

# Satish Dhawan: The transformation of the Indian Institute of Science, Bangalore\*

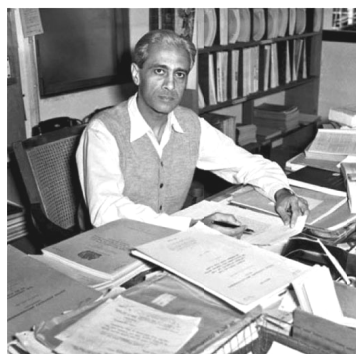
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THE Indian Institute of Science (IISc), Bangalore came into being on 27 May 1909. A little earlier, the first Director, Morris Travers, a young Englishman, arrived in Bangalore, in 1906, to begin the process of building the new institution. In its early years there were only two disciplines, General Chemistry and Electrical Technology, undoubtedly recognizing the importance of chemicals and electrical power in fuelling industrial growth. Expansion was slow. Biochemistry was born in 1921. Physics began when C. V. Raman became the first Indian Director, in 1933. In the mid-1930s, Raman had attempted to persuade eminent physicists fleeing Nazi Germany to come to Bangalore. Max Born was formally appointed a member of the faculty and spent several months at the Institute in 1935–36. In the 1940s, many remarkable men worked in the campus. Raman was a towering presence. Homi Bhabha, already highly recognized, was imagining the institutions he would later build. There were young men, Harish Chandra, G. N. Ramachandran (GNR) and Vikram Sarabhai, at the beginning of their illustrious careers, all of whom would later leave an indelible imprint on their surroundings. There were fewer women, but nonetheless some extraordinary pioneers studied at the Institute. Amongst them, in the 1930s, was the biochemist Kamala Sohoni and in the following decade Anna Mani and Rajeswari Chatterjee, all of whom influenced their surroundings immeasurably. At the time of Independence, in 1947, the Institute was poised to train young Indians in many technical subjects required for the rapid industrialization of the country. Under J. C. Ghosh, who was at the helm in the critical period 1937–1948, which saw the Second World War and the run up to Independence, several new departments had been started, Aeronautical Engineering amongst them. In 1951, a young man, then 31, with a PhD from Caltech, USA joined the department with the unprepossessing title of Senior Scientific Officer. He would rise meteorically up the academic hierarchy and transform the institution.

Satish Dhawan was a man of many parts. His early education in the 1940s, where the numbing precision of an engineering degree was offset by the more liberating experience of a Master's degree in English literature, was

a sign of things to come. When Dhawan made his entry into IISc in 1951, as a member of the Aeronautical Engineering Department, the institution was entering a comfortable state of middle-aged somnolence. He rose dramatically to become its Director in 1962, at the remarkably young age of 42. When he formally retired in 1981, he left an institution that had grown enormously in size and scope and was arguably the preeminent institute of science in the country, comparable to many in the developed nations of the West. Legend has it that Dhawan entered the Institute as an extraordinarily dashing young man. I saw him when he left it, a remarkably handsome and distinguished figure exuding a quiet charm that was uniquely his. In this period he transformed the academic structure of the Institute, moving it from a feudal departmental structure presided over by a single, powerful, and most often, inhibitory professor to a more collegial model, which promised the prospect of collective decision-making on academic matters. During his long innings as its Director, Dhawan gently and, at times, unobtrusively guided the transformation of an established academic institution; a formidable task that required a clear vision, a firm resolve and an ability to persuade recalcitrant academics to tread a new path. Experience tells us that in our surroundings when old institutions begin to falter, it is easier to contemplate setting up new ones; the hope is that this strategy sidesteps the difficult problem of effecting reform and change in institutions with set traditions. Dhawan's administrative achievement at IISc, has faded into obscurity, dimmed by the lustre of his achievement in building up the Indian Space Research Organisation (ISRO) into the formidable structure it is today. Dhawan's ability to attract men of unique and varied talents,



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and his role in shepherding the Institute during this phase of explosive growth, a period that coincided with the development of mechanisms for large-scale funding of academic science, must surely rank as one of his finest achievements. IISc's focus on research, nurtured carefully by Dhawan, deepened in later years, providing an institutional ambience that was clearly distinct from other institutes of technology.

