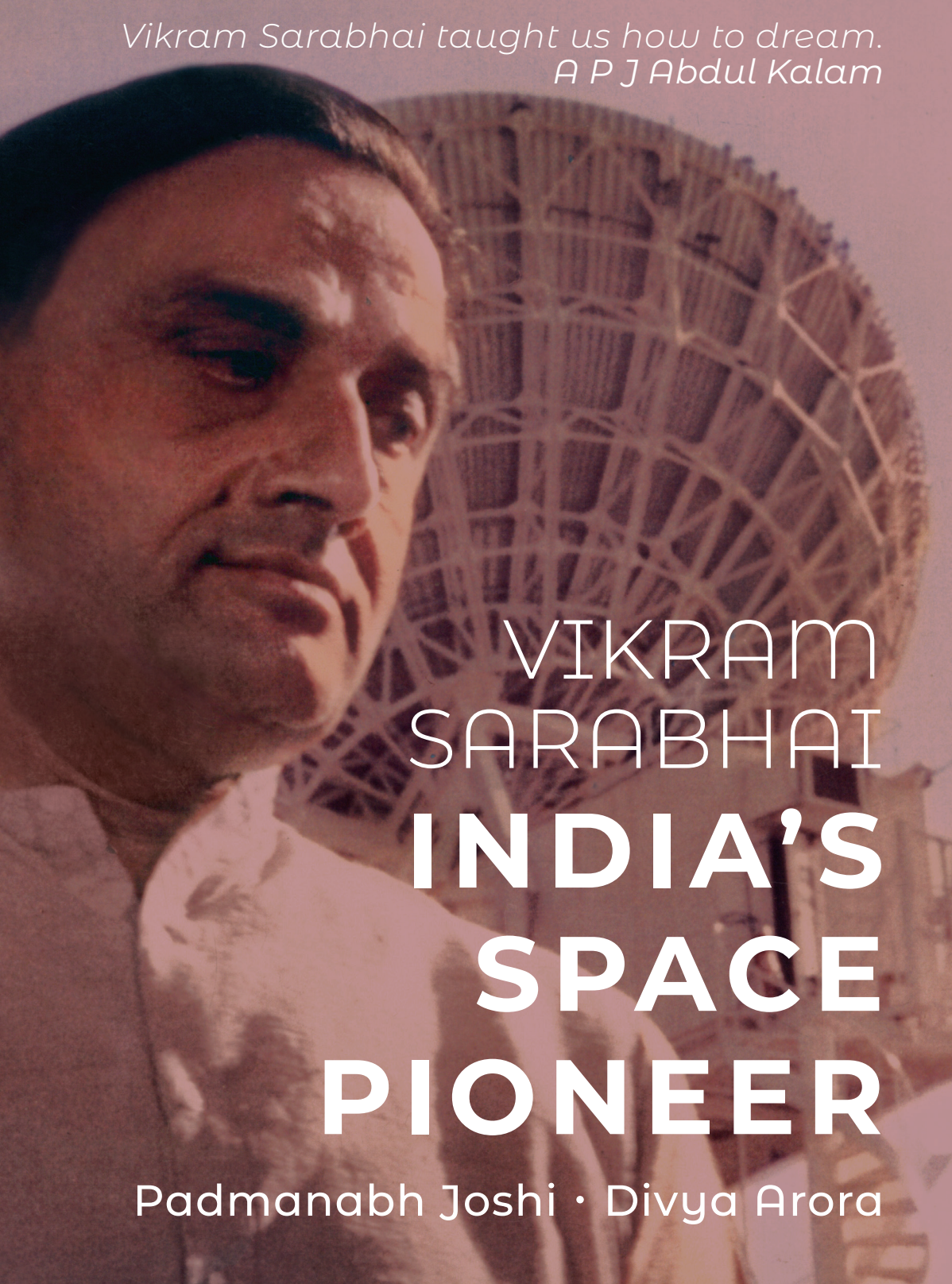
