

## The Indian Institute of Science: Marking a Centenary

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A little over a hundred years ago a paper entitled “On the absorption of water by cotton and wool” appeared in the scientific literature (*Proc. Roy. Soc.*, London A, Vol.79, pp.204–205, 1907). The author was a young English chemist, Morris Travers, and the byline noted that he was at the Indian Institute of Science (IISc), Bangalore. This publication truly marked the launch of one of India’s best known institutions, at a time when modern scientific research had not yet been established in an organized manner in the country. The Institute was formally born on May 27, 1909 when the Government of India issued a Vesting Order. As the Institute celebrates the passage of a century it seems fitting to remember the past and look forward to the future.

The history of IISc is intimately linked with the story of the evolution of higher education, research and science and technology in India, over the course of the turbulent years of the 20th century. It is a story that begins in the high noon of the British Empire and spans the entire period of the nationalist movement that culminated in independence. It is also a story of the birth and growth of the science and technology enterprise over the last half a century. It is a story that begins with an act of philanthropy, unprecedented for its vision and unmatched for its generosity in the years that have followed. Many institutions and journals, the Indian Academy of Sciences amongst them, have been conceived and midwived into existence on the IISc campus over several decades.

IISc was the second scientific research institution to be set up in India. The distinction as the country’s first research centre, in the modern era, must be accorded to the Indian Association for the Cultivation of Science (IACS), which was born in Calcutta (now Kolkata) in 1876, the brainchild of Mahendralal Sircar, ably



supported by Father Lafont. IISc was founded somewhat later, in 1909, after a long and difficult period of gestation, but developed on a pattern entirely different from IACS over the course of the century. Indeed, a comparative study of the growth and development of these two institutions may prove educational for those who seek to build new institutions today. In trying to piece together an authentic historical record of the institution, where I have worked for so long, and in attempting to create a permanent Archives for the future, I have realized, with some dismay, that history is not a subject of any significance within the precincts of a research institute. But, in many ways, there is much to be learnt from the events of the early years of IISc.



**Figure 1. Statue of Jamsetji Nusserwanji Tata unveiled at the Indian Institute of Science on March 10, 1922.**

To what sources must we turn in order to recapture the key events in the genesis of what is, arguably, India's most important scientific research institution? There are two biographies of Jamsetji Tata: the first by Frank Harris which appeared nearly three quarters of a century ago (*Jamsetji Nusserwanji Tata: A Chronicle of His Life*, Blackie, 1925; 2nd Ed. 1958) and the second, a smaller and more recent account, by R M Lala (*For the Love of India: The Life and Times of Jamsetji Tata*, Penguin/Viking, 2004), whose publication coincided with the Tata Centenaries. There is one account of the birth and development of IISc, authored by B V Subbarayappa that appeared in 1992 (*In Pursuit of Excellence*, Tata McGraw-Hill). All three sources detail the events that followed J N Tata's initial proposal to pledge a substantial part of his wealth towards creating a research institute or university. The Tata scheme was the product of a penetrating vision that could see very far into the future. The idea of a postgraduate research institution must have seemed far fetched in the 1890s, at a time when university education had an extremely limited reach. J N Tata backed his vision with an unprecedented act of philanthropy and, most remarkably, did not want his name to be associated with the new institution, thereby paving the way for support from all quarters. For the scheme to materialize two conditions had to be met. First, assured annual support from the Government of India,



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whose powers were vested in the British Viceroy in Delhi, was essential. Second, identification of a location and a land grant was crucial to the implementation of the scheme. The British Government's objections were overcome by 1905 and the grant of land from the Maharaja of Mysore was realized in 1907, culminating in the issuance of a formal vesting order in May 1909. J N Tata died in 1904, unaware that his idea would indeed bear fruit. The tradition of philanthropy was firmly established in the House of Tatas when his sons, Dorab and Ratan, committed themselves to the vision of establishing a research institute. The story of the long struggle to ensure that IISc did indeed come into existence and its difficult years after birth are not well known.

