kolkata: The Indian Science Congress Association, 2008.

Proceedings of the Ninety-First Session of the Indian Science Congress Association, 2004, Part I, Official Matters, Kolkata: The Indian Science Congress Association, 2004.

Proceedings of the Ninety-First Session of the Indian Science Congress Association, 2004, Part II, Presidential Addresses, Kolkata: The Indian Science Congress Association, 2004.

Proceedings of the Ninety-Third Session of the Indian Science Congress Association, 2006, Part I, Official Matters, Kolkata: The Indian Science Congress Association, 2006.

Proceedings of the Ninety-Third Session of the Indian Science Congress Association, 2006, Part II, Presidential Addresses, Kolkata: The Indian Science Congress Association, 2006.

Proceedings of the Ninety-Third Session of the Indian Science Congress Association, 2006, Part III, Advance Abstracts, Kolkata: The Indian Science Congress Association, 2006.

Proceedings of the Ninety-Third Session of the Indian Science Congress Association, 2006, Part IV, Late Abstracts, Discussions, List of Members and List of Index, Kolkata: The Indian Science Congress Association, 2006.

Proceedings of the Second Indian Science Congress, 1915, Calcutta: Asiatic Society of Bengal, 1915.

Proceedings of the Seventeenth Indian Science Congress, 1929, Calcutta: Indian Science Congress Association, 1929.

Proceedings of the Seventeenth Indian Science Congress, 1930, Third Circuit, Calcutta: The Asiatic Society of Bengal, 1930.

Proceedings of the Seventh Indian Science Congress, 1920, Calcutta: Asiatic Society of Bengal, 1920.

Proceedings of the Seventieth Indian Science Congress, 1983, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1983.

Proceedings of the Seventy-Eighth Annual Session of the Indian Science Congress Association, 1991, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1991.

Proceedings of the Seventy-Eighth Annual Session of the Indian Science Congress Association, 1991, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1991.

Proceedings of the Seventy-Fifth Session, Platinum Jubilee, 1988, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1988.

Proceedings of the Seventy-First Indian Science Congress, 1984, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1984.

Proceedings of the Seventy-Fourth Session, 1987, Part II, Presidential Addresses, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1987.

Proceedings of the Seventy-Ninth Annual Session of the Indian Science Congress Association, 1992, Part IA, Official Matters, Calcutta: The Indian Science Congress Association, 1992.

Proceedings of the Seventy-Ninth Annual Session of the Indian Science Congress Association, 1992, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1992.

Proceedings of the Seventy-Second Indian Science Congress, 1985, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1985.

Proceedings of the Seventy-Seventh Session of the Indian Science Congress Association, 1990, Part III, Calcutta: The Indian Science Congress Association, 1990.

Proceedings of the Seventy-Sixth Session, 1989, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1989.

Proceedings of the Seventy-Third Indian Science Congress, 1986, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1986.

Proceedings of the Seventy-Third Indian Science Congress, 1986, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1986.

Proceedings of the Sixteenth Indian Science Congress, 1929, Third Circuit, Calcutta: The Asiatic Society of Bengal, 1929.

Proceedings of the Sixth Indian Science Congress, 1919, Calcutta: Asiatic Society of Bengal, 1919.

Proceedings of the Sixth Indian Science Congress, 1922, Calcutta: Asiatic Society of Bengal, 1922.

Proceedings of the Sixtieth (Diamond Jubilee) Session, 1973, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1973.

Proceedings of the Sixtieth (Diamond Jubilee) Session, 1973, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1973.

Proceedings of the Sixtieth (Diamond Jubilee) Session, 1973, Part IV, Late Abstracts, Discussions, List of Members and Index, Calcutta: The Indian Science Congress Association, 1973.

Proceedings of the Sixtieth (Diamond Jubilee) Session, Part III, Abstracts, 1973, Calcutta: The Indian Science Congress Association, 1973.

Proceedings of the Sixty-Ninth session of Indian Science Congress, 1982, Part I, Calcutta: Indian Science Congress Association, 1982.

Proceedings of the Sixty-Seventh Indian Science Congress, 1980, Part I, Official Matters, Calcutta: The Indian Science Congress Association, 1980.

Proceedings of the Tenth Indian Science Congress, 1923, Calcutta: Asiatic Society of Bengal, 1923.

Proceedings of the Third Indian Science Congress, 1916, Calcutta: Asiatic Society of Bengal, 1916

Proceedings of the Thirteenth Indian Science Congress, 1926, Calcutta: Asiatic Society of Bengal, 1926.

Proceedings of the Thirtieth Indian Science Congress, 1943, Part 1, Official Matters, Calcutta: The Indian Science Congress Association, 1943.

Proceedings of the Thirty-Eighth Indian Science Congress, 1951, Calcutta: Indian Science Congress Association, 1951.

Proceedings of the Thirty-Fifth Indian Science Congress, 1948, Part 1, Official Matters, Calcutta: The Indian Science Congress Association, 1948.

Proceedings of the Thirty-Fifth Indian Science Congress, 1948, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1948.

Proceedings of the Thirty-Fifth Indian Science Congress, 1948, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1948.

Proceedings of the Thirty-First Indian Science Congress, 1943, Part III, Abstracts, Calcutta: Indian Science Congress Association, 1943.

Proceedings of the Thirty-First Indian Science Congress, 1944, Calcutta: Indian Science Congress Association, 1944.

Proceedings of the Thirty-Fourth Indian Science Congress, 1947, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1947.

Proceedings of the Thirty-Ninth Indian Science Congress, 1952, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1952.

Proceedings of the Thirty-Ninth Indian Science Congress, 1952, Part IV, Late Abstracts, Discussions, List of Members and Index, Calcutta: The Indian Science Congress Association, 1952.

Proceedings of the Thirty-Ninth Indian Science Congress, Part 1, 1952, Official Matters, Calcutta: The Indian Science Congress Association, 1952.

Proceedings of the Thirty-Ninth Indian Science Congress, Part II, 1952, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1952.

Proceedings of the Thirty-Seventh Indian Science Congress, 1950, Part II, Presidential Addresses, Calcutta: Indian Science Congress Association, 1950.

Proceedings of the Thirty-Seventh Indian Science Congress, 1950, Part III, Abstracts, Calcutta: The Indian Science Congress Association, 1950.

Proceedings of the Thirty-Sixth Indian Science Congress, 1949, Part II, Presidential Addresses, Calcutta: The Indian Science Congress Association, 1949.

Proceedings of the Thirty-Third Indian Science Congress, 1946, Part 1, Official Matters, Calcutta: The Indian Science Congress Association, 1946.

Proceedings of the Thirty-Third Indian Science Congress, 1946, Part III, Abstracts, Calcutta: Indian Science Congress Association, 1946.

Proceedings of the Twelfth Indian Science Congress, 1925, Calcutta: Asiatic Society of Bengal, 1925.

Proceedings of the Twentieth Indian Science Congress, 1933, Third Circuit, Calcutta: Asiatic Society of Bengal, 1933.

Proceedings of the Twenty-Eighth Indian Science Congress, 1941, Part III, Abstracts, Calcutta: Indian Science Congress Association, 1941.

Proceedings of the Twenty-Eighth Indian Science Congress, 1941, Part IV, Calcutta: The Indian Science Congress Association, 1941.

Proceedings of the Twenty-Fifth Indian Science Congress, 1938, Calcutta: Asiatic Society of Bengal, 1938.

Proceedings of the Twenty-Fifth Indian Science Congress, 1938, Part I, Official Matters, Calcutta: The Royal Asiatic Society of Bengal, 1938.

Proceedings of the Twenty-Fifth Indian Science Congress, 1938, Part III, Abstracts, Calcutta: Asiatic Society of Bengal, 1938.

Proceedings of the Twenty-Fifth Indian Science Congress, 1939, Part IV, Abstracts, Errata and Addenda, Discussions, List of Members and Index, Calcutta: The Royal Asiatic Society of Bengal, 1939.

Proceedings of the Twenty-First Indian Science Congress, 1924, Calcutta: Asiatic Society of Bengal, 1924.

Proceedings of the Twenty-Fourth Indian Science Congress, 1937, Part I, Official Matters, Calcutta: The Asiatic Society of Bengal, 1937.

Proceedings of the Twenty-Fourth Indian Science Congress, 1937, Third Circuit, Calcutta: Asiatic Society of Bengal, 1937.

Proceedings of the Twenty-Seventh Indian Science Congress, 1940, Part III, Abstracts, Calcutta: Indian Science Congress Association, 1940.

Proceedings of the Twenty-Seventh Session of Indian Science Congress, 1940, Calcutta: Indian Science Congress Association, 1940.

Proceedings of the Twenty-Sixth Indian Science Congress, 1939, Part 1, Official Matters, Calcutta: The Asiatic Society of Bengal, 1939.

Proceedings of the Twenty-Sixth Indian Science Congress, 1939, Part III, Abstracts, Calcutta: Indian Science Congress Association, 1939.

Proceedings of the Twenty-Third Indian Science Congress, 1936, Fourth Circuit, Calcutta: The Royal Asiatic Society of Bengal, 1936.

Proceedings of Thirtieth Indian Science Congress, 1943, Calcutta: Indian Science Congress Association, 1943.

Proceedings of Thirty-Third Indian Science Congress, 1946, Calcutta: Indian Science Congress Association, 1946.

Proceedings of Twenty-First Indian Science Congress, 1934, Calcutta: Indian Science Congress Association, 1934.

b. <u>Official Reports and Publications of various departments/boards of the Government</u>

Annual Report of the BOSA for India, Calcutta, Superintendent Government Printing, 1904.

Annual Report of the BOSA for India, Calcutta, Superintendent Government Printing, 1905.

Annual Report of the BOSA for India, Calcutta, Superintendent Government Printing, 1908.

Annual Report of the BOSA for India, Calcutta, Superintendent Government Printing, 1916.

Calcutta University Commission Report 1917-19, Report Vol. V, Part II, Recommendations of the Commission, Calcutta: University of Calcutta, 1919.

Calcutta University Commission Report 1917-19, Vol. III, Calcutta: University of Calcutta, 1919.

Indian Industrial Commission, Minutes of Evidence 1916-17, Vol. II, Bengal & Central Provinces, Calcutta: Superintendent Government Printing, 1918.

Indian Industrial Commission: Inspection Notes 1916-18 (Confidential), Calcutta: Superintendent Government Printing, 1918.

Records of the Botanical Survey of India, Vol. I, No. 1, Calcutta: Office of Superintendent of Government Printing, 1893.

Records of the Geological Survey of India, Calcutta: Superintendent Press, 1887.

Records of the Geological Survey of India, Vol. VII, Calcutta: Government of India, 1874.