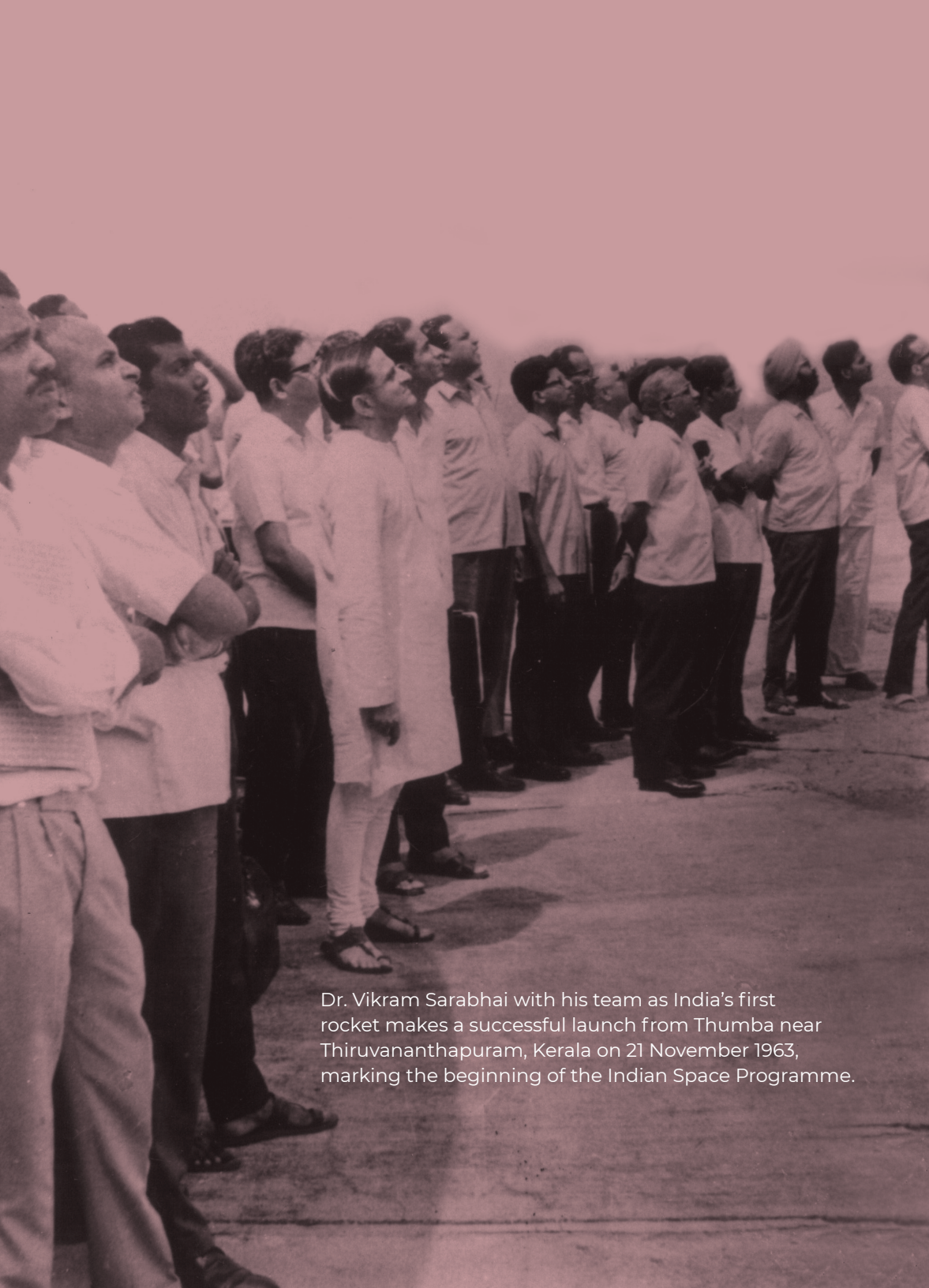