There are many elements in the saga of the Institute's birth. J N Tata's letter to Swami Vivekananda is now a part of the Institute's folklore: '...It seems to me that no better use can be made of the ascetic spirit than the establishment of monasteries or residential halls for men dominated by this spirit, where they should live with ordinary decency and devote their lives to the cultivation of sciences – natural and humanistic. I am of the opinion that if such a crusade in favour of an asceticism of this kind were undertaken by a competent leader, it would greatly help asceticism, science and the good name of our common country; and I know not who would make a more fitting general of such a campaign than Vivekananda...'. The discussions on the import of J N Tata's letter have been elaborate (S P Basu, *Prabuddha Bharata*, pp.413–420; pp.448–458, 1978), although Harris' original biography confines this episode to a footnote. Both men, undoubtedly, saw with remarkable clarity the need for India to build its own centres for research and technological advancement. Sadly, both died several years before the founding of the Institute, Tata in 1904 and Vivekananda in 1902.

Today India is in the throes of a new round of institution building. It is clear that many schemes can be conceived in committee rooms; the real challenge lies in defining and realizing a vision. Can anything be learnt from the past? How was the plan for creating IISc drawn up and how successfully was it implemented



in the early years? How did the bureaucracy of British India respond to an initiative that had no precedent? The answers to these questions are necessarily long and buried in hundreds (indeed thousands) of pages of documents (some disintegrating) lying in the National Archives in Delhi. A few are to be found in the more recently created Tata Control Archives in Pune and, of course, in the libraries in London, which maintain much of the written record of nearly two centuries of British presence in India. As the institutional archives begins the slow process of collecting and cataloguing records that are more than a century old, I have realized that the story of the early history of IISc really centres around one man, Burjorji Padshah (1864–1941), and his complex and, at times, difficult relationships with two Englishmen, George Nathaniel Curzon (1859–1925), the Viceroy of India and Morris Travers (1872–1961), who was the first Director of the Institute.

Burjorji Jamaspji Padshah came under J N Tata's wing even 'when he was a child running about the horse stables' (*TISCO Review*, p.613, August 1941). Armed with a degree in philosophy (a background that may explain many of his views in charting a course for the infant IISc) from Elphinstone College, he became a professor at the Sind Arts College (later D J Sind College) in Karachi in 1887. An obituary notice in the *Sind Observer* (June 25, 1941) provides the titbit that Ratan, J N Tata's son, 'lived with Padshah at Karachi and was a student of the D J Sind College'. This obituary is remarkable for its account of Padshah's early career, noting that he held 'the record for the number of subjects he taught – Philosophy, History, English, Mathematics. . . . The Engineering Branch (which subsequently developed into a full fledged college) also received great encouragement at the hands of Prof. Padshah'. His erudition and wide-ranging knowledge of a remarkable spectrum of subjects is noted in every account of Padshah's career. He was a prolific letter writer and traveller. Even casual inspection of his correspondence, some of it now available at IISc, reveals a man of formidable intellect who tenaciously pursued the goals set by J N Tata's vision for modern India.

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Padshah's contributions to the Karachi of his times may have been recognized by the naming of a road after him, although the obituary in the *Sind Observer* notes that 'the pioneering work he did for Karachi and Sind deserves a more suitable commemoration'. Padshah's contributions to the establishment of IISc were first recognized in the early 1960s when a young American researcher, Kim Sebaly, came to India to study the factors contributing to the development of the newly established IITs. Like Columbus who set sail for India and discovered America instead, Sebaly found that the roots of technical education in India could be traced to the founding of IISc by J N Tata. In researching IISc's early history Sebaly discovered Burjorji Padshah. A well-documented scholarly account appeared two decades after Sebaly's visit to India (K P Sebaly, *History of Education*, Vol.14, p.117, 1985). Padshah was involved in all the major projects conceived by J N Tata, but executed after Tata's death in 1904; the hydroelectric project, IISc and the Jamshedpur steel venture. He worked hard but unsuccessfully in obtaining 'imperial status' for the technical institute at Jamshedpur, which was to provide metallurgical training to Indians in the 1920s and 1930s. In an analysis published two decades ago, Sebaly draws attention to 'Tata steel and higher technical education in India: The Padshah Plan pp.1916-1921' (*History of Education*, Vol.17, p.309, 1988). He notes: 'In 1942 (one year after Padshah's death) the central government established the Council (Board) of Industrial Research which would eventually oversee the creation of the National Metallurgical Laboratory in Jamshedpur in 1950'.