Report of the Health Survey and Development Committee Survey, Delhi: Government of India Press, 1946.

Report of the Indian Education Commission under the Presidentship of W. W. Hunter, Calcutta: Government of India, 1883.

Report of the Indian Education Committee, Government of India, Calcutta, 1883.

Report of the Indian Famine Commission, Simla: Government Central Printing Office, 1898.

Report of the Indian Industrial Commission 1916-18, Calcutta: Superintendent Government Printing, 1918.

Report of the Indian Universities Commission, 1902 presided over by T. Raleigh, Simla: Government Central Printing Office, 1902.

c. <u>Archival Documents pertaining to Government Departments</u>

Department of Education, General, Part B, Nos. 32 A, An Account of the Proceedings of the ISC held in the rooms of the ASB, January 15th, 16th and 17th, 1914 (National Archives of India, New Delhi).

Dispatch from the Court of Directors of EIC to Governor-General of India in Council, 19th July 1854 (National Archives of India, New Delhi).

Education, General no. 1318 June 26, 1914 (National Archives of India, New Delhi).

Education, General no. 2379 November 24, 1913 (National Archives of India, New Delhi).

Education, General, no. 32A September, 1914 (National Archives of India, New Delhi).

Education, Museum A no. 1-6, November, 1912 (National Archives of India, New Delhi).

Foreign Department, General A, File No. 41 – 43, July 1863 (National Archives of India, New Delhi).

Home, Education Part A nos. 204 August, 1899 (National Archives of India, New Delhi).

Home, Education Part A nos. 57 August, 1899 (National Archives of India, New Delhi).

Home, Public, no. 18 16 March, 1836 (National Archives of India, New Delhi).

Home, Public, no. 40, 12 October, 1855 (National Archives of India, New Delhi).

Home, Public, no. 41, 12 October, 1855 (National Archives of India, New Delhi).

Home, Public, no. 41, 6 March, 1823 (National Archives of India, New Delhi).

Home, Public, no. 6 6 October, 1864 (National Archives of India, New Delhi).

Home, Public, no. 8/10 9 September, 1859 (National Archives of India, New Delhi).

Home, Public, no.14/15, 29 July, 1859 (National Archives of India, New Delhi).

Industrial Education a Report, Supdt. of Government Printing: Calcutta, 1902.

Minute by Governor General, Warren Hastings, April 17, 1781 (National Archives of India, New Delhi).

Minute by Honorable T. B. Macaulay, 2 February 1835 (National Archives of India, New Delhi).

Notes, Education - A, August 1899, Nos. 57-58, Report on the IACS (National Archives of India).

Observations of H. H. Wilson before the Select Committee of the House of Lords on the establishment of Universities in 1954 (National Archives of India, New Delhi).

Response of the Assistant Director of Public Health, North-Western Frontier Province to the Chairman of the Royal Commission on the Superior Civil Service, Camp Delhi, Dated, Peshawar, November 2nd 1923, Paper No. (N. W.) 236, No. 877 (The British Library, London).

Revenue, Agriculture and Commerce, Agriculture, Part B, no. 13, July 1872; no. 22 June1875; no. 2, November 1876; no. 73-74 January 1877; no. 8 December 1880 (National Archives of India, New Delhi).

Revenue, Agriculture and Commerce, Agri-Horti no. 23 June (National Archives of India, New Delhi) 1876.

Revenue, Agriculture and Commerce, Agri-Horti no. 73-74 January (National Archives of India, New Delhi) 1877.

Revenue, Agriculture and Commerce, Agri-Horticulture, Part B no. 22 June (National Archives of India, New Delhi) 1875.

The Law Relating to India and East India Company, Charters from the Crown, 1813 (National Archives of India, New Delhi).

Letter from D Hooper, Esq, Secretary and Treasurer of the ISC, ASB to The Secretary to the GOI, Dept od Commerce and Industry, No. 2379, dated Calcutta, the 24th November 1913 (National Archives of India, New Delhi).

d. <u>Official Records and Publications relating to other Scientific Institutions/ Societies</u>

Archives of the British Association for the Advancement of Science (The Bodleian Library, Oxford).

Asiatick Researches or Transactions of the Society Instituted in Bengal for Enquiring into History and Antiquities, the Arts, Science and Literature of Asia, Volume, The First Printed Verbatim from the Calcutta Edition, London, 1788.

Asiatick Researches or Transactions of the Society Instituted in Bengal for Enquiring into History and Antiquities, the Arts, Science and Literature of Asia, Volume, The Second Printed Verbatim from the Calcutta Edition, London, 1799.

Bose Institute, Commemoration Volume, Calcutta: Bose Institute, 1985.

Centenary Review of the Asiatic Society of Bengal, 1784-1883, Calcutta: Asiatic Society of Bengal, 1885.

Constitution of a Board of Science Advice for the furtherance of scientific work in India, Nature, Vol. 67, No. 1746, London: Nature Publishing Group, 16 April 1903, pp. 568, 569.

Correspondence (496 leaves) 1935-7, 1947, "concerning delegates of the Association who attended the meetings of the Indian Science Congress Association in India, with a volume of accounts labelled 'India Fund' (Bodleian Library, Oxford).

Indian Institute of Science, Calendar, 1915-1916, Bangalore, 1915.

Journal of the Asiatic Society of Bengal, Vol. LXV, Part II, Natural History, No. 1-4, Calcutta: Baptist Mission Press, 1897.

Journal of the Bihar and Orissa Research Society, June and December 1916 (National Archives of India, New Delhi).

Journal of the Panjab Historical Society, Volume I (National Archives of India, New Delhi).

Morris, J. C. (ed.), The Madras Journal of Literature and Science, Volume 1, October 1833 to December 1834, Madras: Printed at the Vepery Mission Press, 1834.

Presidency College, Calcutta, Centenary Volume, 1955, Alipore: Superintendent Government Printing.

Printed material (1 box) 1938, "printed material relating to the meeting of the Indian Science Congress Association" (Bodleian Library, Oxford).

Proceeding of the National Institute of Sciences of India, Calcutta: National Institute of Science of India, 1935.

Proceedings of the First All-India Sanitary Conference, Simla, Government Central Branch Press, (The British Library, London) 1912.

Proceedings of the Imperial Malaria Conference, Simla: Government Central Branch Press, 1910.

Proceedings of the Madras Literary Society, Madras: Madras Literary Society, 1834.

Proceedings of the Second All-India Sanitary Conference, Simla, Government Central Branch Press, (The British Library, London) 1913.

Proceedings of the Third All-India Sanitary Conference, Simla, Government Central Branch Press, (The British Library, London) 1915.

Robert Cole and C. P. Brown (eds.), The Madras Journal of Literature and Science, Volume IX, January 1839 to June1839, Madras: Printed at the Atheneum Press, 1839, pp. 194-197.

The Royal Society, "The Indian Science Congress- Delhi Meeting, 1-8 January, 1947". Notes and Records of the Royal Society of London, 5 (1): 27-31, 1947.

Transactions of the Medical and Physical Society of Calcutta, Volume Fourth, Calcutta, Printed by Messrs Thacker and Co, St Andrews Library, 1829.

Transactions of the Medical and Physical Society of Calcutta, Volume Seventh, Calcutta, Printed by Messrs Thacker and Co, St Andrews Library, 1835.

United Nations Conference on Food and Agriculture, Final Act and Section Reports, Washington: Government Printing Office, 1943.

e. Indian and English Journals and Periodicals

Current Science Vol I, (July 1932-June 1933) New Delhi: Indian Science News Association, 1933.

Saha, Meghnad (ed.) Science and Culture, Vol. 1I, 1936-1937, Calcutta: Indian Science News Association.

Imperial Gazetteer of India, volume 21, London, Clarendon Press, 1908.

Indian Medical Gazette, The Indian Research Fund Association, December 1934.

Report of the Dawn Society for 1904, Reprinted from the *Indian Mirror*, August 6, 1904 in Part IV of The Dawn and Dawn Society's Magazine, 1907.

Sir Goroo Das Banerjee's Speech from Bengalee of August I, 1905, Reprinted in Part IV of The Dawn and Dawn Society's Magazine, 1907.

The Dawn and Dan Society's Magazine being Monthly Organ of the Dawn Society Educational Movement, Calcutta: Dawn Society Office, 1907.

Saha, Meghnad (ed.) Science and Culture, Vol. 1, 1935-1936, Calcutta: Indian Science News Association.

Engineering, Vol. 159, no. 4138, Dated May 4, 1945, p. 351, 3646/2788/43/02 (The British Library, London).

f. <u>Private Papers, Papers relating to Indian political leaders and scientific activities and Biographical Memoirs of Scientists</u>

Articles on Jawaharlal Nehru, India Office Records and Private Papers, Mss Eur F236/366 (The British Library, London).

Bernal Papers (The London School of Economics and Political Science, London)

Bhatnagar Papers, India Office Records and Private Papers, (The British Library, London).

Blackett Papers, 1948-1973. (Royal Society Archives, The Royal Society, London)

Correspondence relating to the Bengal Famine of 1943, India Office Records and Private Papers, (The British Library, London)

Files relating to Planning and Development Department, India Office Records and Private Papers, (The British Library, London).

H. Beveridge. Annual Presidential Address to the Asiatic Society of Bengal in Calcutta February 4th 1891, The British Library, London, MSS Eu C176/231, p.11, 1891.

Hill, A. V., Scientific Research in India, Simla, Government of India Press, 1944.

Indira Gandhi, India Office Records and Private Papers, Mss Eur F158/1025 (The British Library, London).

Kothari, D. S. Meghnad Saha, 1893-1956. Biographical Memoirs of Fellows of the Royal Society, Volume: 5. (1960): 216-236.

Langlands, R. P. Harish Chandra, 1923-1983, Elected F.R.S. 1973. Biographical Memoirs of Fellows of the Royal Society, Volume: 31, 1985.

Mehta, Jagdish. Satyendra Nath Bose, 1894-1974, Elected F.R.S. 1958. Biographical Memoirs of Fellows of the Royal Society, Volume: 21. 1975.

Nehru Papers, India Office Records and Private Papers, (The British Library, London).

Papers and Files relating to M. Visvesvaraya, India Office Records and Private Papers, (The British Library, London).

Papers regarding Sir J. C. Bose and The Bose Research Institute, Calcutta. IOR/L/PJ/6/1303, File 1101 30 October 1913- 4 August 1931 (The British Library, London).

Papers relating to Adreshir Dalal, India Office Records and Private Papers, (The British Library, London).

Papers relating to Atomic Energy in India (A File containing news reports of newspapers across the world reporting India's Atomic energy developments), India Office Records and Private Papers, (The British Library, London).