Dhawan's love for Bangalore and his attachment to IISc led inevitably to the choice of the city as the ISRO Headquarters. Vikram Sarabhai's untimely death in 1971 catapulted Dhawan into a dual role of heading both ISRO and IISc for a decade. The space programme has had a wonderfully romantic history with Dhawan as the guiding force; in times of failure he shouldered responsibility, in the heady days of success he stood quietly by the sidelines. Dhawan's ability to build an organization whose success relied on teamwork, discipline and collective dedication was truly remarkable, particularly when one recognizes that he was simultaneously guiding an institution, where individuality and idiosyncrasy were cherished qualities.

My view of Dhawan is necessarily circumscribed by the limited perspective from which I saw him. For a man of many facets, any historical assessment must, of course, come from a scholarly study of his life and times. But, at the distance from which I viewed him, separated by the gulf of age, position and discipline, Dhawan was a man who engendered immense respect by his grace of conduct. There was a shy air of reticence about him, uncommon in men, who have experienced power and distinction. I saw him first from a distance towards the end of 1973. A friend pointed out, in hushed tones, that the silver-haired gentleman whom we saw in the distance was the Director. As a newly joined Lecturer, the lowest position in the academic faculty, fresh from the United States, I was unimpressed by administrative position. In the years that followed until his formal retirement from the Institute I saw him, individually, only on a few occasions, in most of which I was a supplicant. After nearly 18 months of not having a proper laboratory, I managed to enter his room. His first response to my request was a firm no, saying it was up to my department to find a place. Curiously, the department headed by one of India's most illustrious scientists, GNR, was scattered in temporary accommodations. Impatient and unfettered by the inhibitions which accumulate with age, I wrote him a very strong letter. Reading it after 45 years sent a chill down my spine for the damage it may have caused my career. Dhawan summoned me and in the formidable room of the Director, behind an imposing desk, he greeted me cordially and asked if I knew of any vacant and unused laboratories in the Institute. I had already done the reconnaissance and helpfully suggested that an old building occupied by the chemical engineers might be a good place, as most of them had moved to a new building. He

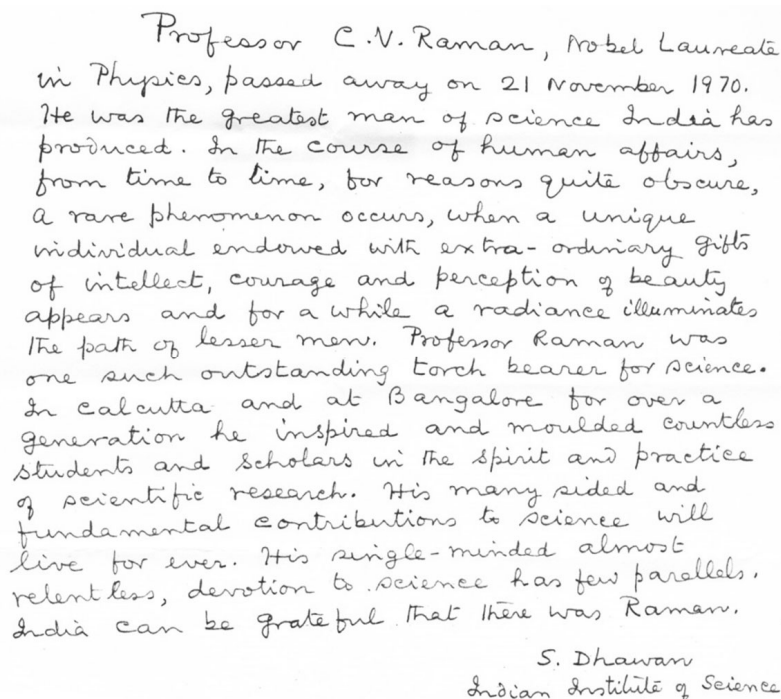
responded that he would find out the status of the building. Seeing bewilderment on my face he said that I must wonder why he is suddenly receptive to my request. By way of explanation he added that many people come with difficult requests. He invariably says a firm no the first time. If they return persistently he believes they must be serious. Decades later, I often thought of this encounter when I sat in the chair that Dhawan occupied with such grace and distinction.

