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Role of Indian Science Congress Association in the Emergence of Scientific Community in Pre-Independence India

Sneha Sinha*

Abstract: The paper endeavours to understand the evolution of the scientific workforce in India during the colonial rule, prior to the inception of the Indian Science Congress Association (ISCA). It highlights the initial efforts of Indians in scientific research, which began to be increasingly recognized world-wide by early twentieth century. The paper also seeks to assess reasons for lack a community consciousness among the scientific workforce and the absence of a scientific community in India. Further, it discusses 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. With this background, ISCA emerges as an important forum for communication between scientists and scientific discussion and deliberation. The paper 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 seeks to understand emergence of ISCA as a platform for personal interaction among scientific workers/scientists across various disciplines and institutions in India but, also with foreign scientists from different international institutions, including professional scientific societies, associations and academies of science.

Keywords: Indian Science Congress Association, ISCA, professional associations, scientific community, community consciousness, Indian science.

Introduction

The general scientific societies like the Royal Society (RS)[1], British Association for the Advancement of Science (BAAS), American Association for the Advancement of Science (AAAS) and Australian and New Zealand Association for the Advancement of Science (ANZAAS)

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have played a crucial role in shaping a recognisable scientific community, and promoting and advancing science and technology (S&T). They provide central space for scientific debates on S&T issues, which have socio-economic and political implications. Their deliberations and recommendations were closely followed by the public and government, and also provide a podium for announcement of new policies (Howarth, 1931; Kohlstedt, 1976; MacLeod ed., 1988; Botelho, 1990).

Considering the enormous significance that scientific and professional science societies and associations have in developing of science in a country, it is surprising that not much attention has been given to them in the existing literature on social history of science in India. They provide a common meeting ground for communication among scientists or professionals, and a forum where new ideas or facts could be expressed, deliberated, debated and critiqued. According to A.V. Hill, the progress of science in the United Kingdom is intimately bound with the growth of numerous learned societies, beginning with the inception of the Royal Society in 1662. These societies influence the transformation of mostly individualistic and critical people into 'living communities'.[2]

The studies on similar societies in Britain, United States of America, Australia and New Zealand and Brazil brings out the need for understanding and evaluating one of India's earliest professional science association. As early as 1944, A. V. Hill in his report noted that ISCA occupied a crucial place in the scientific activity of India.[3] Many historians of science too have made similar observations. According to J. N. Sinha, ISCA evolved as the most important forum among various scientific organisations that emerged during the War (Sinha, 2008). Uma Das Gupta saw in ISCA, Indian science finding its feet. Its meetings embodied the development of science in India (Gupta, 2011). 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 catalyzing community consciousness (Gaillard, Krishna and R Waast, 1997). These observations and an attempt to address the existing gap in literature on professional science associations motivate

the present study. The paper aims to assess ISCA's role in emergence of the scientific community, which lay at the core of institutionalisation, professionalisation and shaping of science in India.

Background

The sole aim of the East India Company (EIC) was trade. So, when they gained political supremacy over India, Robert Clive adopted a policy of little interference with existing institutions (Basu, 1982). Foundation of Calcutta Madrasa (1781) under the patronage of Warren Hastings can be viewed as the beginning of British administrator's involvement in Indian education.[4] Later, Sanskrit College at Benaras (1791), Poona (1821) and Calcutta (1824) were established. They were set up to serve two primary aims namely, the need to develop a class of Indians well-versed in Sanskrit, Arabic and Persian to help in colonial administration and cultivate goodwill among elite classes (Basu, 1982).[5] William Wilberforce's resolution (1793) was the first instance when education was remotely linked to the duty of the government.[6] However, it faced great opposition and rejection and was viewed as repeating the folly in India, after losing territories in America, as a result of opening schools and colleges there.[7] The Charter Act (1813) was a major departure from earlier policies of non- or little interference, mostly by individual British administrators. It sought to introduce and promote knowledge of science, providing scope for schools, public lectures and other institutions.[8] However, the Act did not give any direction for use of sums allocated and specify the medium of instruction.