Vikram Sarabhai taught us how to dream.
A P J Abdul Kalam



VIKRAM
SARABHAI
INDIA'S
SPACE
PIONEER

Padmanabh Joshi • Divya Arora



Dr. Vikram Sarabhai with his team as India's first rocket makes a successful launch from Thumba near Thiruvananthapuram, Kerala on 21 November 1963, marking the beginning of the Indian Space Programme.

VIKRAM
SARABHAI
**INDIA'S
SPACE
PIONEER**

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Padmanabh Joshi
Divya Arora





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Preface

India has been blessed with many geniuses. Brilliant men like Swami Vivekanand, Swami Yoganand, Gurudev Rabindranath Tagore and Mahatma Gandhi have blessed our country with their wisdom and knowledge. With the next generation, we had Sir C.V. Raman, Prof. S. Chandrashekhar, Dr. H. J. Bhabha and Dr. Vikram Sarabhai. 2019 marks the centenary celebrations for Dr. Vikram Sarabhai (1919-2019).

When I first met Dr. Sarabhai in 1966, he had just taken over as the Chairman of the Atomic Energy Commission. He was a great influence on me and gradually I had the good fortune to know him better. After his sudden, untimely and sad demise, I decided to pay my heartfelt tribute by doing a Ph.D. on him and later worked to organise the archives on his life and contributions.

Whenever he was in Ahmedabad, his hometown which is where I live and work, I tried to meet him except if he was very busy or had a guest. Each time that we met, he would remember to ask me about my study and would take special interest and discuss foreign relations with me, which was a subject that was part of my study. He would always emphasize to me that every student whether he or she was studying the arts or science, must study the history of our country. Only then, according to him, would he or she understand our culture. While talking about music, he liked Indian Classical Instrumental and Western Music. He also enjoyed listening to Saigal's songs.

He advised me to learn computer operations, a skill that we cannot do without today. I remember once after lunch, I was mixing betel nut with tobacco. He saw me and not only did he stop me from eating it but he also convinced me to let go of the habit. I was very fortunate to experience his care and concern, often.

He had the rare combination to be as connected to nature as he was to technology and science. I remember talking to him once after lunch and as we strolled into the garden, he delicately held a leaf of a tree within his palms and it was as if he were holding a deep conversation with it.

The main objective of this book is to motivate the young generation and inspire them to learn from the life and contributions of a legend like Dr. Vikram Sarabhai. His unfinished dreams are not difficult to achieve but total dedication and commitment will certainly help translate them into reality. India has the makings of a superpower in terms of science and technology - we have shown it time and again, and in business too, as Dr. Sarabhai envisaged. Entrepreneurship is not lacking. We need to take our ideas to the world, like he did. We need to educate our children in such a manner that they become leaders. The Uttarakhand State Council for Science and Technology under the Department of Science and Technology, Government of India, has been at the forefront of encouraging scientific exploration and innovation among the youth. The book is the outcome of discussions with the Director-General, Dr. Rajendra Dobhal.

My co-author Divya Arora must be given the credit of writing this book and doing everything else to bring it out in time. This book has reached its readers only because of her dream, her dedication and lastly her commitment.

PADMANABH JOSHI



Absolute right or wrong do not exist in the values of those who have understood the Upanishads or those who have followed the concept of relativity.