In the 1960s, Bangalore's sole claim to distinction was that it was a retirement paradise. Stately charm and a leisurely lifestyle were the city's defining characteristic. Its old neighbourhoods of Malleswaram and Basavangudi provided the incomparable R. K. Narayan with the inspiration for immortal *Malgudi*. Institutions cannot remain unaffected by the ambience of their surroundings. When I saw the city and the institution for the first time, in late 1973, little seemed to have changed. I was to realize much later that the winds of change had begun to blow over the Institute. By this time Dhawan was in the second half of his 18-year long tenure and had set in motion many of the reforms which would transform the institution. In the mid-1960s, early in his directorship, the resistance of senior faculty to change would have been an impediment, but as he grew in stature and confidence he was able to, with the help of many younger colleagues, begin the process of transformation. In a radical departure, permanent Heads of Departments (HODs) became Chairmen (Chairpersons, in the gender neutral era, which lay in the future). One may ask, as Juliet did, 'what's in a name'? In this case the answer is 'everything'. The Heads ruled the body of departmental faculty. The term 'Chairman' conveys a feeling of one among equals and limited tenure ensures that change can be imminent. The democratization of the Institute began with Dhawan. In 1974, over much opposition, a formal graduate course programme for PhD students was introduced. The American model replaced a system which was more European in its academic structure for research students. In retrospect, this may appear a minor change. In reality, it was a



### Mystery of the Raman obituary note

In preparing to present a short talk on Satish Dhawan's role in transforming the Indian Institute of Science, Bangalore as its longest serving Director, I chanced upon a note obtained from the archives of the Raman Research Institute, Bangalore (Figure 1). The presentation was part of a virtual meeting organized by the Indian Academy of Sciences, Bangalore to mark the centenary of Dhawan's birth. The brief note, on the passing of C. V. Raman on 21 November 1970, is wonderfully crafted, beautifully



Professor C.V. Raman, Nobel Laureate in Physics, passed away on 21 November 1970. He was the greatest man of science India has produced. In the course of human affairs, from time to time, for reasons quite obscure, a rare phenomenon occurs, when a unique individual endowed with extra-ordinary gifts of intellect, courage and perception of beauty appears and for a while a radiance illuminates the path of lesser men. Professor Raman was one such outstanding torch bearer for science. In Calcutta and at Bangalore for over a generation he inspired and moulded countless students and scholars in the spirit and practice of scientific research. His many sided and fundamental contributions to science will live for ever. His single-minded almost relentless, devotion to science has few parallels. India can be grateful that there was Raman.

S. Dhawan  
Indian Institute of Science.

Figure 1. Handwritten note from the Raman Research Institute archives.

handwritten and bears Dhawan's name. Having seen some handwritten, signed notes from him decades ago, I was doubtful about the provenance of the note I had in hand. In sharing the note during my presentation, I voiced my doubts. Confirmation that it was not Dhawan's handwriting was quick to come from his daughter, Jyotsna. But to my complete surprise, I received a mail from Satyendra Bhandari, a student at the Physical Research Laboratory (PRL), Ahmedabad, in the early 1970s, who pointed out that the handwriting matched that of his mentor, P. R. Pisharoty, who was then at PRL. A small sample is shown in Figure 2. Pisharoty (1909–2002) was one of India's most distinguished meteorologists and considered by many to be the father of India's remote sensing programme. He was recipient of the International Meteorological Organization Prize in 1989. Was Dhawan in Ahmedabad during 21–22 November 1970, when Raman died in Bangalore? Did Pisharoty, a student of Raman, draft the note for him? Pisharoty would have been 61 then; his handwriting must have been the envy of much younger people at that time.

In attempting to answer this question, I chanced upon a wonderful blog with the engaging title 'Millennial Matriarchs, subtitled Musings on Life and Times: Views, Reviews, Previews, Interviews and Advice'<sup>1</sup>. Here I may have found the answer. In paying a tribute to Pisharoty, on World Meteorological Day, 23 March 2018, one of the matriarchs, Meena Raghunathan, writes: '*Typical of the old school, he wrote and wrote – letters, articles, notes, comments.*' She then recalls two of Pisharoty's favourite sayings. I cannot resist reproducing them: '*The more you write, the better will be your handwriting; and the more you think, the sharper will be your intellect.*' '*Science is our profession as well as our life's hobby. Government is paying us for our hobby. Amount of money which we get from the Government should not worry us very much; we are being paid for our hobby.*'

Indian Meteorological Society,  
Ahmedabad Chapter (IMSA)