Ram Mohun Roy's letter to Lord Amherst in 1823 was one of the earliest emphatic effort by an Indian towards western science and English education. He underlined the importance of learning mathematics, natural philosophy, chemistry, astronomy along with other useful sciences.[9] The debate on the medium of instruction initiated by the Charter Act (1813) got settled with Macaulay's Minute (1835). It was difficult to educate the entire population with limited resources. Therefore, a class of interpreters

could be developed, which is 'Indian by blood and colour, but English in taste, intellect, opinions and morals' to initiate downward-filtration of knowledge to the masses through vernacular dialects and also help the government in administration by occupying subordinate positions.[10] The Hunter Committee reviewed the courses taught in colleges across provinces[11], before universities came up in 1854. The period of EIC rule can essentially be viewed as an era of explorations, while the efforts towards institutionalisation of science began with the inception of the crown rule in 1857.

The Despatch on Education (1854) asserted the need for universities and is seen as a milestone in the history of education in India, though a few like H. H. Wilson criticised the move.[12] However, modelled on London universities, they merely conducted examinations and issued degrees to affiliated institutions, rather than encouraging teaching and research in science among Indians. The universities of Calcutta, Madras and Bombay were established by 1857. The Punjab and Allahabad University came up in 1882 and 1887 respectively. With the foundation of universities, the diverse collegiate institutions gave way to a more uniform one. Except for purely oriental colleges, the scope of most colleges was to educate and enable Indians to joins professional careers and government services. The subjects included history, philosophy, mathematics, physical science, logic, psychology, chemistry, geography, natural sciences, physiology. In its B.Sc. course, Bombay university by 1882 had few other subjects like botany, zoology, geology, etc.[13]

The policy on education clearly underlines colonial interests and a complete neglect of sciences. In 1882, the Hunter Committee, comprising of few Indians as well, reviewed existing system of public instruction and education. The report threw no light on special branches like working of Indian universities and technical institutions in medical, law and engineering[14], which could have been beneficial. The post-graduate teaching in Chemistry started at Presidency College under Calcutta University in 1885. The committee on Indian Universities (1902)

recommended transforming universities into 'teaching universities'. It emphasised on practical laboratory training and re-structuring of courses for B. Sc. and M. Sc., and noted that D.Sc. would be granted, after spending few years in original investigation.[15]

Mapping Colonial Scientific Societies

In view of this background, it is important to understand the nature and composition of colonial scientific societies. The focus here, is to map scientific societies to understand the context for the foundation of the ISCA. In the pre-British era, there were centres of education like pathshalas under gurumahasya[16], 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 education to trading classes, children of petty landlords and well-to-do cultivators.[17] Genesis of some form of a society of astronomers and trained scribes, formation of a 'virtual colony of astronomers' to advance astronomical knowledge was seen during Jai Singh's reign, decades before the Asiatic Society of Bengal (ASB) was established (Kumar, 2003; Sharma, 1982). The period between Raja Jai Singh's 'astronomical society' and the foundation of ASB saw attempts to bring together Europeans and local 'fakirs', surveyors, soldiers, '*harkaras'* and artists to co-produce and advance botanical knowledge and terrestrial surveying (Raj, 2006). James Rennell deployed foot-soldiers and *harkaras* (intelligence agents), local specialists and artists, along with European surveyors for British-sponsored terrestrial surveying. While preparing the 'Map of Hindoostan', he received helpful advice from Mr Sulivan of Madras and Mr Callander of Bombay for providing local knowledge (Markham, 1895). These efforts can be seen as precursors in realising the need for association among specialists, inspectors, superintendents, military institutions to work together. The establishment of the ASB needs to be seen in light of these efforts to form associations.

The establishment of ASB was viewed as the institutionalisation of western science in India (Vishvanathan, 1985). It was seen as the beacon of scientific research in India (Kumar, 2018). William Jones[18] 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 Asiatic Society was formed in 1784.[19] 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'. Part I of the 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. However, most investigations especially in Part I were confined to the Bengal Presidency, with hardly any literary paper from Madras and Bombay.[20]

These scientific institutions were primarily largely manned by Europeans (Kumar, 1982). The 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 were officially laid down.[21] The 'natives' were assigned the subordinate tasks of 'data exploration and application of existing technological knowledge (Krishna et. al, 1997, p. 238). During a hundred years of its existence, only five Indians held different capacities in the ASB's council. One reason being the high subscription fee which allowed only few 'native' gentlemen to take prominent part in Society's meetings, especially as members. Another reason could have been discussion in a foreign language, as 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.[22] 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 (MacLeod and Kumar, 1995).