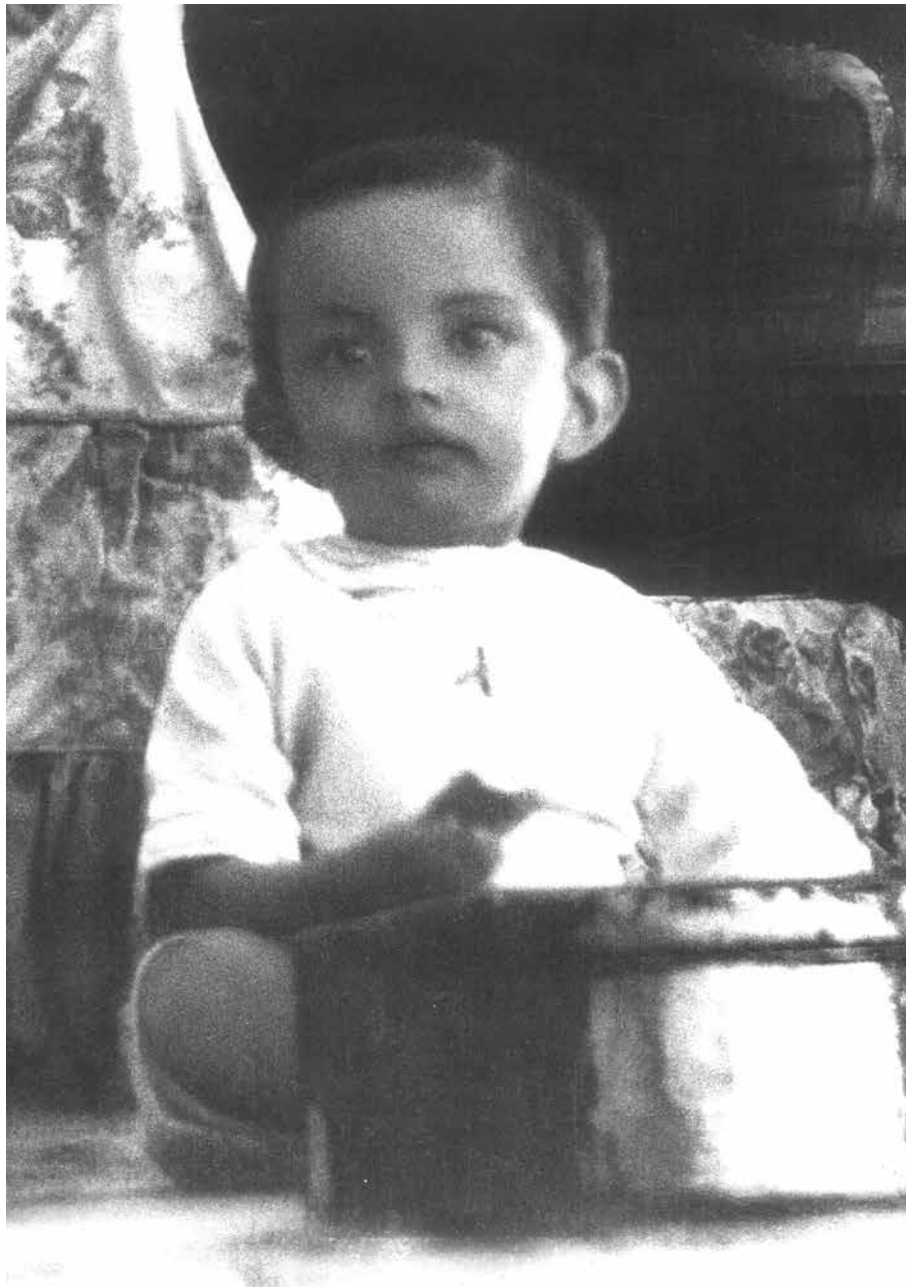


Vikram Sarabhai was born to Ambalal and Sarladevi Sarabhai in Ahmedabad, Gujarat on 12 August, 1919. He was the sixth of eight children. Ambalal Sarabhai was a well known millowner, and an industrialist respected across Ahmedabad. The Sarabhai family were prominent industrialists since the 18th century in Gujarat. They owned the Calico Mills, which were one of the oldest mills in the country. They went on to become the most famous and were pioneers in the textile industry.

Sarladevi, his mother hailed from Saurashtra. She had very strong social ideals and was very pragmatic. His father, apart



Ambalal and Sarladevi Sarabhai. Vikram was the sixth of their eight children.



Vikram was an observant and intelligent child.