Prof. K. R. Ramanathan, M.A., DSc,  
(1893-1984) FNA, FASc.  
and His Contributions to Meteorology.  
(P. R. Pisharoty)

Deewan Bahadur, Padma Vibhushan,  
Kalpathi Ramakrishna Ramanathan was  
one of the most distinguished meteorologists  
of India. His research work spanned over  
a period of more than six decades. It  
covered a wide spectrum of Scientific

**Figure 2.** Extract from a handwritten obituary note on K. R. Ramanathan by Pisharoty provided by Satyendra Bhandari.

In thinking about handwritten notes and letters I was reminded that, a long time ago, Charles Dodgson, better known as Lewis Carroll, said that 'Man is an animal that writes letters'. Sadly, that is no longer true.

P. Balaram

<https://millennialmatriarchs.com/2018/03/23/world-meteorology-day-a-tribute-to-the-father-of-indian-meteorology-dr-p-r-pisharoty/>

significant departure from the past, preparing students more broadly for an interdisciplinary future and enhancing the importance of teaching in an institution that took pride in its research focus. Research and teaching are two sides of the same coin, especially at the graduate level. Caltech of Dhawan's days boasted of two of the most influential scientists, who raised teaching to its highest level, Richard Feynman and Linus Pauling. There must have been others. I do not know if there was a direct connection between Dhawan's Caltech experiences and the reforms he initiated, but I suspect there was.

If I were to single out the most important contribution of Dhawan to IISc, it would be his efforts to expand the scope of subjects studied at the Institute. In a retrospective on Dhawan, a distinguished alumnus K. R. Sreenivasan, had this to say: 'Even as late as 1968, most departments at IISc were quite traditional and operated as silos under department heads who ran them essentially according to their norms. And it is hard to imagine that such a pre-eminent place did not cover subjects such as pure mathematics, theoretical physics, ecology, atmospheric science and oceanography, computer science, automation, solid state chemistry, molecular biology, biophysics, and the like – in short, anything modern. Nor did

it own a decent computer (a few IISc researchers went to TIFR, Mumbai, for their computational work).' (*Bhavana*, July 2020, 4(3)). By 1970, the fledgling Indian Institutes of Technology (IITs) were beginning to have an impact on the teaching of both engineering and science subjects. IIT Kanpur, modelled on the best of American Universities, also emphasized research by the faculty. Competition was in the air and IISc, now past its 60th year, needed to change. Two disciplines, physics and biology had already undergone tumultuous revolutions. A third, computer science, was poised to explode. The pace of research had quickened dramatically in the West in the decades after the Second World War, driven by the enhanced funding catalysed by the Vannevar Bush Report, *Science: The Endless Frontier*. In the absence of change the Institute would have faded into insignificance, another aging institution sliding into terminal decline, a fate that has overcome many, once renowned, Indian institutions. Dhawan's first efforts seem undramatic, with the benefit of hindsight. In 1964, He established a Central Instruments and Services Laboratory (CISL). This was the first time that instrumentation for chemical spectroscopy, electron microscopy, glass blowing and vacuum technology became centrally available to researchers. This

AS. lecture  
Dec 24 1979  
Chandigarh.

## The National Satellite System

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A unique and distinguishing feature of man is his ability to create languages through which complex and abstract ideas can be communicated between individuals - and also stored & transmitted to future generations.

Science and Scientific Activity also can hardly survive leave alone flourish without communications: - lectures, seminars, reports, journals and books - in short all the means of dissemination, exchange, storage and transmission of knowledge & information are almost the basis of civilized, developed society. The present day professional scientist uses the ~~word~~ jargon "Publish or perish" to express - although in a somewhat distorted way - the intrinsic importance of communications to the scientific community. John Milton <sup>in 1667</sup> ~~expressed~~ expressed the idea more profoundly in his Paradise lost... "The Good, the more communicated, the more abundant grows"... [The cynic would say the same of evil]

A sample of Satish Dhawan's handwritten notes for a lecture to the Indian Academy of Sciences in 1979. Note that a quote from Milton has been woven into a talk on the National Satellite System (Source: Jyotsna Dhawan).

predates by more than a decade the efforts of the subsequently formed Department of Science and Technology (DST) to set up Sophisticated Instruments Facilities, across the country. He also formed the Computer Centre in 1970, a modest beginning from which the Supercomputer Education and Research Centre (SERC) would flower in the 1980s. In 1968, with collaboration from the Soviet Union he established the School of Automation, a department that would grow in later years to encompass Computer Science. There was another facet of Dhawan, his societal concerns and his socialist leanings, which led him to support and encourage A. K. N. Reddy in the establishment of a unit for the Application of Science and Technology for Rural Areas (ASTRA) in 1974 and the Karnataka State Council for Science and Technology (KSCST) in 1975. The former later grew into the Centre for Sustainable Technologies. The latter remains one of the country's most active State Councils, for the promo-

tion of science and technology. These initiatives served a larger purpose, that of integrating the institution with the environment in which it is embedded.