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.[23] The early scientific work in India was by amateur scientists mostly army and civil employees who undertook scientific work in their spare time (Visvanathan, 1985, p. 10). Until 1828, most scientific papers concerned mathematics, followed by zoology.[24] 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 and Sen, 2010).

It was believed that every branch of scientific activity owed its origins to ASB. It advised government on matters of scientific interest (Bagchee, 1984). There is a consensus among scholars that various departments blossomed and multiplied into institutions like the Geological Survey, Meteorological Department, Linguistic Survey, the Indian Museum, etc. (Visvanathan, 1985; Kumar, 2018; Bagchee, 1984). The Society's meeting had lost its lustre and was 'falling off', which led to the foundation of other societies (MacLeod and Kumar, 1995).

The school book and native education societies saw greater cooperation between Indians and Europeans for popularising education and science among Indians. However, the foundation of most scientific societies until the mid-nineteenth century were through British efforts. These include literary Society of Bombay (1804), Literary and Scientific Society of Madras (1818), Agricultural and Horticultural Society of India (1820), Medical and Physical Society of Calcutta (1823), Agriculture and Horticulture Society of Punjab (1851), Bihar and Orissa Research Society, Panjab History Society, etc. The Board of Scientific Advice (BOSA) was appointed for organising and coordinating the scientific work undertaken in various government scientific departments. BOSA was seen as the greatest and noblest that anywhere devolved upon the British race (Baber, 1998). However, context and the aims of the constitution of the Board, clearly point at colonial imperatives behind

scientific research in India, which 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 history of the Board reflected the containment of British scientific activity in India within the government with largely limited scope and distanced away from the Indian society (MacLeod, 1975).

Unlike most scientific societies which were primarily European/ British endeavors, there were a few exceptions like the Students' Literary and Scientific Society, Bombay (1848), Bombay Natural History Society (1883), which were a culmination of joint efforts of Indians and Europeans. Most of these societies discussed above were region-specific and their objectives remained restricted to subjects that catered to colonial imperatives, and certainly not for advancing or promoting sciences among Indians. On the contrary, there were others like Aligarh Scientific Society (1865) and Bihar Scientific Society (1868) which were solely Indian initiatives. After the Revolt of 1857, the need for understanding and learning western knowledge led to the growth of the Aligarh Scientific Society and Bihar Scientific Society. Their objectives 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 (Azmi, 1969; Narain; 1969). However, these societies were short-lived and showcase the fate of efforts made solely by Indians, which did not attract European membership and government aid.

The first organised effort towards advancing and promoting science can be seen in the foundation of the Indian Association for the Cultivation of Science (IACS) in 1876 by Mahendralal Sircar. IACS's objective was 'to cultivate science in all departments with a view to its advancement by original research and its varied application to the arts and comforts of life'.[25] However, the establishment of the Association was not without struggles (Lourdusamy, 2003). The initial funds for the establishment were generated by Indians. The motive was to develop a

national institution solely managed by Indians without interference from the government.[26] Amongst all scientific societies discussed, IACS stands out for its commitment towards cause of cultivation and advancement of science among Indians. It aimed at the promotion and cultivation of all branches of science at mass level in India. IACS 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 could not 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.

Another society created in 1908 by an Indian, Ashutosh Mookerjee was the Calcutta Mathematical Society. He remained the President of the Society until his death. Unlike most of the societies mentioned above, the founder President, Vice-President, Secretary and Treasurer of the Society were mostly Indians, except for 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 and abroad, reviewing their contributions and discussing modern topics. The publication of the society, the Bulletin of the Calcutta Mathematical, commenced in 1909. These societies can be seen as steps leading to the foundation of ISCA and provide the necessary context for its creation.

Foundation of ISCA

Quite a few historians have dealt with ISCA in passing as part of their research giving a glimpse of its foundation. 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 foundation of the Congress (Vishvanathan, 1985). By the twentieth century, scientific research had progressed enough 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). Geographical and academic isolation of scientific investigators in science organisations, educational institutions and research institutes across various parts of India, necessitated greater interaction (Govil, 2011).