Padshah emerges as an extraordinary figure who corresponded with Viceroys from Curzon to Willingdon, Gokhale, Gandhi (with whom he disagreed on satyagraha), Ratan and Dorab Tata. Descriptions of Padshah by those who knew him, highlight his encyclopaedic knowledge and his courteousness even in disagreement. For a man trained in philosophy, his abilities to manipulate and remember numbers, as recorded by his contemporaries, seem unusual. At IISc in its early years, Padshah seemed intent on nudging the institution to embark on studies in the social



sciences and medicine. The 1898 document for the proposed University or Institute of Research included a 'Medical Department' and a 'Philosophical and Educational Department'. The latter was envisaged to engage in a wide variety of disciplines ranging from Indian History and Archaeology to Statistics and Economics. Padshah met resolute opposition to his ideas from the first Director of IISc, Morris Travers. Between 1907 and 1913 there was little agreement, but Travers had launched the institution towards its eventual focus on science and engineering. Both men severed their association with IISc in 1914, in none too happy circumstances, but lived long enough to see the institution emerge from its early difficulties.

In my present role, I have wondered about the Institute's first Director and attempted to imagine what it must have been like to embark on the unprecedented experiment of building a research institution in India, at the dawn of the twentieth century. Bangalore, a hundred years ago, would have been a far cry from today's bustling metropolis. Research was not a common or well-understood activity in India. The turbulence and turmoil of the first half of the twentieth century still lay ahead. The Victorian era had just drawn to a close and Gandhi was yet to appear on the Indian scene. It is in this setting that the first Director, Morris Travers, began the task of building an institution that has weathered the tumultuous century that followed.

Travers is not a well-known name in India. Even at IISc, a lecture in his memory, marking his research interests in chemistry, was established only in 1990, over eight decades after he began the work of building an institution. Travers worked in Bangalore between 1906 and 1914, his tenure ending in the midst of a growing controversy between him and members of the governing council of the Institute. His years in India must have been difficult, but the foundations he laid have held well against the ravages of time.

The written records available at the Institute are pitifully small. Formal minutes of meetings, however well preserved, tell little of

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the story. In attempting to piece together a narrative that would capture a sense of the times, I was delighted to be handed a bundle of poorly kept letters, written by Travers to one of his successors, S Bhagavantam in 1958/1959, when IISc marked the completion of fifty years. By this time, Travers was past eighty and nearing the end. His recollections of the events of the first years of the Institute are vivid and poignant.

Travers' account of Ramsay's life and work must stand as one of the classics in the genre of biographies of men of science.

Morris Williams Travers (1872–1961) was a chemist, a student of William Ramsay at the University College London. He was Ramsay's assistant in the famous experiments, which led to the isolation of the inert gases neon, krypton and xenon. These studies were carried out immediately after the Ramsay–Rayleigh discovery of argon and Ramsay's work on helium. The experimental skills of Morris Travers must have been formidable; the fractionation of liquid air yielded three new elements in a few weeks of work. The first British scientists to win Nobel Prizes were Rayleigh (Physics, 1904) and Ramsay (Chemistry, 1904). Travers appears to have been a meticulous documenter of events and experiments and an author of uncommon talent. In 1901 he published *Experimental Study of Gases* (Macmillan, London). This is a book that is remarkable for its experimental detail and I believe it is testimony to the care and devotion that Travers brought to his work. At twenty nine, Travers had completed a major piece of work and published a scholarly treatise. Five years later, at a remarkably young age, he would begin building an institution, working in an environment that would bear no resemblance to his London laboratory. Travers authored a second book, *A Life of William Ramsay* (Edward Arnold, London, 1955), written between his 'eighty-first and eighty-third' birthdays. The Ramsay biography is a remarkable book; extraordinary in its detail and meticulous in its documentation, providing an insight into the author's character. Travers' account of Ramsay's life and work must stand as one of the classics in the genre of biographies of men of science. The author's attention to detail and his ability to make Ramsay come alive, speak of Travers' talents as a chronicler. It is this rare talent that one must bear in mind when