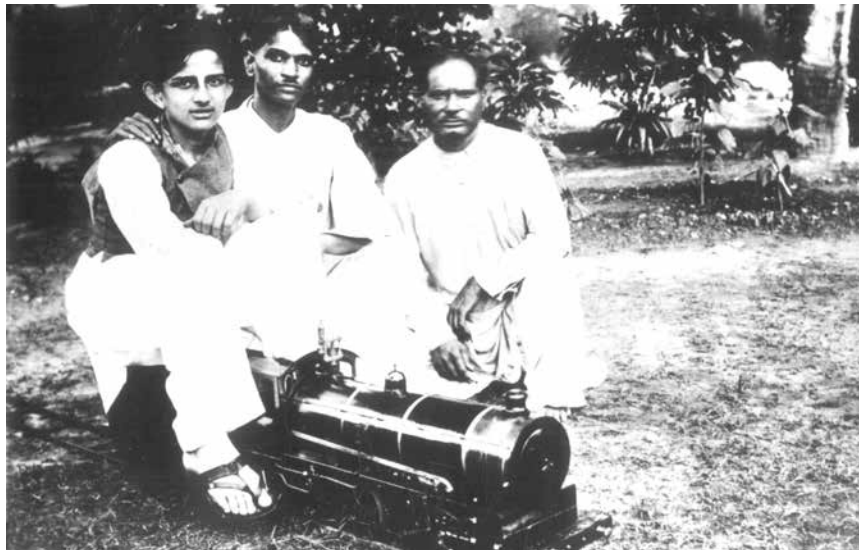
from interests in business, also had knowledge of and passion for botany. Vikram's parental residence, known as *The Retreat* was spread across twenty acres of land that was home to a wide range of plants and trees not just from India but from across the world. The botanical garden was well preserved and well known. Vikram's father was also known for the pets they had—dogs, and horses, and in fact their aviary of parrots and lovebirds was famous, far and wide.

Vikram's parents were very concerned about the type of education they would provide their children. On a trip to the United Kingdom, they came across a book by Maria Montessori, an Italian physician and educator, and they were very impressed with her style of education. It was quite similar to the idea they had on how they wanted to educate their children in Ahmedabad.

The Sarabhais met Maria, exchanged notes, and *The Retreat* became a school following Maria Montessori's method for the eight children, with about fifteen to twenty teachers imparting knowledge not only on academic subjects but also teaching the children co-curricular activities that included art, music, theatre, sports and dance. It was an ideal space for the Sarabhai children to learn – there were no rules, no classrooms – if one child wanted to study geography and not physics at a particular time, then that was fine. Every teacher gave special attention to building the interests of each child in the best manner possible.

Internationally acclaimed poet and Nobel Laureate, Rabindranath Tagore, was a dear family friend, and he too recommended some teachers to the school. The teachers had weekly discussions with the parents on the growth and development of the children. New ideas and concepts were introduced as and when necessary. When the teachers decided that the child was ready for the matriculation examination, then the child went as an external student and appeared for the exam.

This was also the time of the independence movement—political leaders would visit Ahmedabad regularly to meet Mahatma Gandhi and when they would come they would stay at *The Retreat*. Pandit Jawaharlal Nehru, Annie Besant, Maulana Azad, Sarojini Naidu, Sardar Vallabhbhai Patel and Dr. C.V. Raman were some of the



Vikram's parents set up a workshop for him at home. With his assistants, he assembled a train engine he designed at home.

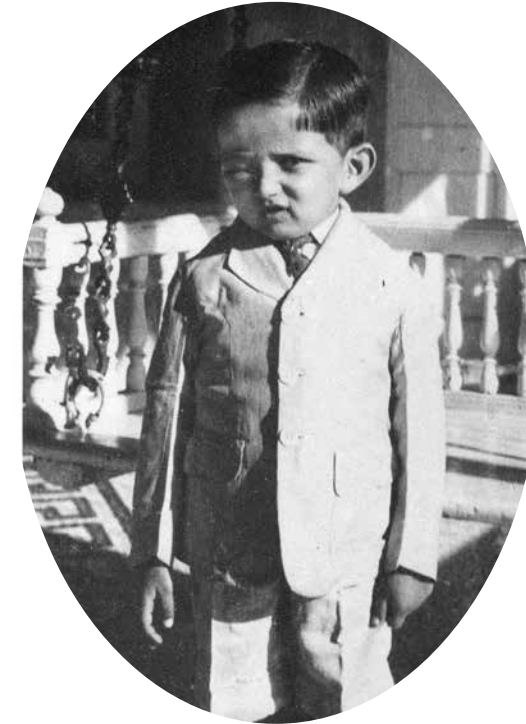
luminaries who were regular visitors to the home. The Sarabhai family was committed to the Indian independence movement, especially to Gandhi's ideal of non-violence. Gandhi's famous Sabarmati Ashram was generously supported by the Sarabhai family. Vikram was surrounded by ideas, discussions and debate as he grew up in the fervent atmosphere at *The Retreat*.