While, these reasons cited by historians of science certainly provide understanding about ISCA's creation, it is important to see ISCA's foundation in the larger context and creation of various scientific societies as steps leading to its establishment. However, its inception in the twentieth century still cannot be viewed as a single event in Indian history. Rather, there had been efforts for organisation of an institution similar to BAAS atleast twice, before ISCA. The first attempt to form an Indian Association for Advancement of Natural History was proposed by the Calcutta Journal of Natural History in 1841 (Kumar, 2018). Mahendralal Sircar's proposal for IACS also envisaged an institution modelled on the Royal Institution and the British Association. However, he later realised that time was not ripe for an institution similar to BAAS. Therefore, the Royal Institution became the model for IACS, though he hoped for a combination at a later date.[27] The efforts saw light after ISCA was proposed in 1911.

The scientific work in India remained restricted to government services, constrained by employment conditions imposed in these services. It was marred by problems 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 government scientific departments and in scientific research. These 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). 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.[28] Also, by the second decade of twentieth century, a number of Indian scientists like S. S. Bhatnagar, J. C. Ghosh, etc. who undertook scientific research abroad came back and joined various universities, fostering multiplication of research groups and advancing sciences.

It is in this context, that the creation of ISCA needs to be studied. The credit for genesis of ISCA is attributed to two British chemists, John Lionel Simonsen[29] and and P. S. MacMahon, appointed as professors of chemistry in India in 1910. ISCA's founders were concerned with the position of scientific teaching and research in India, which could have been as an important reason for absence of professional bodies for advancement of science. Simonsen pointed at the absence of direct teaching in universities. They were merely examining bodies before the Curzon education reforms. By the early decade of twentieth century, scientific research in Indian universities was restricted to few individuals like Alfred Pedler, P. C. Ray, J. C. Bose, largely confined to the scientific services. They saw a complete absence of scientific intercourse, lack of scientific activity and scientific atmosphere in both Lucknow and

Madras. Apart from the meetings of ASB, there were very few scientific discussions promoted by Government of India, which included the Sanitary conferences and conferences of agricultural chemists.[30]

Both believed that scientific research in India might be stimulated by an annual meeting of scientific workers arranged on the lines of the meetings of BAAS. These led Simonsen and Mac Mahon to formulate their idea and issue a circular letter in 1911 to obtain the views of other scientists.[31] The proposal reiterated the lack of scientific organisation and isolation of scientific workers. It was proposed that the difficulties that science suffered in India could 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.[32] He sought the 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.[33]

The proposal for formation of a Scientific Association met with general consensus. The opinions expressed on close acquaintance between scientific workers with practical needs of the country, cooperation between European ad Indians to spread scientific culture in India and making commercial classes realise the value of science for industrial regeneration were largely favourable. But, there were difference in opinion regarding its feasibility and extent to which it could perform these objectives.[34]A provisional committee was formed to arrange the first Science Congress in Calcutta.[35] The meeting was to be held under the aegis of the 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.[36] In order to arrange for the first annual meeting of the Indian Science Congress, seventeen foremost men of science were invited to form a committee,[37] comprising of fifteen Englishmen[38] and two Indians.[39] The ASB readily accepted the proposal and became the foster-parent of ISCA. The Committee also sought support from the government[40] and reiterated similar demands for the next meeting.[41] Although the intention was to have the first meeting in Calcutta from 8th to 12th December, 1912 or January 1913, the first meeting could only be scheduled between January 15th-17th, 1914 simultaneously with the centenary celebrations of British India at the premises of the Asiatic Society. The first Science Congress lasted over three days, presided by Asutosh Mookerjee. It was believed that the number of attendees may have swelled due to centenary celebrations of the Indian Museum. The composition of the office-bearers, list of members, chairman of sections and presenters attest to involvement of both Europeans and natives.[42]

The low number of papers presented during the first session threatened the future proceedings of the Congress. It was realised that government recognition and travel allowances to the attendees would be necessary for future meetings. Government of India authorised the local government to permit officers to attend the annual Science Congress meetings. Sir S.G. Burrard induced Indian railways to grant concessional rates to non-government servants who wished to attend ISCA's annual meetings. But, due to the exigencies of the First World War, the concession was withdrawn. ISCA's membership and number of papers presented increased over the years. Prof. MacMahon and J. L. Simonsen continued with the secretarial work of the Association until 1921.[43]

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'.[44] The objectives of the Association have not undergone any major change since 1914.

ISCA and Emergence of Scientific Community in India

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.[45] 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 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.[46] Krishna opined that ISCA served as a platform for catalyzing '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.