reading his account of his days in India, written half a century after he began the work of building the Indian Institute of Science.

Travers did not complete an autobiography, but left behind at the University College London's Archives a typescript, notes and diaries. His biography of Ramsay contains a chapter entitled 'India'. It begins on an intriguing note: 'A reason for wishing to finish the work on the rare gases in July 1900, was that Ramsay had arranged to visit India in the autumn. As Travers sat at the balance on Monday, July 7th making weighings in determining the first density of pure neon, he gave him an outline of the proposal. They had seen little of one another the previous six weeks. A wealthy Parsee, Mr Jamsetjee N. Tata of Bombay, proposed to establish in India what he called an *Institute* or *University of Research*, said to be on the lines of the Johns Hopkins University of Baltimore. Ramsay asked Travers if, in the event of the scheme materializing he would consider going out to India as the first Principal. Travers replied at once that he would not; though he was very ill at the moment, he was confident that at no distant date he would obtain a chair in a British university institution, and he did not relish the idea of exile, though the salary offered was large' (p. 194). Travers presents an account of Ramsay's visit to India quoting his mentor, who said that it was 'like reading the index of a book, without time to read the book itself'. The young Travers had visions of a chair of chemistry in a British University. But circumstances were to force him to accept the task of building IISc as its first Director, undoubtedly attracted by the annual salary of £1800 and a promised pension.

Travers arrived in India towards the end of 1906. A notice in the journal *Science* (Vol.24, p.710, 1906) records that he 'left Marseilles, on November 2, in the mail steamer *Victoria*, for Bangalore to take up his work as first director of the Indian Institute of Science'. He was then only 34 years old. In letters to his mother he describes vividly the sights, sounds and smells of India, a century ago. The notes available at the University College London Archives present a fascinating picture of an era





**Figure 2. Students and staff of the Institute, April 1912.**

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long gone. Travers' first sight of the land destined to be the IISc campus follows a ride on horseback from the West End hotel in Bangalore. Travers worked against many odds in getting the Institute to a stage where students were admitted in 1911. In a letter addressed to the Registrar of IISc, A G Pai, in July 1954, Travers writes: 'When I first went to India one of the first things I did was to look into the question of housing and feeding students drawn from all over India. I came to the conclusion that I should have to have several messes. Then I was right, for when we opened I found that we had to have five. Then a Muslim student turned up, and as no mess would take him in, I had to make a one-man mess for him. I still wonder how fish-eating Bengalis get on with meat-eating Punjabis.'

Travers fought an unceasing battle with Padshah and Dorab Tata on the academic directions of the Institute. Padshah favoured starting subjects like archaeology and the humanities, while Dorab Tata had visions of bacteriology and a tropical diseases institute. Travers was sharply focused, realizing that resources, both human and material, would permit only a more limited



approach. In many ways he set the agenda for the century that followed. His troubles with the Tatas were compounded by problems with the task of erecting the magnificent structure which symbolizes the Institute today. He fell afoul of the governing council and eventually resigned in 1914, a forced retirement engineered by opponents who converged from different directions. The Travers story must strike a chord in those who seek to build new institutions and protect old ones. Travers involved himself in research, despite great odds, setting an example for his successors. He reflects: 'A particularly happy memory at Bangalore is the work in my laboratory during my last three years. Ramsay always said that our discoveries are our students'. Travers' side of the story is compelling, but his opponents prevailed. In 1954, he notes, with some regret: 'spite exceeded wisdom'.