Penney, William George. Homi Jehangir Bhabha, 1909-1966. Biographical Memoirs of Fellows of the Royal Society, Volume: 13(1967): 35-55.

Post-War Scientific Collaboration, IOR/L/E/8/4759, C&O 85/46, May 3, 1947 (The British Library, London).

Raman, C.V., Scientific Research in Asia, Indian Council of World Affairs, New Delhi, 1947 (India Office Records, Q/26/3/60, The British Library, London).

Rao, Calyampudi Radhakrishna. "Prasantha Chandra Mahalanobis, 1893-1972." Biographical Memoirs of Fellows of the Royal Society, Volume: 19. (1973): 455-492.

Ratcliffe, John Ashworth. "Sisir Kumar Mitra, 1890-1963.", Biographical Memoirs of Fellows of the Royal Society, Volume: 10, (1964): 221-227.

Report of Proceedings, British Commonwealth Scientific Official Conference, IOR/L/E/8/4759, C&O 85/46, 1946 (The British Library, London).

Roy, Sanku Bilas and Subir K. Sen, "Scientific Research Papers by Native Bengali Authors during the Nineteenth Century", Current Science 99, No. 12, (2010): 1849-1857.

Seshadri, Thiruvenkata Rajendra. "Shanti Swarup Bhatnagar, 1894-1955." Biographical Memoirs of Fellows of the Royal Society (1962): 1-17 (Deepak Kumar Collection).

Sheshadri, T. R. Biographical Memoirs of the Fellows of the Royal Society, Vol 8, 1962, (Deepak Kumar Collection).

Speech of Right Hon. Sir Charles Wood on Moving for Leave to Introduce a Bill to Provide for the Government of India delivered in the House of Common on June 3, 1853, London: Piccadilly, 1853.

Steward, Frederick Campion. "Panchanan Maheshwari, 1904-1966." Elected F.R.S. 1965". Biographical Memoirs of Fellows of the Royal Society, Volume: 13, (1967): 256-266.

Stubblefield, Cyril James. "Darashaw Nosherwan Wadia, 1883-1969." Elected F.R.S. 1957”. Biographical Memoirs of Fellows of the Royal Society, Volume: 16, (1970): 543-562.

The Royal Society “Sir Jagdish Chandra Bose, 1858-1937, Obituary Notices of Fellows of The Royal Society, 3 (8): 2-12, (1940).

William Wilberforce, Substance of the speeches of William Wilberforce, especially on the clause in the East-India; bill for promoting the religious instruction and moral improvement of the natives of the British dominions in India, on the 22d of June, and the 1st and 12th of July, 1813, The Pamphleteer, Vol. 3, No. 5, 1814, p. 47.

2. Secondary Sources

a. <u>Articles</u>

Altbach, Philip G. "The Transformation of the Indian Student Movement." *Asian Survey* (1966): 448-460.

Altman, David. "From Fukuoka to Santiago: Institutionalization of Political Science in Latin America." *PS: Political Science & Politics* 39, no. 1 (2006): 196-203.

American Association for Advancement of Science. “Current Science”, *Science, New Series*, 82, 2125, (1935): 270-271.

American Association for the Advancement of Science. "Resource Management Theme of Indian Science Congress." *Science* 196, no. 4285 (1977): 47-48.

American Association for the Advancement of Science. "The Indian Science Congress, 1976—An Agenda for Action." *Science* 192, no. 4234 (1976): 45-45.

American Association for the Advancement of Science. “70th Indian Science Congress held at Tirupati”, *Science, New Series*, 220, 4593 (1983): 187-228.

American Association for the Advancement of Science. “Gandhi addresses Indian Science Congress”, *Science, New Series*, 216, 4546 (1982): 613-614.

American Association for the Advancement of Science. “Jubilee Meeting of the Indian Science Congress”, *Science, New Series*, 87, 2247 (1938): 67-69.

American Association for the Advancement of Science. “Report from Indian Science Congress Association”, *Science, New Series*, 232, 4746 (1986): 109.

American Association for the Advancement of Science. “Report from Indian Science Congress”, *Science, New Series*, 212, 4490 (1981): 37.

American Association for the Advancement of Science. “The Indian Science Congress”, *Science, New Series* 45, 1161 (1917): 302-304.

American Association for the Advancement of Science. “The Indian Science Congress”, *Science, New Series*, 86, 2238 (1937): 462.

American Association for the American of Science. “The Indian Journal ‘Current Science”, *Science, New Series*, 84, 2186 (1936): 452.

Anderson, Robert S. “Patrick Blackett in India: Military Consultant and Scientific Intervenor, 1947-72” *Notes and Records of the Royal Society of London* 53, No. 2 (1999): 253- 273.

Arnold, David. "Nehruvian Science and Postcolonial India." *Isis*104, no. 2 (2013): 360-370.

Azmi, Arshad Ali, 'The Aligarh Scientific Society 1864-1867." *Proceedings of the Indian History Congress*, Vol. 31, (1969): 414-20.

Bakshi, Rajni. "Traditional Sciences Congress." *Economic and Political Weekly* (1993): 2872-2874.

Balaram, P. "Science in India: Reflection on the Anniversary of a Congress". *Current Science* 103, No. 11 (2012): 1255-1256.

Balaram, P. "Symposia and congresses". *Current Science* 76, No. 11 (1999): 1411-1412.

Basalla, George. "The Spread of Western Science." *Science*, *New Series*, Vol. 156, No. 37(1967): 611-622.

Beer, John J., and W. David Lewis. "Aspects of the Professionalization of Science." *Daedalus* (1963): 764-784.

Bellis, Clare S. "Professions in Society." *British Actuarial Journal* 6, no. 2 (2000): 317-364.

Ben-David, Joseph. "Roles and Innovations in Medicine." *American journal of sociology* 65, no. 6 (1960): 557-568.

Bhargava, Pushpa M., and Chandana Chakrabarti. "Of India, Indians, and Science." *Daedalus* (1989): 353-368.

Bhattacharya, Sabyasachi. "Indian Science Today: An Indigenously Crafted Crisis." *Social Research* 78, no. 1 (2011): 255-80.

Biswas, Arun Kumar. "Revered Father Eugene Lafont and the Scientific Activity of St. Xavier's College" *Indian Journal of History of Science* 29, No. 1 (1994): 77-87.

Bose, Debasis, 'Madhusudan Gupta', *Indian Journal of History of Science*, 29, no. 1, (1994): 31-40.

Botelho, Antonio José Junqueira. "The Professionalization of Brazilian Scientists, the Brazilian Society for the Progress of Science (SBPC), and the State, 1948-60." *Social Studies of Science* 20, no. 3 (1990): 473-502.

British Medical Journal. "India". *The British Medical Journal*, 1, 3467, (1927): 1124. (Author not mentioned).

British Medical Journal. "The Indian Science Congress (Continued)". *The British Medical Journal*, 1, 3039 (1919): 382-383. (Author not mentioned).

British Medical Journal. "The Indian Science Congress". *The British Medical Journal*, 1, 3038 (1919): 346. (Author not mentioned).

British Medical Journal. “The Report of the Indian Plague Commission.” *The British Medical Journal* 1, no. 2157 (1902): 1093-098. (Author not mentioned).

Brooks, Nathan M. "Alexander Butlerov and the Professionalization of Science in Russia.” *The Russian Review* 57, no. 1 (1998): 10-24.

Brown, Richard Harvey. "Modern Science: Institutionalization of Knowledge and Rationalization of Power.” *Sociological Quarterly* 34, no. 1 (1993): 153-168.

Chakrabarti, Pratik. “Asiatic Society and its Vision of Science: Metropolitan Knowledge in a Colonial World.” *Calcutta Historical Journa*l 21, no. 1 (1999).

Chaubey, N. P., and Iswar Saran Ashram Campus. “XXXI Indian Social Science Congress.” *Economic and Political Weekly* 32, no. 27 (1997): 1570-1570.

Chatterjea, Ram G. "Indian Psychological Association" *Indian Journal of Psychology* 3, No. 1 (1968)

Choudhuri, A. R. “Election as a Recognition for Scientists of Colonial India”. *Indian Journal of History of Science* 53, no. 4 (2018): T223-T229.

Current Science. “The Indian Science Congress 1947 – Delhi”. *Current Science* XVI, No. 1 (1947): 3-4. (Author not mentioned).

Current Science. “The Indian Science Congress”. *Current Science Supplement* (1938): 253-255. (Author not mentioned).

Current Science. “The Indian Science Congress”. *Current Science* VI, No. 8 (1938): 2-4. (Author not mentioned).

Cutts, Elmer H. "The Background of Macaulay's Minute." *The American Historical Review* (1953): 824-853.

David, Arnold. "The New Cambridge History of India: Science Technology and Medicine in Colonial India. Part 3, Vol. 5." (2000): 176-85.

D, Minakshi. “92nd Indian Science Congress”. *Current Science* 88, No. 10 (2005): 1536-1541.

Economic and Political Weekly. “Occultists of the Fore”, *Economic and Political Weekly* 28 No. ½ (1993): 4. (Author not mentioned).

Economic and Political Weekly. “Reclaiming Science”, *Economic and Political Weekly* 35 No. ½ (2000): 3-4. (Author not mentioned).

Economic and Political Weekly. “Science Congress in Bombay”. *Economic and Political Weekly* 12 No. 2 (1960): 35. (Author not mentioned).

Economic and Political Weekly. “What are the Priorities?” *Economic and Political Weekly* 24 No. 2 (1989): 56. (Author not mentioned).

Gates, R. R. "The Jubilee Meeting of the Indian Science Congress." *Science* 87, no. 2260 (1938): 357-359.

Ghaswala, S. K. "Letter from Bombay: Chaotic Congress." *Science News* 95, no. 11 (1969): 270-270.

Ghosh, Suresh Chandra. "The Genesis of Curzon's University Reform: 1899–1905." *Minerva* 26, no. 4 (1988): 463-492.

Gopinathan, Asha. “97th Indian Science Congress”. *Current Science* 98, No. 7 (2010): 886.

Hughes, Everett C. "Professions." Daedalus (1963): 655-668.

Iyer, Sridhar D. “Reflections of the Indian Science Congress”. *Current Science* 78, No. 5 (2000): 538-539.

Jain, N.C. “Indian Science Congress – Need to make it a stock-taking affair”. *Current Science* 66, No. 5 (1994): 334-335.

Klein, Ira. "Death in India, 1871-1921." *The Journal of Asian Studies* 32, no. 4 (1973): 639-59.

Krishna, V. V. "Science, Technology and Innovation Policy 2013: High on Goals, Low on Commitment." *Economic and Political Weekly* (2013): 15-19.

Krishna, V. V. "The Emergence of the Indian Scientific Community." *Sociological Bulletin* 40, no. 1-2 (1991): 89-107.