Common meeting ground

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. The only Indian in the executive committee until 1919 was R. D. Mehta. However, between 1919-1926, ISCA's executive committee had a good number of Indian scientists.[47] Out of the nine members of the executive committee of 1927-28, three were Europeans, while six were Indians.[48] There was only one European in the executive committee of 1942-43 which comprised fourteen members.[49] An analysis of the first decade of its sectional presidents also attest to a fair representation of Indians, except for sections like agriculture, medical research and botany which had lesser number of Indians.[50] 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 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, the co-authored papers by an Indian in collaboration with a European were very few in number.[51] Thus, it is clear the initial progress of ISCA was a result of combined efforts of both European and Indians.[52]

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.[53] There were sixteen annual meetings of learned scientific bodies organised simultaneously with the Thirty-Third session of the Congress.[54]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.[55] At the Thirty-Third session, nineteen delegates came from scientific societies.[56] ISC enabled greater association between scientists belonging to different institutions.

Mitigating the spatial and specialised isolation

The Association organised annual meetings in different parts of the country. 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 in Bangalore and Madras, thrice each in Bombay, Lahore and Nagpur, and twice each in Lucknow, Benaras and Delhi. It was held once in Allahabad, Patna, Indore, Hyderabad and Baroda. 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 emerging smaller towns. ISCA's importance in mitigating the twin isolations – namely geographical and specialisation of scientific workers in India was reiterated by L. L. Fermor in his inaugural address of National Institute of Sciences of India.[57]

Prior to Indian Science Congress's annual meetings, there was hardly any scientific society or conference which accommodated as many scientific disciplines as the Congress. ISCA provided a platform for numerous branches of science to communicate, coordinate and co-exist at a single forum. 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.[58] 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. 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.[59] ISCA also facilitated intra- and inter-disciplinary cooperation between scientists of various disciplines through the joint discussions and symposiums arranged during the Congress. At the silver jubilee session of ISCA, ten joint discussions concerning more than one section of the Congress were held.[60] 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.

Membership of ISCA

In 1914, ISCA had 105 members. Simonsen's presidential address in 1928 underlined that the numbers of papers presented and the attendance augured a threat for the future of the Congress. Certainly, this did not happen. It emerged as the largest and most represented organisation of scientific workers in India, whose council consisted of practically all leading scientific workers of the country.[61] During the period of study, ISCA saw participation of the who's who of science in India including, P.C. Ray, Meghnad Saha, J.C. Bose, C.V. Raman, S.S. Bhatnagar, M. Visvesvaraya, P.C. Mahalanobis, etc. There were no qualifications laid for ISCA's membership until Independence. We do see a diversification in categories of membership. 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.[62] By the Thirty-Third session in 1946 membership categories increased to include, Ordinary members, Sustaining Members, Benefactors, Honorary Members and Sessional Members which further included Full Sessional Members, Associate Sessional Members and Student Members.[63] The subscriptions were increased for Ordinary Members and Full Sessional Member at Rs. 12

while the others remained similar.[64] The increased rate of subscription was extended for two successive sessions by P. C. Mahalanobis.[65] But, it did not reflect in any significant decline in its membership. The financial statements show steady increase in amount received from members' subscription.[66] ISCA's membership saw a steady increase in membership to about 2500 members by 1947.[67] This illustrates an increase in the size of the scientific community in India. It was noted that many members enlisted themselves at the last moment, therefore a 'large shifting, fluid membership' of the Association was witnessed. This did not add to the strength of the Association, with needed greater interest of members throughout the year.[68]

The ISCA provided a meeting ground for young amateur scientists to meet the who's who of science. As early as mid-1930s, Simonsen realised that the scope for young members to get inspired by personal contact with the pioneers of scientific thought was being lost sight of, and there was a need for emphasising it.[69] The ISCA 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.[70] Even then, no woman was elected as the sectional and general president of ISCA until Independence. Further, it is important to assess whether ISCA's membership truly reflected an all-India character.

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 per cent), Southern zone (16.3 per cent), Western zone (15 per cent), Central zone (14 per cent), North-Western zone (10 per cent) and foreign members (0.005 per cent). 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. The figures suggest that about 49 percent of the members of the Association belonged to the three Presidencies.[71] This could be

specifically true of Bengal as is also evident from J. L. Simonsen's observation that twenty-five among the thirty-one papers presenters at the First Science Congress in 1914, were from to Calcutta or other places in Bengal.[72] This phenomenon is also in consonance with Anderson's analysis of ISCA's membership in 1930s who noted that scientists based in Bengal dominated the Science Congress. He also reiterated the need to regulate membership and demonstrate recognition for superior performance (Anderson, 2010).