Dhawan set to work on his most impactful initiatives in 1970-71, a year he was on sabbatical at Caltech, halfway into his long directorship. Institutional reputations are built by people, not by the grandeur of their buildings or by the facilities they amass. His ability to attract men of distinction to the Institute and provide both freedom and support was the key to his success. In 1971, GNR arrived from Madras University to set up the Molecular Biophysics Unit (MBU). He had a formidable reputation, internationally, and his best work was behind him. IISc provided the opportunity to build a unit, which would blend his deep interest in theoretical biophysics with complementary experimental research. His interests in crystallography and computational analysis of macromolecules would lay the foundations for building a

department, whose research dramatically altered the visibility of the Institute in the newly emerging field of structural biology.

In mid-1972, another star arrived, the physicist E. C. G. Sudarshan, from Texas, USA, to start a Centre for Theoretical Studies (CTS). Housed in the quaint building of what was once the Gymkhana of the Institute, CTS was envisaged as a centre, devoid of boundaries, which would provide a novel interdisciplinary ambience. Particle and theoretical physics coexisted with ecology, fluid dynamics with genetics and evolution. N. Mukunda, so influential in later years in charting a course for science undergraduate education, R. Rajaraman and J. Pasupathy formed the nucleus of what would eventually grow as the Centre for High Energy Physics (CHEP). Madhav Gadgil brought ecology to India and the Institute, building in time the Centre for Ecological Sciences, which is now recognized widely for its research in the areas of evolutionary biology, biodiversity and ecology. Sulochana Gadgil was the driver in establishing the Centre for Atmospheric and Oceanic Sciences (CAOS), so influential today in monsoon and climate change research. H. G. Sharat Chandra began human genetics at IISc, setting the stage for later developments, which would be speeded up by the genomics revolution. In retrospect, it is hard to imagine so many diverse disciplines being established from a single nucleus (CTS), whose initial charter excluded the direct admission of PhD students. I suspect that Dhawan would have intuitively sensed the great potential of recruiting the best people, even if their initial home was unusual, and anticipated that academic evolution in the institution would eventually lead to a most desirable conclusion.

In late 1976, Dhawan persuaded C. N. R. Rao (CNRR) to return to the Institute from IIT Kanpur. Still in his early forties, Rao already had a formidable reputation. His energy and drive were unmatched. In a remarkably short

time two major departments were established, Solid State and Structural Chemistry Unit (SSCU) in 1976 and the Materials Research Centre (MRC) in 1978. Rao's career at the Institute over the next two decades and his leadership for a decade contributed enormously in establishing IISc as the preeminent research institution in India. GNR and CNRR, by their single-minded pursuit of scientific research set an example to others in making the Institute a modern competitive research institution. It is Dhawan whom we must thank for catalysing this major transformation of an old institution, which has now completed 111 years of formal existence. For an institution to have weathered a turbulent century there must have been men who steered the ship through rough waters. Foremost amongst them was Dhawan.

Dhawan mentored some remarkable students and built the discipline of aeronautical engineering at the Institute. He influenced aeronautical research and industry in India in a major way. He shepherded the Indian space programme following Vikram Sarabhai's untimely death. He served the Indian scientific community in many ways. His stewardship transformed IISc. How then do we describe such a man? Dhawan studied English literature obtaining a Master's degree in his youth. It may therefore be appropriate for me to borrow a 16th century description of Sir Thomas More:

*'[Sir Thomas] More is a man of an angel's wit and singular learning. I know not his fellow. For where is the man of that gentleness, lowliness and affability? And, as time requireth, a man of marvelous mirth and pastimes, and sometime of as sad gravity. A man for all seasons.'*

Satish Dhawan was truly a man for all seasons.

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