Krishna, V. V. “Changing Policy of Science and Technology in India” *Encyclopaedia of Life Support Systems.*

Kumar, Deepak. "Emergence of' Scientocracy': Snippets from Colonial India." *Economic and Political Weekly* (2004): 3893-3898.

Kumar, Deepak. "Racial Discrimination and Science in Nineteenth Century India." *The Indian Economic & Social History Review* 19, no. 1 (1982): 63-82.

Kumar, Deepak. "Reconstructing India: Disunity in the science and technology for development discourse, 1900-1947." *Osiris*15 (2000): 241-257.

Kumar, Deepak. "Technoscientific Education and the Development Discourse: India (1900–47)." *Indian Historical Review* 45, no. 2 (2018): 286-299.

Kumar, Deepak. "The ‘Culture of Science and Colonial Culture, India 1820–1920." *The British journal for the history of science* 29, no. 2 (1996): 195-209.

Larwood, H. J. G. "Western Science in India before 1850." *Journal of the Royal Asiatic Society* 94, no. 1-2 (1962): 62-76.

Larwood, H. J. G. "Science in India before 1850." *British Journal of Educational Studies* 7, no. 1 (1958): 36-49.

Lourdusamy, John Bosco. "The Indian Association for the Cultivation of Science: A Tortuous Tryst with Modern Science." *Journal of Science Education and Technology* 12, no. 4 (2003): 381-396.

MacLeod, Roy. "On Visiting the 'Moving Metropolis': Reflections on the Architecture of Imperial Science." *Historical Records of Australian Science* 5, no. 3 (1980): 1-16.

MacLeod, Roy. "Scientific Advice for British India: Imperial Perceptions and Administrative Goals, 1898—1923." *Modern Asian Studies* 9, no. 3 (1975): 343-384.

Majumder, Dwijesh Dutta. "Scientific Contributions of Professor P. C. Mahalanobis" *Current Science* 65, No. 1 (1993): 97-101.

Mehrotra, R. C. "The Indian Science Congress: Kumbh Mela or an effective forum for Science and Technology". *Current Science* 79, No. 2 (2000): 138.

Moseley, Russell. "Tadpoles and Frogs: Some Aspects of the Professionalization of British Physics, 1870 1939." *Social Studies of Science* 7, no. 4 (1977): 423-446.

Mukhopadhyay, Dipankar. "Post-Independence Science Policy and Science Funding in India." *Current Science* (2014): 1983-1987.

Narain, V. A. "The Role of Bihar Scientific Association in the Spread of Western Education in Bihar." *Proceedings of the Indian History Congress*, vol. 31, pp. 421-424. Indian History Congress, 1969.

Panja, Ranjit, Arati Ghosh. "Calcutta Medical College." *National Medical Journal of India* 2, no. 5, (1989): 244-248.

Parthasarathi, Ashok, and Baldev Singh. "Science in India: The First Ten Years." *Economic and Political Weekly* 27, no. 35 (1992): 1852-858.

Patra, Swapan Kumar and Mammo Muchie. "Science in pre-independent India: a scientometric perspective" *Annals of Library and Information Studies* 64, 2017: 125-136.

Raina, D. "Science since Independence". *India International Centre Quarterly*, 33 (3/4) (2006): 182-195.

Raina, Dhruv, and S. Irfan Habib. "The Moral Legitimation of Modern Science: Bhadralok Reflections on Theories of Evolution." *Social Studies of Science* 26, no. 1 (1996): 9-42.

Raina, Vinod. "The Science-in-Society Congress." *Economic and Political Weekly* (1990): 481-482.

Rangarajan, Mahesh. "Ideology, the Environment and Policy: Indira Gandhi." *India International Centre Quarterly* 33, No. 1 (2006): 50-64.

Sangwan, Satpal. "Indian Response to European Science and Technology 1757–1857." *The British Journal for the History of Science* 21, No. 2 (1988): 211-232.

Sangwan, Satpal. "Science Education in India under Colonial Constraints, 1792-1857." *Oxford Review of Education* 16, No. 1 (1990): 81-95.

Schlesinger, B. “Student Unrest in Indian Universities”. *Comparative Education Review* 6 No. 3: 218-223.

Schott, Thomas. "The world scientific community: Globality and globalisation." *Minerva* 29, No. 4 (1991): 440-462.

Sen, B. K. "Growth of Scientific Periodicals in India". *Indian Journal of History of Science* (1901-1947) 40, No. 4, 2005.

Sen, B.K. “General Scientific Society in India”. *Indian Journal of History of Science* 52, No. 2 (2017): 197-219.

Sen, Nirapa. “Indian Science Congress Some Facts”. *Current Science* 84, No. 4 (2003): 490.

Sen, Nirapa. “Kalam addresses Space Summit at the Indian Science Congress”. *Current Science* 84, No. 2 (2003): 131.

Sen, Nirupa. “Indian Science Congress”. *Current Science* 84, No. 1 (2003): 12.

Sen, Nirupa. “The Indian Science Congress”. *Current Science* 80, No. 5 (2005): 607-609.

Sen, Subir K. “Rituals of Science Congress”. *Current Science* 84, No. 8 (2003): 969-970.

Sharma, Om P. “Indian Science Congress – A Circus or a forum for showcasing hard science”. *Current Science* 110, No. 5 (2016): 749-750.

Sharma, V. N., ‘Sawai Jai Singh’s Hindu Astronomers’, *Indian Journal of History of Science*, Vol, 28, No. 2, 1993, pp. 131-155.

Shiva, Vandana, and Jayanta Bandyopadhyay. "The Large and Fragile Community of Scientists in India." *Minerva* 18, No. 4 (1980): 575-594.

Singh, Rajinder. “Indian Science Congress Association and the VIPs”. *Current Science* 84, No. 12 (2003): 1499.

Stephan Fuchs, Joseph Ben-David and Gad Freudenthal. “Scientific Growth: Essays on Social Organisation and Ethics of Science.” *Contemporary Sociology* 21, No. 6 (1992): 859

Tauro, P., A. S. Rao. “Indian Science Congress – Time for Reflection”. *Current Science* 94, No. 9 (2008): 1113.

Technology Policy Statement. *Journal of Indian School of Political Economy,* Vol. 4, No. 3 (1992): 535-541.

Unnikrishnan, M. K. “Science Congress and the VIP Syndrome”. *Current Science* 84, No. 4 (2003): 484.

Vijayaraghavachari, T. "Joint Meeting of the Statistical Conference with the Section of Agriculture of the Indian Science Congress." *Sankhyā: The Indian Journal of Statistics* (1941): 349-350.

Virk, H. S. “Indian Science Congress”. *Current Science* 85, No. 3 (2003): 240.

Virk, H. S. “The fun of holding Indian Science Congress Melas”. *Current Science* 78, No. 9 (2000): 1052.

Wilensky, Harold L. "The Professionalization of Everyone? "*American journal of sociology* 70, No. 2 (1964): 137-158.

b. <u>Unpublished M.Phil. Dissertation/Thesis</u>

Collins, P. M. D., The British Association for the Advacement of Science and Public Attitudes to Science, 1919- 1945, Ph.D. Thesis, School of Education, University of Leeds, Leeds, 1978.

Sinha, Sneha. Institutionalisation and Professionalisation of Science: Role of Indian Science Congress Association, 1914 – 1947, M. Phil Dissertation, Centre for Studies in Science Policy, Jawaharlal Nehru University, New Delhi, 2014.

c. <u>Books</u>

Acharya Nil Ratan Dhar: Short *Life Sketch, Scientific Activities and List of Publications*. Calcutta: Indian Chemical Society, 1982.

Anderson, Robert S. *Nucleus and Nation: Scientists, International Networks and Power in India*. Chicago and London: The University of Chicago Press, 2010.

Arnold, David, *Tropics and the Traveling Gaze: India, Landscape and Science 1800-1856.* Delhi: Permanent Black, 2005.

Aurora, Gurdip Singh. *Scientific Community in India*. Vol. 1. New Delhi: Amrita Prakashan, 1989.

Baber Zaheer, *Science of Empire: Scientific Knowledge, Civilization and Colonial Rule in India*. New Delhi: Oxford University Press, 1998.

Bagal, Jogesh Chandra. *Pramatha Nath Bose*. Calcutta: Elm Press, 1955.

Bagchee, Moni. *The Asiatic Society: A Brief History*. New Delhi: People's Publishing House, 1984.

Bagchi, Amiya Kumar. *Economy and Organization: Indian institutions under the neoliberal regime.* New Delhi: Sage Publications Pvt. Ltd, 1999.

Bala, Poonam. *Imperialism and medicine in Bengal*. New Delhi: Sage Publications, 1991.

Banerjee, Pranab K. *Essays in Technology Development and the Third World*. HK Pub., 1990.

Basu, Aparna, *Essays in the History of Indian Education*. New Delhi: Concept, 1982.

Basu, Aparna, *The Growth of Education and Political Development in India, 1898-1920.* Delhi: Oxford University Press, 1974.

Basu, Baman Das. *History of education in India under the rule of the East India Company*. Calcutta: Modern Review Office, 1944.

Baudisch, K. eds. ABC Weapons, *Disarmament and Responsibility of Scientists*. Berlin: World Federation of Scientific Workers. 1971.

Ben, David, J. *The Scientists Role in Society.* Chicago: The University Press, 1971.

Bernal, J.D., *Science in History*. London: Watts & Co., 1954.

Besant, Annie, *Annie Besant, An Autobiography*. London: The Theosophical Publishing House, 1910.

Bhargava, Pushpa M., and Chandana Chakrabarti. *The Saga of Indian Science since Independence: in a nutshell.* Hyderabad: Universities Press, 2003.

Bhatnagar, Anand Swarup. *Shanti Swarup Bhatnagar, his life and work.* Delhi: NISTADS-CSIR, 1988.

Bhattacharjee, K. S. *The Bengal Renaissance, Social and Political thoughts*. New Delhi: Classical Publishing Company, 1986.

Bhattacharyya, Amit. *Swadeshi Enterprise in Bengal, 1890-1920,* Kolkata: Setu Prakashani. 2007.

Bhishagratna, Kaviraj Kunja Lal (ed.), *An English Translation of The Sushruta Samhita,* Calcutta: Kaviraj Kunja Lal Bhishagratna, 1911.

Bose, P. K. eds, *A Decade (1963-1972) of Indian Science Congress Association, Progress of Geography,* Calcutta: The Indian Science Congress Association, 1973.

Bose, P. K., *A Decade (1963-1972) of Science in India, Progress of Statistics,* Calcutta: The Indian Science Congress Association, 1973.