Contacts with Foreign Scientists

By late 1920s, Indian scientists were increasingly recognised internationally for their scientific research. It was thought that Association's meetings could provide a forum for interaction with the foreign scientists as well as greater visibility to the Indian scientific workers. As a result, a joint session of the British Association and ISCA was scheduled for the Silver jubilee session of ISC in 1938. Correspondence between British Association and ISCA's committee attest to great interest taken by BAAS as well as British donors regarding the joint session.[73][74] The session was to be presided over by Lord Rutherford but after his sudden death, James H. Jeans presided. Ninety-one delegates from BAAS attended the session, and participated in scientific deliberations, presented papers, delivered popular lectures and attended joint-meetings.[75] They also gave broadcast speeches on topics of public interest and visited scientific institutions across India.[76] Jeans underlined the powerful new bond beyond the bounds of science forged between Indian and British scientists as a result of the invitation of the session.[77]

Besides BAAS, invitations for jubilee session were also sent to scientists from other countries. Ten scientists from Amsterdam, Germany, Africa, Canada, United States attended the Twenty-Fifth session of the Congress. Participation of scientists from abroad became a regular feature of the Congress after 1938.[78] The ISCA received congratulatory messages, and goodwill messages from scientific associations and

academies of science across the world.[79] Two delegates from AAAS and one from Pacific Science Association attended ISC in 1941.[80] Post-War reorganisation necessitated establishing closer scientific connections with technically advanced countries. Thus, nine Indian scientists attended the British Commonwealth Scientific Official Conference in 1946.[81] An Indian Scientific Mission also visited UK, USA and Canada to see recent developments in S&T research.[82] Eminent scientists were also appointed as liaison officers in these countries, and appointment of liaison officers in the USSR was under consideration.[83] P. C. Mahalanobis and S. S. Bhatnagar's efforts enabled participation of twenty-four representatives in the 38 th ISCA session 1947, 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.[84] P.M.S. Blackett's 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).[85]

Many Indian scientists were elected as members of reputed science academies and associations across the world, including the Fellows of the Royal Society of London (FRS). FRS was considered one of the most coveted honour for the scientists. Until 1947, twenty-four nominations were made for the FRS. Eleven out of these were elected.[86] About twenty of the nominated Indian scientists were associated with ISCA as General Presidents, Sectional Presidents, members of the council or executive body. Indian scientists also received honours, medals and prestigious awards including the Nobel Prize for contributing to knowledge production and advancement in pure and applied sciences. Thus, we see greater recognition of the Indian Science and the Indian scientific community making its space within the larger scientific community. ISC provided a rare platform during the period for networking with scientists abroad. It emerged as a forum for communication between scientific workers across various disciplines not just within India but also facilitated networking with the scientists abroad.

Communion between scientists, political leaders and government

The foundation of the Indian Science Congress necessitated greater communication between the 'scientific estate' and the political world and translation of the dialect of science in to popular idiom (Vishvanathan, 1985). The annual meetings of the Congress were held in different provincial centres and saw the presence of 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 the Governor of Bengal, Sir Francis Stanley Jackon as the Patrons.[87] 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. Ashutosh Mookerjee during ISC in 1914 stressed periodical meetings and discussions would bring the aims of the scientific community to public notice and attention of the Government.[88] ISCA's role in this regard was not restricted to deriving grants from the government or concessions for leaves and travel for attending its annual sessions. Since its inception ISCA carried on its activities with partial assistance from ASB and through its own subscriptions. The foundation of Madras Fisheries Department Marine Biological Station in Krusadai Island, by the government was the direct result of the efforts of the Congress sections.[89] ISC showcased need of scientific community in professional matters like remuneration of scientific workers and professional status of scientists. The committees of the ISCA were requested for their recommendations on the professional status of statisticians and pay of scientific workers at the annual meeting in 1946.[90]

Four delegates representing Government of India, Government of Bihar and Government of United Provinces of Agra and Oudh attended the ISC in 1941.[91] Delegates from various universities, research institutes, learned societies, colleges, states and government departments attended