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In the run up to the formed establishment of IISc, the formidable figure of the Viceroy of India, Lord Curzon stands, at times, as a trenchant critic of the Tata scheme for a research institute, which envisaged continuing financial support from the Government. Almost the very first issue that Curzon faced when he landed in Bombay as the new Viceroy in December 1898 was the proposal to set up the Institute. Indeed, a deputation including J N Tata and Padshah met him on 31 December 1898. Curzon was a brilliant and complex man. The veteran journalist Durga Das provides an assessment, a generous one: 'In a real sense, nevertheless, Curzon was the midwife of India's emergence on the world scene... What Curzon set in motion was decades later to find consummation at the hands of Jawaharlal Nehru' (*India: From Curzon to Nehru*, Rupa & Co, 1981). A quotation from Curzon, used by Durga Das, highlights an imperial ambition: 'India is the pivot of Empire, by which I mean that outside the British Isles we could, I believe, lose any portion of the Dominions of the Queen and yet survive as an Empire; while if we lost India, I maintain that our sun would sink to its setting'. Durga Das has a tempered view of Curzon's efforts in university education: 'The measures Curzon introduced to reform university education and promote technical training bear the stamp of a courageous vision, although they confirmed



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his anti-Indian bias by excluding Indian intellectuals from membership of the commissions on university education.’

The Institute began with only two departments: General and Applied Chemistry and Electro-Technology. Travers began the construction of the main building, which is one of Bangalore’s landmarks today. The Departments of Organic Chemistry and Biochemistry together with the Library were among the earliest to be established. The Physics department came into being in 1933, when C V Raman became the first Indian Director of the Institute. It is Raman who brought to the Institute the driving desire to excel in research and to build schools of research comparable to the best in the West. Raman’s unmatched achievements and his intense focus on research, despite his administrative travails, make the Raman era a turning point in the evolution of IISc.

Raman’s term as Director was turbulent; to his successor Jnan Chandra Ghosh must go the credit for steadying the course of development and for overseeing a great expansion of programs in engineering during the period 1939–48, which would position IISc as a key institution in the growth of science and technology in India after independence. J C Ghosh was to go on to establish the first Indian Institute of Technology (IIT) at Kharagpur in the early 1950s, capping a career of great accomplishment in the growth of higher education in the country.

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In the century that has passed since its inception, IISc has grown to become India’s premier centre for research and postgraduate education in science and engineering. The evolution of the Institute over the past one hundred years has mirrored the development of science and technology in India. A long history, a strong tradition of academic research and an ambience that favours scholarly activity have been important elements in making the Institute a most attractive place for students and faculty.

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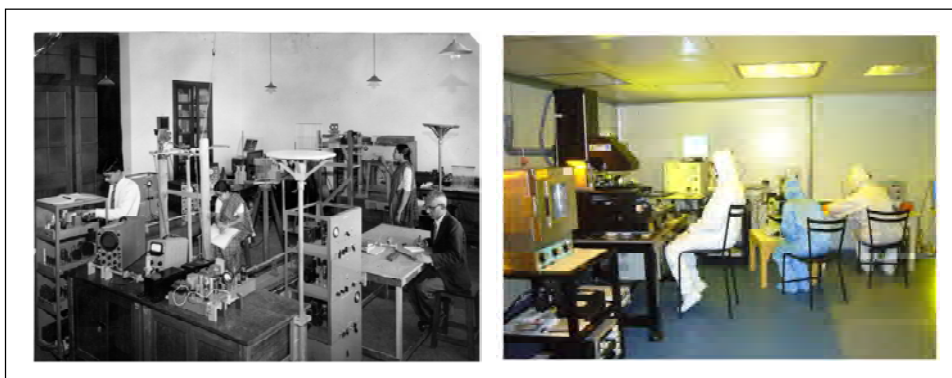