Calcutta University. *Commemorative Volume- Hundred Years of Post-Graduate Teaching in Chemistry under Calcutta University, 1886-1986,* Calcutta: The Organizing Committee, Celebration of Hundred Years of Post-Graduate Teaching in Chemistry under Calcutta University,1986.

Chakrabarti, Pratik, *Western Science in Modern India: Metropolitan Methods*, Colonial Practices, Paperback Edition, Ranikhet: Permanent Black, 2004.

Chatterjee, C. and Chatterjee, E. *Meghnad Saha*, New Delhi: National Book Trust, 1984.

Chatterjee, S. P., *A Decade (1963-1972) of Science in India, Progress of Geography.* Calcutta: The Indian Science Congress Association, 1973.

Chatterjee, Santimay, and Enakshi Chatterjee. *Satyendra Nath Bose*. New Delhi: National Book Trust, 1976.

Chaturvedi, Pradeep, Eds. *Science in India,* New Delhi: Indian Association for the Advancement of Science. 1985.

Clark, Ronald. *J. B. S. Life and Work of J. B. S. Haldane.* London: Bloombury Reader, 2013.

Das, Tarakchandra. *Bengal Famine 1943*. Calcutta: University of Calcutta, 1949.

Dasgupta, Subrata, *Jagadish Chandra Bose and the Indian Response to Western Science.* Ranikhet: Paperback Edition, Permanent Black, 2009.

Dasgupta, Subrata. *Jagadis Chandra Bose and the Indian response to western science*. USA: Oxford University Press, 1999.

Dasgupta, Uma, ed. *History of Science, Philosophy and Culture in Indian Civilisation*, Volume XV, Part 4, Science and Modern India: An Institutional History, c.1784-1947. Delhi: Pearson, 2011.

Edwards, Thomas. *Henry Derozio, the Eurasian, Poet, Teacher, and Journalist: With Appendices.* Calcutta: W. Newman, 1884.

Gaillard, J., Krishna, V. V. and Waast, R. eds. *Scientific Communities in the developing world.* New Delhi: Sage Publication. 1997.

Gandhi, Indira ed. *Indira Gandhi on Science, Technology and Self-Reliance.* Kolkata: ISCA. 1984.

Ganguly, Nalin C., *Builders of Modern India, Raja Ram Mohun Roy.* Calcutta: YMCA Press, 1934.

Geoffrey, Millerson. *The Qualifying Associations. A Study in Professionalization*. London: Routledge and Kegan Paul. 1964.

Ghose, Sarat Chandra. *Life of Dr. Mahendra Lal Sircar*, Calcutta: The Oriental Publishing Home.1909.

Ghosh, Jnan Chandra. The National Planning Commission and Iron, Steel and Petroleum Industries: Being the Rao Bahadur Bapu Rao Dada Kinkhede Lectures for 1950 Delivered at the Nagpur University on the 7th, 8th, and 9th August, 1952. Nagpur University, 1953.

Girjesh Govil, 'Indian Science Congress Association and the Three Academies of Science' in Uma Das Gupta, History of Science, Philosophy and Culture in Indian Civilisation, Volume XV, Part 4, Science and Modern India: An Institutional History, c.1784-1947. New Delhi: Pearson Longman, 2011,

Gupta, Monoranjon. *Prafulla chandra Ray: a biography*, Bombay: Bharatiya Vidya Bhawan, 1966.

Gupta, Monoranjon. *Jagadishchandra Bose: A Biography*. Vol. 117. Bharatiya Vidya Bhavan, 1964.

Gupta, S. M. *Birbal Sahni*, New Delhi: National Book Trust, 1978.

Habib, S. Irfan and Dhruv Raina. eds., *Social History of Science in Colonial India*, New Delhi: Oxford University Press, 2007.

Haldane, J. B. S. *Science and Indian Culture*. Calcutta: New Age Publishers, 1965.

Howarth, Osbert John Radcliffe. The British Association for the advancement of science: a retrospect 1831-1921. London: The British Association for the Advancement of Science, 1922.

Indian Association for the Cultivation of Science (1976).A Century, Calcutta: Indian Association for the Cultivation of Science.

Indian Science Congress Association. The Shaping of Indian Science – Indian Science Congress Association Presidential Addresses, Volume I: 1914-1947. Hyderabad: Universities Press, 2003.

Indian Science Congress Association. The Shaping of Indian Science – Indian Science Congress Association Presidential Addresses, Volume II: 1948-1981. New Delhi: Universities Press, 2003.

Indian Science Congress Association. The Shaping of Indian Science – Indian Science Congress Association Presidential Addresses, Volume III: 1982-2003. New Delhi: Universities Press, 2003.

ISCA, A Decade (1963-1972) of Science in India, Agriculture Research in India since Independence. Calcutta: The Indian Science Congress Association, 1973.

Jackson, John Archer, and J. H. Jackson, eds. *Professions and professionalization: Volume 3, sociological studies*. Vol. 3. Cambridge: Cambridge University Press, 1970.

Jambhekar, Ganesh Gangadhar, Centenary Memorial Volumes I-IV in Honour of Acharya Bal Gangadhar Shastri Jambhekar, Memoirs and Speeches of Acharya Bal Gangadhar Shastri Jambhekar. Poona: Published by Ganesh Gangadhar Jambhekar, 1950.

Jataraman, A. *C. V. Raman, A Memoir*. Bengaluru: Indian Academy of Sciences, 2017.

Kapil, Raj. *Relocating Modern Science: Circulation and the Construction of Knowledge in South Asia and Europe, Seventeenth to Nineteenth Centuries*. Conservation & Society, Delhi: Permanent Black, 2006.

Karmohapatra, S. B. *Meghnad Saha*. New Delhi: Ministry of Information and Broadcasting, 1997.

Khastgir, S, R., *A Decade (1963-1972) of Science in India*, Progress of Physics, Calcutta: The Indian Science Congress Association, 1973.

Khoshoo, T. N. *Mahatma Gandhi, an Apostle of Applied Human Ecology,* New Delhi: TERI, 1995.

Kohlstedt, Sally Gregory. The formation of American scientific community: the American Association for the Advancement of Science, 1848-1860, United States of America: University of Illinois Press, 1976.

Kothari, D. S. *Education Science and National Development*, Bombay: Asia Publishing House, 1969.

Kothari, D. S. *Nuclear Explosions and their Effects.* Delhi: The Publication Division, 1958.

Krishnamurti, Y. G., and Mokshagundam Visvesvaraya. *Sir M. Visvesvaraya: a study*. Popular Book Dept, 1941.

Kumar Deepak, *Science in Modern Bengal, The History of Bengal Project*, The Asiatic Society, 7- 9, 2018.

Kumar, Deepak 'India' in Roy Porter (ed.) Eighteenth Century. New Delhi: Cambridge University Press, 2003.

Kumar, Deepak. eds, *Science and Empire: Essays in Indian Context*, Delhi: Anamika Prakashan, 1991.

Kumar, Deepak. *Science and the Raj: A Study of British India,* Second Edition, New Delhi: Oxford University Press, 2006.

Lovell, Bernard. *P. M. S. Blackett, A Biographical Memoir.* London: The Royal Society. 1976.

Macleod Roy and Kumar Deepak eds., *Technology and the Raj: Western Technology and Technical Transfers to India I700-1947*, Sage Publications: New Delhi, 1995.

Macleod, Roy eds., *Nature and Empire: Science and the Colonial Experience*, Osiris, 2nd Series, Vol. 15, 2000.

MacLeod, Roy M., and Roy MacLeod, eds. *The commonwealth of science: ANZAAS and the scientific enterprise in Australasia, 1888-1988*. Oxford University Press, USA, 1988.

Milne, John. *A Catalogue of Destructive Earthquakes. London: British Association for the Advancement of Science,* 1911.

Mishra, R. S., *A Decade (1963-1972) of Science in India, Progress of Mathematics,* Calcutta: The Indian Science Congress Association, 1973.

Mitra Rajendralal, A. F. R. Hoernle and P. N. Bose, *Centenary Review of The Asiatic Society,* 1784-1884, Calcutta: The Asiatic Society, 1885.

Mitra, Pearey Chand, *A Biographical Sketch of David Hare*, Calcutta: W. Newman and Co., 1877.

Mitra, Shib Kumar, *A Decade (1963-1972) of Science in India*, Progress of Psychology, Calcutta: The Indian Science Congress Association, 1973.

Morris, Henry. *Charles Grant*. London: John Murray, Albemarle Street, 1904

Mukerji, Bishnu, and P. K. Bose, eds. *A Short History of the Indian Science Congress Association (with Life-sketches of General Presidents) 1914-1963*. Calcutta: Indian Science Congress Association, 1963.

Nandy, Ashis. *Alternative sciences: Creativity and authenticity in two Indian scientists*. Vol. 4. Allied, 1980.

Narayan, T. G. *Famine Over Bengal*. Calcutta: The Book Company Ltd., 1944.

Natesan, *Dr. P. C. Ray, Sketch of his Life and Career*, Madras: G. A. Natesan and Co., 1918. (Author not mentioned)

Natesan, *Indian Scientists, Biographical Sketches with an account of their researches, discoveries and inventions*, First Edition, Madras: G. A. Natesan and Co. (Author not mentioned)

Nehru, Jawaharlal. *Discovery of India*. Calcutta: Signet Press, 1946.

Pal, Bipan Chandra. *Sir Ashutosh Mookherjea, A Character Study*. Calcutta: Kuntaline Press, 1920.

Pandit, M. P., *Sri Aurobindo*, New Delhi: Ministry of Information and Broadcasting, Government of India, 1983.

Phalkey, Jahnavi, *Atomic State: Big Science in Twentieth Century India*, Ranikhet: Permanent Black, 2013.

Pisharoty, P. R., *C.V. Raman*. Publications Division Ministry of Information & Broadcasting, 1982.

Prakash, Gyan, *Another Reason: Science and the Imagination of Modern India*, New Delhi: Oxford University Press, 2000.

Rahman, Abdur, ed. *History of Indian Science, Technology, and Culture*, AD 1000-1800. Vol. 1. Oxford University Press, 1999.

Raina, Dhruv, and S. Irfan Habib. *Domesticating Modern Science: A Social History of Science and Culture in Colonial India*. New Delhi: Tulika Books, 2004.

Raina, Dhruv. Images and Contexts: *The Historiography of Science and Modernity in India*. New Delhi: Oxford University Press, 2010.

Ramaseshan, S., C. Ramachandra Rao. *C. V. Raman, A Pictorial Biography*. Bangalore: Indian Academy of Sciences, 1988.

Ramesh, Jairam. *Indira Gandhi: A Life in Nature*. New Delhi: Simon and Schuster, 2017.

Rao, V. S. Narayana. *Mokshagundam Visvesvaraya: His Life and Work.* Mysore: Geetha Book House, 1973.