ISC Sessions. Apart from being members of the delegations abroad, members of ISCA were 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 and Meghnad Saha were closely associated with the National Planning Committee. The Central Board of Irrigation under the Government of India requested a representative member of ISCA for its Board for which, P. C. Bose was selected. Thus, ISCA members held positions on various advisory boards under the Government.[92] 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.[93] The sub-committee on standard time for India under the chairmanship of S. K. Mitra submitted a report in 1946. The Decimalisation 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.[94]

As 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). Jawaharlal Nehru was appointed the President for the Thirtieth session and continued to be the President-Elect for the next session. Although he could not himself preside over the session.[95] he was the president for the session in Delhi in 1947. His presidential address emphasised the importance of science and scientists in the service of the nation. In the post-Independence era, as the Prime Minister, Nehru inaugurated fourteen sessions of the Science Congress (Singh, 1986). However, Mahatma Gandhi who was so active during the National Movement never attended the ISC. Kumar noted that Gandhi declared that he was not an opponent of science but he wanted limitations of scientific research and its application (Kumar, 2000). This may be the reason for his absence in Science Congresses. The Science Congress provided a meeting ground for political leaders like Nehru,

Indian scientists as well as those from abroad like P.M.S. Blackett, shaping a science-politics nexus which was central to post-Independence developments in science in India.

Conclusion

The motive behind the formation of an association as diverse in its scope, catering to various disciplines of science, was to foster community consciousness, enabling the formation of a scientific community. ISC emerged and continues to remain the sole platform which provides scope for the scientists across the country from various disciplines of science to meet and discuss at one platform. It enabled greater interaction between different scientific fields through its sectional meetings giving 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 specialised isolation. During the period, ISC has evolved as the Congress of savants and became a forum for participation of the 'who's who in science' and scientific institutions in India. It certainly, emerged as an important binding force for the scientific community. ISC also provided a medium for communication with scientists abroad. 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. ISC too emerged as an interface between political leaders, government and the scientific community. Therefore, ISCA provided the ground for shaping a viable scientific community and catalysed the community consciousness within the scientific workforce in India.

Recently, scientists have raised concerns about the over shadowing of the importance of ISC's scientific sessions by the 'ceremonies' like inaugurations and valedictory sessions (Balaram, 2012). ISCA's annual meetings are increasingly seen as 'science fairs'[96] or 'mela' (Virk, 2000). However, some senior or retired scientists who have been attending

these Congresses for more than three decades, believe that it is a 'one-time capsule' for knowing all the happenings of Indian science as well as progress in S&T abroad.[97] Regardless of its growing criticism, ISC certainly serves a wider forum and emerges as an important annual event for young researchers and college students from smaller towns, cities an interest in science. However, ISCA's activities should be seen beyond these Congresses.

Our challenges today like climate change, health, environmental degradation, poverty, inequality, including the ongoing COVID-19 outbreak are complex. Most of our challenges and SDGs have scientific dimensions. Achieving Sustainable Development Goals (SDGs) and tackling global societal challenges require scientific advice in policy-making. As a rare multi stakeholders' forum, ISCA together with other institutions can play a key role in deliberating on STI for SDGs regionally, nationally and internationally.

ISCA annual sessions and general presidents' address haves focused on issues relating to health, hygiene, sanitation, nutrition, food security, environmental degradation, etc. much before Millennium Development Goals and Sustainable Development Goals were undertaken. By the turn of the century, ISCA annual Congresses' focal themes reflect issues like food, nutrition and Environmental Security; Health Care, Education and Information Technology; Health Technology; Integrated Rural Development; Planet Earth; Quality Education and Role of Women.

ISCA has provided a forum for stressing the centrality of STI for national as well as Inclusive Development. The focal theme for ISCA's annual session in 2008 was Knowledge Based Society Using Environmentally Sustainable Science and Technology. Given, ISCA's long history of science and its social relations, representing a microcosm of the Indian scientific community and as a platform for engaging with scientists abroad, it can act as a forum for scientific deliberation on key issues faced today and provide scientific knowledge based advice on grand societal challenges as well as SDGs.

It is an opportune time for the Association to widen its scope and diversify its activities, like other professional associations/institutions like AAAS. The World Academy of Sciences (TWAS), etc. AAAS undertook various science-policy and science diplomacy programmes recently. Similarly, TWAS has made several efforts in furthering and advancing sciences as well as facilitated South-South and North-South cooperation and recently involved with various capacity building activities in science diplomacy.