**Figure 3. Commemorative postage stamps issued in December 2008.**

Institute's departments in fields ranging from Biochemistry to Aerospace Engineering have served to nucleate research and development in both the public and private sectors. The faculty and alumni of the Institute have been responsible for establishing and spearheading many new institutions and programs across the country, reflecting in a real sense, a major contribution of this centre of learning to national growth and development. Homi Bhabha conceived the idea of the Tata Institute of Fundamental Research (TIFR) and an Atomic Energy Program while working in the Department of Physics. Vikram Sarabhai, the founder of India's space program was an alumnus. Following his premature death, the Indian Space Research Organization (ISRO) was built by the farsighted leadership of Satish Dhawan, who simultaneously held the position of the Director of the Institute with the greatest distinction. Many of India's most distinguished scientists and institution builders have been associated with the Institute as students or faculty. Notable among them are Harish-Chandra, the mathematician, G N Ramachandran whose seminal work expanded our understanding of bimolecular structures, S Ramaseshan who built schools in crystallography and materials science, Brahm Prakash who advanced metallurgy in a way that has laid a deep foundation for national programs and P K Kelkar who planned and set up the IITs at Bombay and Kanpur. The roll call of honour is long and I have mentioned only a representative

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**Figure 4. Laboratory evolution at Electrical Communication Engineering (ECE). Left: Microwave laboratory in 1950s, Right: VLSI laboratory now.**

few. It is the work of generations of dedicated teachers, students and researchers that has made IISc what it is today.

The face of science and engineering research has been changing very rapidly over the past few years. In approaching the second century of the Institute many new activities have been initiated. Notable among them are the interdisciplinary PhD programs that are intended to blur the traditional boundaries between disciplines, thereby promoting cross-disciplinary research and centers in earth sciences and neurosciences, areas that were largely unrepresented so far. The Institute hopes to foster collaborative and interdisciplinary research in a vigorous fashion in the years to come. The Institute is also committed to promoting post-doctoral research in the areas of science and engineering.

To live and work at the Institute is a special privilege. Anniversaries are an occasion for both celebration and introspection. In reflecting on the past, present and future of the Institute, in this Centenary Year, an exchange between Morris Travers, the first Director, and Lord Willingdon, the then Governor of Bombay and later Viceroy of India, is worth recounting. Willingdon went around the Institute in June 1914 and said: "I had no idea that there was anything like this in India". Travers responded: "There is nothing like it in India; and nothing better in Great Britain". In ensuring that this sentiment is true, a great deal of work remains to be done.

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In looking back on a century and more I must turn to Jamsetji Tata, undoubtedly one of India's greatest sons. His conception of a university or institute for research in the last decade of the 19th century must surely rank as a decisive event in the shaping of modern India. In a public meeting held on March 28, 1905, which initiated the task of building the J N Tata Memorial in Bombay, many rich tributes were paid to the memory of a man whose vision for his country was as practical as it was farsighted. Lawrence Jenkins, then Chief Justice of Bombay said of the proposal to establish the Institute: ".....it was no hare-brained chimera that he proposed, but a practical scheme directed to definite ends, and formulated with the aid of the ablest advice that could be obtained, and that Mr. Tata was inspired with the firm belief that it was by the application of the teaching of science through the medium of the Institute that the resources of the country could be best developed". Bhalchandra Krishna called the proposal for the Institute "Mr. Tata's greatest work", adding that "the *magnum opus* of his life which will always keep his memory green in India is, undoubtedly, the Research Institute ..... The Institute will be the noblest memorial of the late Mr. Tata's noble and lofty aims and character and will forever serve as a bright example and stimulus to other men of wealth to walk in his footsteps".

Visitors to Bangalore who seek out IISc still have to ask local residents for directions to the "Tata Institute", clear evidence that Jamsetji Tata's act of generosity has remained undimmed in public memory despite the passage of a century. There can be no greater tribute than this to the memory of a man who did not wish his name to be formally associated with the institution that he conceived and founded.

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