Rau, M. Chalapathi. *Jawaharlal Nehru*. Publications Division, Ministry of Information and Broadcasting, Government of India, 1973.

Ray, Prafulla Chandra. *Autobiography of a Bengali Chemist*. Orient Book Co., 1958.

Ray, Prafulla Chandra. *Life and experiences of a Bengali chemist*. Chackervertty, Chatterjee and Co Ltd, Calcutta, 1932.

Ray-Chaudhuri, S. P., *A Decade (1963-1972) of Science in India*, Progress of Zoology and Entomology. Calcutta: The Indian Science Congress Association, 1973.

Rudra, Ashok. *Prasanta Chandra Mahalanobis: A Biography*. USA: Oxford University Press, 1996.

Sadhu, D. P., *A Decade (1963-1972) of Science in India*, Progress of Physiology, Calcutta: The Indian Science Congress Association, 1973.

Sangwan, Satpal. *Science, Technology and Colonisation: An Indian Experience*, 1757-1857. Delhi: Anamika Prakashan, 1991.

Shah, Amrita. *Vikram Sarabhai, A Life.* Penguin: Viking, 2007.

Sharma, Arun Kumar, *A Decade (1963-1972) of Science in India, Progress of Botany*. Calcutta: The Indian Science Congress Association, 1973.

Singh, Baldev. *Jawaharlal Nehru on science*. New Delhi: Nehru Memorial Museum and Library, 1986.

Sinha, Jagdish. *Science, War and Imperialism: India in the Second World War.* Leiden: Brill Publication, 2008.

Sinha, Probodh Chandra. *Sir Asutosh Mookerjee: A Study*. Calcutta: Book Company Limited, 1928.

Sinha, Sasadhar. *Asutosh Mookerjee*. Publications Division, Ministry of Information and Broadcasting, Government of India, 1970.

Sir Shanti Swarupa Bhatnagar, V. V. Krishna, *S. S. Bhatnagar on Science, Technology and Development*, *1938-1954*. New Delhi: Wiley Eastern Limited, 1993.

Stephen, Leslie. *The English Utilitarians,* Vol. II, James Mill, London: Duckworth and Co., 1990.

Stokes, Eric. *The English Utilitarians And India.* Delhi: Oxford University Press, 1959.

Tagore, Saumyendranath, *Builders of Modern India, Raja Ram Mohun Roy*, New Delhi: Ministry of Information and Broadcasting, Government of India, 1973.

The Asiatic Society, *Sir William Jones, Bicentenary of his birth commemoration*, volume, 1746-1946. Calcutta: The Asiatic Society, 1948.

Tiwari, R. D., Dey, Arun K., *A Decade (1963-1972) of Science in India, Progress of Chemistry,* Calcutta: The Indian Science Congress Association, 1973.

Venkataraman, Ganesan. *Journey into light: life and science of CV Raman*. Indian Academy of Sciences, 1988.

Venkataraman, Ganesan. *Bhabha and his magnificent obsessions*. Universities Press, 1994.

Venkataraman, Ganesan. *Bose and his Statistics*. Universities Press, 1992.

Visvanatham, Shiv. *Organizing for Science: Making of an Industrial Research Laboratory.* Delhi: Oxford University Press, 1985.

Visvesvaraya, M. *Memoirs of my Working Life*. Bombay: O. Claridge and Co., 1951.

Visvesvaraya, Mokshgundam. *Planned economy For India*, Second Edition, 1936.

Visvesvaraya, Mokshgundam. *Reconstructing India*. London: PS King & son, Limited, 1920.

Zachariah, Benjamin, *Nehru*, New Delhi: Roli Book, 2004.

Zachariah, Benjamin. *Developing India: An Intellectual and Social History c. 1930-50.* OUP Catalogue, 2005.

d. <u>Web Sources and News Articles</u>

Chowdhury, Shreya Roy. "Chauvinistic claims: Embarrassment Indian scientists protest irritational comments at Science Congress". January 2019, Scroll.in https://scroll.in/article/908392/chauvanistic-claims-embarrassed-indian-scientists-protest-irrational-comments-at-science-congress (accessed March 1, 2019).

Deccan Herald. "Science Congress: a circus of clowns". Deccanherald.com. https://www.deccanherald.com/opinion/first-edit/science-congress-circus-clowns-711873.html (accessed March 1, 2019).

Indian Express Editorial. "Comic Timing". Indianexpress.com. https://indianexpress.com/article/opinion/editorials/indian-science-congress-scientist-theories-comic-timing-5529270/ (accessed March 1, 2019).

Krishnaswami, Narayanan. "Need focus on science: Manjul". January 2016. The Times of India, https://timesofindia.indiatimes.com/india/Need-focus-on-science Manjul/articleshow/50476403.cms? (accessed March 1, 2019).

Mehta, Nikita. "New addition at ISC: ancient Indian science". January 2015, Live Mint. https://www.livemint.com/Politics/jaZOpxx2ReWF8ZuHvi01HM/New-addition-at-ISC-ancient-Indian-science.html (accessed March 1, 2019).

Mohanty, Ranjani Iyer. “India Journal: When Scientists Become Stars”. January 2011. The Wall Street Journal. https://blogs.wsj.com/indiarealtime/2011/01/07/india-journal-when-our-scientists-become-star/(accessed March 1, 2019).

Mukunth, Vasudevan. “How to React to Stupidity at the Science Congress”. January 2019. The Wire, https://thewire.in/the-sciences/how-to-react-to-stupidity-at-the-science-congress (accessed March 1, 2019).

Nadathur, Ramanujan. “The Indian Science Congress Is Too Big Succeed”. January 2019. The Wire, https://thewire.in/the-sciences/the-indian-science-congress-is-too-big-to-succeed/(accessed March 1, 2019).

Panda, Binay. “Not a Congress But a Big Fat Indian Science Wedding”. January 2016. The Wire, https://thewire.in/politics/not-a-congress-but-a-big-fat-indian-science-wedding (accessed March 1, 2019).

Pathak, Avijit. “Does the Indian Science Congress Acknowledge the Need to Be Reflexive”. January 2019. The Wire, https://thewire.in/the-sciences/does-the-indian-science-congress-acknowledge-the-need-to-be-reflexive (accessed March 1, 2019).

Prasad, R. “Regaining respect: on Indian Science Congress”. January 2019. The Hindu, https://www.thehindu.com/opinion/op-ed/regaining-respect/article25943533.ece(accessed March 1, 2019).

Ravindranath Prasad. “Indian Science Congress: An annual ritual losing its meaning”. January 2016. Science Chronicle, https://journosdiary.com/2016/01/17/indian-science-congress-an-annual-ritual-losing-its-meaning/(accessed March 1, 2019).

Somasekhar, M. “Jamboree in the name of science”. March 2018. The Hindu Business Line, https://www.thehindubusinessline.com/opinion/columns/from-the-viewsroom/jamboree-in-the-name-of-science/article23263307.ece (accessed March 1, 2019).

Talukdar, Sandipan. “Indian Science Congress: A Mockery of Science!”. January 2019. News Click, https://www.newsclick.in/indian-science-congress-mockery-science (accessed March 1, 2019).

The Hindu. “Indian Science Congress sans drama from 2020?”. Janury 2019. The Hindu https://journosdiary.com/2019/01/09/new-indian-science-congress-drama/ (accessed March 1, 2019).

The Times of India. “Science Congress a circus? Scientists split”. January 2016 The Times of India, https://timesofindia.indiatimes.com/india/Science-Congress-a-circus-Scientists-split/articleshow/50476408.cms (accessed March 1, 2019).

Varshney, Vibha. “Can 104th Indian Science Congress claim any achievement”. January 2017. Down to Earth. https://www.downtoearth.org.in/coverage/india/indian-science-congress-56742 (accessed March 1, 2019).

Vijayraghavan, K. “Pseudoscience at the Science Congress Won’t Stop Unless All Scientists Speak Up”. January 2019. The Wire, https://thewire.in/the-sciences/pseudoscience-the-gorillas-in-the-room-are-not-at-the-indian-science-congress (accessed March 1, 2019).

APPENDIX I

Glossary of Indian Scientists

The glossary provides biographical notes and specialisation of Indian scientists which enables the reader to identify the scientists discussed in the present study at a glance.

A. C. Joshi	Botanist	(1908 - 1971)
A. K. Datta	Molecular Biologist	(1944 –)
A. K. Sharma	Cytogeneticist	(1924 – 2017)
A. L. MudaliaR	Physician	(1887 – 1974)
A. P. J. Abdul Kalam	Aerospace Scientist	(1931 – 2015)
A. P. Mitra	Physicist	(1927 – 2007)
A. S. Paintal	Medical Scientist	(1924 – 2005)
A.K. Saha	Nuclear Physicist	(1922 - ?)
Archana Sharma	Botanist	(1932 – 2008)
Ashutosh Mukherjee	Mathematician	(1864 – 1924)
Asima Chatterjee	Chemist	(1917 – 2006)
Atma Ram	Chemist	(1908 – 1983)
B. B. Ray	Physicist	(1894 – 1944)
B. C. Guha	Biochemist	(1904-1962)
B. C. Roy	Physician	(1882 – 1962)
B. Mukherji	Pharmacologist	(1903 - ?)
B. N. Prasad	Mathematician	(1899 – 1966)
B. P. Pal	Agriculture Scientist	(1906 – 1989)
B. R. Rao	Space Physicist	(1922 – 2005)
B. Sahni	Palaeobotanist	(1891 – 1949)
C. N. R. Rao	Chemist	(1934 -)
C. V. Raman	Physicist	(1888 – 1970)
D. K. Sinha	Mathematician	(1940 -)
D. M. Bose	Physicist	(1885 – 1975)
D. N. Wadia	Geologist	(1882 – 1969)
D. S. Kothari	Physicist	(1906 – 1993)
T. N. Khoshoo	Environmental Scientist	(1927 – 2002)
Vasant Gowarikar	Space scientist	(1933 – 2015)
Ganesh Prasad	Mathematician	(1876 – 1935)
Geetha Bali	-	-
H. J. Bhabha	Nuclear Physicist	(1909 – 1966)
H. N. Sethna	Engineering Science	(1923 – ?)
J. C. Bose	Bio-Physicist, Botanist	(1858 – 1937)
J. C. Ghosh	Chemist	(1894 – 1959)