Endnotes

1 A. V. Hill, Scientific Research in India, London: William Clowes and Sons, August 14, 1944 (The Royal Society, London).

2 Ibid.

3 Ibid.

4 Minute by Governor General, Warren Hastings, April 17, 1781 (National Archives of India, New Delhi).

5 Report of the Indian Education Committee, Calcutta: Government of India, 1883.

6 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.

7 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.

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

9 Ram Mohun Roy's Letter to Lord Amherst, 1823 quoted in Nalin C. Ganguly, *Builders of Modern India*, Calcutta: YMCA Press, 1934.

10 See Minute by Honourable T. B. Macaulay dated the 2nd February 1835 (National Archives of India, New Delhi)

11 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.

[12] 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).

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

[14] Ibid.

[15] 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).

[16] Dr. Mahendralal Sircar was born on 2nd November 1833 in Paikara in Bengal. He received 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).

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

[18] 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.

[19] 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.

[20] 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).

[21] 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).

[22] 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).

[23] 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).

[24] 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).

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

[26] Indian Association for the Cultivation of Science, *A Century*, Calcutta: Indian Association for the Cultivation of Science, 1976.

[27] Indian Association for the Cultivation of Science (1976). *A Century*. Calcutta: IACS.

[28] Indian Institute of Science, Calendar, 1915-1916, Bangalore, 1915, pp. 12-14.

[29] 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).

[30] Ibid.

[31] 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.

[32] 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.

[33] Ibid.

[34] 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.

[35] MacMahon, P. S., 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.

[36] Asutosh Mookerjee's Presidential Address at the first meeting of the Indian Science Congress held in Calcutta.

[37] MacMahon, P. S., 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.

[38] 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.

[39] P. C Ray and J. C. Bose were invited to form the first Provisional Committee of the Indian Science Congress.

[40] Education, General no. 2379 November 24, 1913 (National Archives of India, New Delhi).

[41] Education, General no. 1318 June 26, 1914 (National Archives of India, New Delhi).

[42] Ibid.

[43] 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.

[44] 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.

[45] See Proceedings of the Fourth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1917.

[46] A. V. Hill, Scientific Research in India, London: William Clowes and Sons, August 14, 1944.

[47] 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.

[48] Proceedings of the Fifteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal 1928, p. 3.

[49] Proceedings of the Thirtieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1943, p.6.

[50] Proceedings of the Fourteenth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1927.

[51] 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'.

[52] 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.

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

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

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

[56] 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.

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

[58] 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.

[59] See Current Science, New Delhi: Indian Science News Association, 1933.

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

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

[62] Proceedings of the Seventeenth Indian Science Congress, Calcutta: Indian Science Congress Association, 1930.

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

[64] Proceedings of the Thirty-First Indian Science Congress, Calcutta: Indian Science Congress Association, 1944, pp. 30, 31.

[65] Proceedings of the Thirty-Third Session of Indian Science Congress, Calcutta: Indian Science Congress Association, 1946, p. 24.

[66] 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.

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

[68] 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.

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

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

[71] 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.

[72] Proceedings of the Fifteenth Indian Science Congress, Calcutta: Indian Science Congress Association, 1928.

[73] 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).

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

[75] 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

[76] 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.

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

78 Proceedings of the Twenty-Fifth Indian Science Congress, Calcutta: Asiatic Society of Bengal, 1938, p. 44.

79 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.

80 Proceedings of the Twenty-Eighth Indian Science Congress, Calcutta: Indian Science Congress Association, 1941, p. 33.

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

82 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).

83 Ibid.

84 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.

85 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).

86 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.

87 Proceedings of the Fifteenth Indian Science Congress, Calcutta: Asiatick Society of Bengal, 1928, p. 1.

88 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.

[89] Current Science, Vol 2, No. 4, 1933, p. 195.

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

[91] Proceedings of the Twenty-Eighth Indian Science Congress, Calcutta: Indian Science Congress Association, 1941, p. 34.

[92] 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.

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

[94] 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.

[95] Proceedings of the Thirtieth Indian Science Congress, Calcutta: Indian Science Congress Association, 1943, p. 25.

[96] Author interview with scientists during ISC in 2016, 2017 and 2019 at Mysore, Tirupati and Phagwara, Jalandhar respectively.

[97] Author interview with scientists during ISC in 2016, 2017 and 2019 at Mysore, Tirupati and Phagwara, Jalandhar respectively.

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