J. N. Mukherjee	Chemist	(1893 – 1983)
K. Kasturirangan	Space Scientist	(1940 -)
K. S. Krishnan	Physicist	(1898 – 1961)
Lal C. Verman	Physicist	(1902 - ?)
M. A. Husain	Entomologist	(1889 – ?)
M. G. K. Menon	Physicist	(1928 – 2016)
M. S. Krishnan	Geologist	(1898 – 1970)
M. S. Swaminathan	Agricultural Scientist	(1925 -)
M. S. Thacker	Engineer	(1904 – 1988)
M. Visvesvaraya	Engineer	(1861 – 1962)
Mahendralal Sircar	Doctor	(1833 – 1904)
Manju Sharma	Biologist	(1940 -)
Manjul Bhargava	Mathematician	(1974-)
Meghnad Saha	Astrophysicist	(1893 – 1956)
N. R. Dhar	Physical Chemist	(1892 – 1986)
P. Balaram	Biochemist	-
P. C. Mahalanobis	Statiscian	(1893 – 1972)
P. C. Ray	Chemist	(1861 – 1944)
P. N. Bose	Geologist	(1855 – 1934)
P. N. Srivastava	Radiation Biologist	(1927 - ?)
P. Parija	Botanist	(1891 - ?)
P. Rama Rao	Metallurgy	(1937 -)
R. A. Mashelkar	Engineer	(1943 -)
R. B. T. S. Venkatraman	Botanist	(1884 – 1963)
R. C. Mehrotra	Chemist	(1922 – 2004)
R. P. Bambah	Mathematician	(1925- ?)
R. S. Mishra	Mathematician	(1918 – 1999)
Yash Pal	Physics	(1928 – 2017)
R. S. Paroda	Agricultural Scientist	(1942 -)
S. Bhagvantan	Physicist	(1909 – ?)
S. C. Pakrashi	Chemist	(1930 - ?)
S. K. Joshi	Physicist	(1935 - ?)
S. K. Mitra	Physicist	(1890 – 1963)
S. L. Hora	Zoologist	(1896 – 1955)
S. N. Bose	Physicist	(1894 – 1974)
S. M. Sircar	Physiologist	(1908 - ?)
S. R. Kashyap	Botanist	(1882 – 1934)
S. S. Bhatnagar	Chemist	(1894 – 1955)
S. Z. Qasim	Marine Biologist	(1926 – 2015)
T. N. Khoshhoo	Environmental Scientist	(1927 – 2002)
T. R. Sheshadri	Chemist	(1900 – 1975)
U. N. Brahmachari	Medical practitioner	(1873 – 1946)
U. R. Rao	Space Scientist	(1932 – 2017)
R. N. Mukherjee	Engineer	(1854 – 1936)
R. N. Chopra	Indian Medical Service	(1882 – 1973)

APPENDIX II

Biographical Memoirs of British/European Scientists: General Presidents of ISCA

The glossary provides biographical notes and specialisation of British and European scientists which enables the reader to identify these scientists discussed in the present study at glance.

A. G. Bourne	(1859 – 1940)
A. Howard	(1873 – 1947)
C. S. Middlemiss	(1859 – 1945)
G. T. Walker	(1888 – 1958)
J. H. Hutton	(1908 – ?)
J. H. Jeans	-
J. L. Simonsen	(1884 – 1957)
L. L. Fermor	(1880 – 1954)
L. Rogers	(1868 – 1962)
Lord Rutherford	(1871 – 1946)
M. O. Forster	(1862 – 1945)
N. Annandale	(1876 – 1924)
P. S. Macmahon	-
R. B. S. Sewell	(1880 – ?)
S. G. Burrard	(1860 – 1943)
S. R. Christophers	(1873 – ?)
W. B. Bannerman	(1858 – 1924)
W. D. West	(1901 - ?)

APPENDIX III

The General President, General Secretaries and Title/Theme of the sessions of the Indian Science Congress (1914 – 2014)

Session	Year	Place	President	General Secretaries	Title/Theme
1st	1914	Calcutta	Hon. Justice Sir Asutosh Mookerjee	Mr. D. Hooper	About Science Congress
2nd	1915	Madras	Hon.Surgeon-General Dr. W.B.Bannermann	Dr. J. L. Simonsen Mr. P. S. MacMahon	The Importance of Knowledge of Biology to Medical, Sanitary and Scientific Men Working in the Tropics
3rd	1916	Lucknow	Colonel Sir Syndey Burrard	Dr. J. L. Simonsen Mr. P. S. MacMahon	The Plains of Northern India and their Relationship to the Himalayan Mountains
4th	1917	Bangalore	Sir Alfred Gibbs Bourne	Dr. J. L. Simonsen Mr. P. S. MacMahon	On Scientific Research
5th	1918	Lahore	Dr.Gilbert T.Walker	Dr. J. L. Simonsen Mr. P. S. MacMahon	On Teaching Of Science
6th	1919	Bombay	Lt.Colonel Sir Leonard Rogers	Dr. J. L. Simonsen Mr. P. S. MacMahon	Researches On Cholera
7th	1920	Nagpur	Acharya Prafulla Chandra Ray	Dr. J. L. Simonsen Mr. P. S. MacMahon	Dawn of Science in Modern India
8th	1921	Calcutta	Sir Rajendra Nath Mookerjee	Dr. J. L. Simonsen Dr. C. V. Raman	On Science and Industry
9th	1922	Madras	Mr.C.S.Middlemiss	Dr. J. L. Simonsen Dr. C. V. Raman	Relativity
10th	1923	Lucknow	Sir M.Visvesvaraya	Dr. J. L. Simonsen Dr. C. V. Raman	Scientific Institutions and Scientists
11th	1924	Bangalore	Dr.T.N.Annandale	Dr. J. L. Simonsen Dr. C. V. Raman Dr. S. P. Agharkar	Evolution Convergent and Divergent
12th	1925	Banaras	Dr.M.O.Forster	Dr. J. L. Simonsen Dr. S. P. Agharkar	On Experimental Training
13th	1926	Bombay	Mr.Albert Howard	Dr. J. L. Simonsen Dr. S. P. Agharkar Dr. Roland V. Norris	Agriculture and Science
14th	1927	Lahore	Sir J.C.Bose	Dr. S. P. Agharkar Dr. Roland V. Norris	The Unity of Life
15th	1928	Calcutta	Dr.J.L.Simonsen	Dr. S. P. Agharkar Dr. Roland V. Norris	On Chemistry of Natural Products
16th	1929	Madras	Professor C.V.Raman	Dr. S. P. Agharkar Dr. Roland V. Norris	On Raman Effect

17th	1930	Allahabad	Col.S.R.Christophers	Dr. S. P. Agharkar	The Science and Disease
18th	1931	Nagpur	Lt.Col.R.B.Seymour-Sewell	Dr. S. P. Agharkar Dr. H. B. Dunnicliff	The Problem of Evolution - Experimental Modification of Bodily Structure
19th	1932	Bangalore	Rai Bahadur Lal Shiv Ram Kashyap	Dr. S. P. Agharkar Dr. H. B. Dunnicliff	Some Aspects of the Alpine Vegetation of the Himalaya and Tibet
20th	1933	Patna	Sir Lewis L.Fermor	Dr. S. P. Agharkar Mr. W. D. West	The Place of Geology in the Life of a Nation
21st	1934	Bombay	Professor M.N.Saha	Dr. S. P. Agharkar Mr. W. D. West	Fundamental Cosmological Problems
22nd	1935	Calcutta	Dr.J.H.Hutton	Dr. S. P. Agharkar Mr. W. D. West	Anthropology and India
23rd	1936	Indore	Sir U.N.Brahmachari	Mr. W. D. West Prof. J. N. Mukherjee	The Role of Science in the Recent Progress of Medicine
24th	1937	Hyderabad	Rao Bahadur T.S. Venkatraman	Mr. W. D. West Prof. J. N. Mukherjee	The Indian Village its Past, Present and Future
25th	1938	Calcutta	Sir James H.Jeans	Mr. W. D. West Prof. J. N. Mukherjee	Researches in India and in Great Britain (Lord Rutherford of Nelson died prematurely)
26th	1939	Lahore	Professor J.C.Ghosh	Prof. J. N. Mukherjee Prof. P. Parija	On Research in Chemistry in India
27th	1940	Madras	Professor B.Sahni	Prof. P. Parija Prof. S. K. Mitra	The Deccan Traps: An Episode of the Tertiary Era
28th	1941	Banaras	Sir Ardeshir Dalal	Prof. P. Parija Prof. S. K. Mitra	Science and Industry
29th	1942	Baroda	Dr.D.N.Wadia	Prof. P. Parija Prof. S. K. Mitra	The Making of India
30th	1943	Calcutta	Dr.D.N.Wadia	Prof. P. Parija Prof. S. K. Mitra	Minerals' Share in the War
31st	1944	Delhi	Professor S.N.Bose	Prof. P. Parija Prof. S. K. Mitra	The Classical Determinism and the Quantum Theory
32nd	1945	Nagpur	Sir Shanti S.Bhatnagar	Prof. S. K. Mitra Prof. P. C. Mitter Prof. M. Qureshi	Give Science a Chance
33rd	1946	Bangalore	Professor M.Afzal Husain	Prof. M. Qureshi Prof. P. C. Mahalanobis	The Food Problem of India
34th	1947	Delhi	Pandit Jawaharlal Nehru	Prof. M. Qureshi Prof. P. C. Mahalanobis	Science in the Service of the Nation
35th	1948	Patna	Colonel Sir Ram Nath Chopra	Prof. M. Qureshi Prof. P. C. Mahalanobis Dr. B. Mukherji	Rationalisation of Medicine in India

36th	1949	Allahabad	Sir K.S.Krishnan	Prof. M. Qureshi Dr. B. Mukherji Dr. B. Sanjiva Rao	-
37th	1950	Poona	Professor P.C. Mahalanobis	Dr. B. Mukherji Dr. B. Sanjiva Rao	Why Statistics?
38th	1951	Bangalore	Dr.H.J.Bhabha	Dr. B. Mukherji Dr. B. Sanjiva Rao	The Present Concept of the Physical World
39th	1952	Calcutta	Dr.J.N.Mukherjee	Dr. B. Mukherji Dr. B. Sanjiva Rao	Science and Our Problems
40th	1953	Lucknow	Dr.D.M.Bose	Dr. S. R. Sen-Gupta Dr. B. N. Prasad	The Living and the Not-living
41st	1954	Hyderabad	Dr.S.L.Hora	Dr. B. N. Prasad Dr. U. P. Basu	Give Scientists a Chance
42nd	1955	Baroda	Professor S.K.Mitra	Dr. B. N. Prasad Dr. U. P. Basu	Science and Progress
43rd	1956	Agra	Dr.M.S.Krishnan	Dr. U. P. Basu Mr. B. B. Joshi	Mineral Resources and Their Problems
44th	1957	Calcutta	Dr.B.C.Roy	Dr. U. P. Basu Mr. B. B. Joshi	On Science for Human Welfare and Development of the Country
45th	1958	Madras	Prof.M.S. Thacker	Mr. B. B. Joshi Dr. A. K. Dey	Grammar of Scientific Development
46th	1959	Delhi	Dr.A.L.Mudaliar	Dr. A. K. Dey Dr. B. N. Prasad	Tribute to Basic Sciences
47th	1960	Bombay	Professor P.Parija	Dr. A. K. Dey Dr. B. N. Prasad	Impact of Society on Science
48th	1961	Roorkee	Professor N.R.Dhar	Dr. B. N. Prasad Prof. B. C. Guha	Nitrogen Problem
49th	1962	Cuttack	Dr.B.Mukerji (Dr. B. C. Guha died prematurely)	Prof. B. C. Guha Prof. P. S. Gill	Impact of Life Sciences on Man
50th	1963	Delhi	Professor D.S.Kothari	Prof. P. S. Gill Dr. Atma Ram	Science and the Universities
51st	1964	Calcutta	Professor Humayun	Prof. P. S. Gill Dr. Atma Ram	Science and the State
52nd	1965	-	Professor Humayun Kabir	Prof. P. S. Gill Dr. Atma Ram	-
53rd	1966	Chandigarh	Professor B.N.Prasad	Dr. Atma Ram Prof. Chandra Sekhar Ghosh	Science in India

54th	1967	Hyderabad	Professor T.R.Seshadri	Dr. Atma Ram Prof. Chandra Sekhar Ghosh Prof. A. K. Saha	Science and National Welfare
55th	1968	Varanasi	Dr.Atma Ram	Prof. A. K. Saha Dr. R. S. Mishra	Science in India Some Aspects
56th	1969	Bombay	Dr.A.C.Joshi (Prof.A.C.Banerjee prematurely)	Prof. A. K. Saha Dr. R. S. Mishra	A Breathing Spell: Plant Sciences in the Service of Man Man died
57th	1970	Kharagpur	Dr.L.C.Verman	Dr. R. S. Mishra Prof. (Mrs.) Asima Chatterjee	Standardization: A Triple Point Discipline
58th	1971	Bangalore	Dr.B.P.Pal	Dr. R. S. Mishra Prof. (Mrs.) Asima Chatterjee	Agricultural Science and Human Welfare
59th	1972	Calcutta	Professor W.D.West	Prof. (Mrs.) Asima Chatterjee Prof. Ram Chand Paul	Geology in the Service of India
60th	1973	Chandigarh	Dr.S.Bhagavantam	Prof. Ram Chand Paul Dr. S. M. Sircar	Sixty Years of Science in India
61st	1974	Nagpur	Professor R.S.Mishra	Prof. Ram Chand Paul Dr. S. M. Sircar	Mathematics Queen or Handmaiden
62nd	1975	Delhi	Professor (Mrs.) Asima Chatterjee	Dr. S. M. Sircar Prof. R. D. Tiwari	Science and Technology in India: Present and Future
63rd	1976	Waltair	Dr.M.S.Swaminathan	Prof. R. D. Tiwari Dr. S. M. Sircar	Science and Integrated Rural Development
64th	1977	Bhubaneswar	Dr.H.N.Sethna	Prof. R. D. Tiwari Prof. A. K. Sharma	Survey, Conservation and Utilisation of Resources
65th	1978	Ahmedabad	Dr.S.M.Sircar	Prof. A. K. Sharma Dr. B. Ramachandra Rao	Science Education and Rural Development
66th	1979	Hyderabad	Professor R.C. Mehrotra	Dr. B. Ramachandra Rao Prof. A. K. Sharma	Science and Technology in India During the Coming Decade(s)
67th	1980	Jadavpur	Professor A.K.Saha	Dr. B. Ramachandra Rao Dr. D. Basu	Energy Strategies for India
68th	1981	Varanasi	Professor A.K.Sharma	Dr. D. Basu Prof. Arun K. Dey	Impact of the Development of Science and Technology on Environment

69th	1982	Mysore	Professor M.G.K. Menon	Prof. Arun K. Dey Dr. D. Basu	Basic Research as an Integral Component of Self-reliant Base of Science and Technology
70th	1983	Tirupati	Professor B. Ramachandra Rao	Prof. Arun K. Dey Prof. (Mrs.) Archana Sharma	Man and the Ocean Resource and Development
71st	1984	Ranchi	Professor R.P.Bambah	Prof. (Mrs.) Archana Sharma Prof. M. K. Singal	Quality Science in India Ends and Means
72nd	1985	Lucknow	Professor A.S.Paintal	Prof. M. K. Singal Prof, (Mrs.) Archana Sharma	High Altitude Studies
73rd	1986	Delhi	Dr. T.N. Khoshoo	Prof. M.K. Singal Prof. DO. K. Sinha	Role of Science and Technology in Environmental Management
74th	1987	Bangalore	Professor (Mrs.) Archana Sharma	Prof. D. K. Sinha Dr. (Mrs.) S. P. Arya	Resources and Human Well-being Inputs from Science and Technology
75th	1988	Pune	Professor C.N.R.Rao	Dr. (Mrs.) S. P. Arya Prof. D. K. Sinha	Frontiers in Science and Technology
76th	1989	Madurai	Dr.A.P.Mitra	Dr. (Mrs.) S. P. Arya Dr. S.C. Pakrashi	Science and Technology in India: Technology Missions
77th	1990	Cochin	Professor Yash Pal	Dr. S. C. Pakrashi Dr. (Mrs.) Gouri Ganguly	Science in Society
78th	1991	Indore	Professor D.K.Sinha	Dr. (Mrs.) Gouri Ganguly Dr. S. C. Pakrashi	Coping with Natural Disaster: An Integrated Approach
79th	1992	Baroda	Dr.Vasant Gowariker	Dr. (Mrs.) Gouri Ganguly Prof. D. P. Chakraborty	Science, Population and Development
80th	1993	Goa	Dr.S.Z.Qasim	Prof. D. P. Chakraborty Prof. H. P. Tiwari	Science and Quality of Life
81st	1994	Jaipur	Professor P.N. Srivastava	Prof. H. P. Tiwari Prof. D. P. Chakraborty	Science in India: Excellence and Accountability
82nd	1995	Calcutta	Dr.S.C.Pakrashi	Prof. H. P. Tiwari Prof. S. P. Mukherjee	Science, Technology and Industrial Development in India
83rd	1996	Patiala	Professor U.R.Rao	Prof. S. P. Mukherjee Dr. (Mrs.) Yogini Pathak	Science and Technology for Achieving Food, Economic and Healthy Security
84th	1997	Delhi	Dr.S.K.Joshi	Dr. (Mrs.) Yogini Pathak Prof. S. P. Mukherjee	Frontiers in Science and Engineering and Their Relevance to National Development

85th	1998	Hyderabad	Professor P.Rama Rao	Dr. (Mrs.) Yogini Pathak Prof. A. S. Mukherjee	Science & Technology in Independent India: Retrospect and Prospect
86th	1999	Chennai	Dr.(Mrs.) Manju Sharma	Prof. A.S. Mukherjee Prof. Uma Kant	New Bioscience: Opportunities and Challenges as we Move into the Next Millennium
87th	2000	Pune	Dr.R.A.Mashelkar	Prof. Uma Kant Prof. A. S. Mukherjee	Indian S & T into the Next Millennium
88th	2001	New Delhi	Dr.R.S.Paroda	Prof. Uma Kant Prof. A. B. Banerjee	Food, Nutrition and Environmental Security
89th	2002	Lucknow	Professor S.S.Katiyar	Prof. A. B. Banerjee Prof. B. Satyanarayana	Health Care, Education and Information Technology
90th	2003	Bangalore	Dr.K.Kasturirangan	Prof. A. B. Banerjee Prof. B. Satyanarayana	Frontier Science and Cutting Edge Technologies
91st	2004	Chandigarh	Professor Asis Datta	Prof. B. Satyanarayana Prof. B. P. Chatterjee	Science and Society in the Twenty First Century: Quest for Excellence
92nd	2005	Ahmedabad	Professor N.K.Ganguly	Prof. B. P. Chatterjee Prof. S. P. Singh	Health Technology as Fulcrum of Development for the Nation
93rd	2006	Hyderabad	Dr.l.V.Subba Rao	Prof. B. P. Chatterjee Prof. S. P. Singh	Integrated Rural Development: Science and Technology
94th	2007	Annamalai nagar	Prof.Harsh Gupta	Prof. S. P. Singh Prof. Avijit Banerji	Planet Earth
95th	2008	Visakhapatnam	Prof.R.Ramamurthi	Prof. Avijit Banerji Dr. Ashok K. Saxena	Knowledge based Society using Environmentally Sustainable Science and Technology
96th	2009	Shillong	Dr. T. Ramasami	Prof. Avijit Banerji Dr. Ashok K. Saxena	Science Education and Attraction of talent for Excellence in Research
97th	2010	Thiruvanthapuram	Dr. G. Madhavan Nair	Dr. Ashok K. Saxena (dual charge)	Science and Technology challenges of 21° Century National perspective
98th	2011	Chennai	Prof. K.C.Pandey	Dr. Vijay Laxmi Saxena Dr. Manoj Kumar Chakrabarti	Quality Education and excellence in Scientific Research in Indian Universities
99th	2012	Bhubaneswar	Prof. Geetha Bali	Dr. Vijay Laxmi Saxena Dr. Manoj Kumar Chakrabarti	Science and Technology for Inclusive Innovation - Role of Women

100th	2013	Kolkata	Dr. Manmohan Singh	Dr. Vijay Laxmi Saxena Dr. Manoj Kumar Chakrabarti	Science for Shaping the Future of India
101st	2014	Jammu	Prof. Dr. Ranbir Chander Sobti	Prof. Arun Kumar Dr. Nilangshu Bhusan Basu	Innovations in Science & Technology for Inclusive Development

APPENDIX IV

Photographs taken during ISCA sessions


07 01 2016


PRIDE OF INDIA
104th INDIAN SCIENCE CONGRESS


Mathematics
Gems of Ramanujan and their lasting impact on Mathematics
04 01 2016


PHYSICS
06 01 2017


TALENT
VISION
SUCCESS
LEARNING
MOTIVATION
DILIGENCE
POSITIVE
CONFIDENCE
DISCIPLINE
ATTITUDE
106
INDIAN SCIENCE CONGRESS
3rd-7th January, 2019
Theme - "Future India: Science & Technology"
WOMEN SCIENCE CONGRESS


TALENT
VISION
SUCCESS
LEARNING
MOTIVATION
106
INDIAN SCIENCE CONGRESS
3rd-7th January, 2019
Theme - "Future India: Science & Technology"
ACADEMIA -INDUSTRY INTERFACE SE ON
4th-5th January, 2019
15.20 LPA
2500+
600+