Since the Sarabhai family was close to Mahatma Gandhi, from a young age Vikram observed Gandhi's style of leadership, his virtues of humility, courage and conviction for a free India. He had spent time talking to Gandhi at various occasions as a young boy. In an interview, he recalls how he used to watch Gandhi conduct himself with people of different religions, and castes, and remembers that when he asked Gandhi questions, "he never made me feel immature or that I was talking nonsense." With such close and intimate interactions with a person of such strength, Vikram inculcated Gandhi's teachings as his essential life skills.

There is an interesting story that one day, when Vikram was two years old, his mother Sarladevi took him to meet Tagore who was visiting the family. Tagore was also a phrenologist. He took one look at Vikram's forehead and predicted that *the boy would be a celebrity*. The family and teachers did not make this prediction known till Vikram passed on.



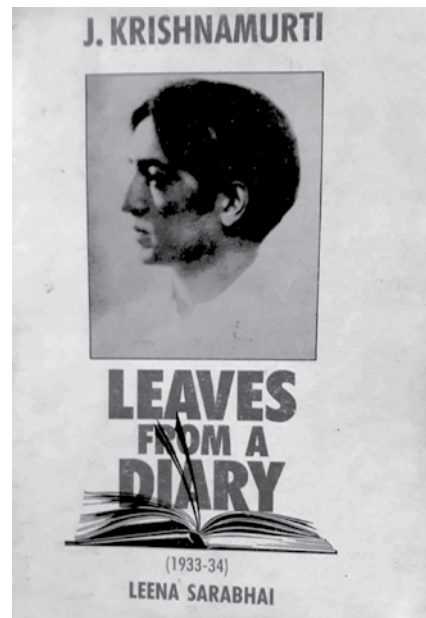
A portrait with a dear friend of the family, Gurudev Rabindranath Tagore (centre).



Apart from English, Vikram learnt to speak Hindi, Gujarati, and Sanskrit. J.S. Badami, his teacher once told his mother, *“Vikram has a very inquisitive mind, he often asks questions for explaining which I have to go far and wide out of the prescribed course. This is very good and he should be encouraged to discuss details.”*

Young Vikram was very interested in Math and Science. His parents had already established a workshop at home and an assistant was also hired to help him. Vikram was encouraged to question, develop on his ideas, experiment and make connections between the different subjects he was being taught. What made little Vikram stand out was his strong

conviction and unflagging curiosity to learn new things. His teachers were able to perceive his keenness and aspirations, his desire for knowledge and his relentless nature which impelled him to seek answers. At the very young age of six and seven, he used to dismantle his toy trains, engines, signal and stations just to understand how the various parts worked and later he would assemble them back together. In fact, this habit stayed with him even when he became a father. His children fondly recall how he would bring them toys from abroad, disassemble them to see how they worked and then put them back together again!



Well known philosopher J Krishnamurti was a family friend of the Sarabhais. Vikram's elder sister, Leena Sarabhai wrote a small booklet of about 35 pages titled "*Leaves from a Diary: J Krishnamurti (1933-34)*" in which she records this extremely informed and insightful discussion between Krishnamurti and 15-year-old Vikram. It reflects Vikram's depth and maturity in understanding complex issues:

About nationalism he said, "Nationalism can do no good to the country. Through patriotism and nationalism, we in India are

trying to resist the British. Maybe we shall have the right to legislate and rule but we are not going to be free; because with such 'freedom' we shall still continue to be narrow-minded, orthodox, bigoted, superstitious and tyrannical and still remain exploiters. At present there are white exploiters and then we shall have brown ones."

My brother Vikram interrupted, "It is better to have our own exploiters than have strangers to exploit us."

Krishnaji replied: "No, not at all. It is the same to me whether a white man or a brown man were to steal my thing. After all, I have lost it. Would I feel it less, if a brown man were to snatch it away from me? This is merely an empty sentiment."

To this Vikram said, "Let us assume that our people are tyrannical, bigoted and orthodox, and that when they assume power, they shall be even greater exploiters than the English. But after some time they shall learn how to rule and they shall improve. We must drive out the English first. For this we must become national minded and patriotic."

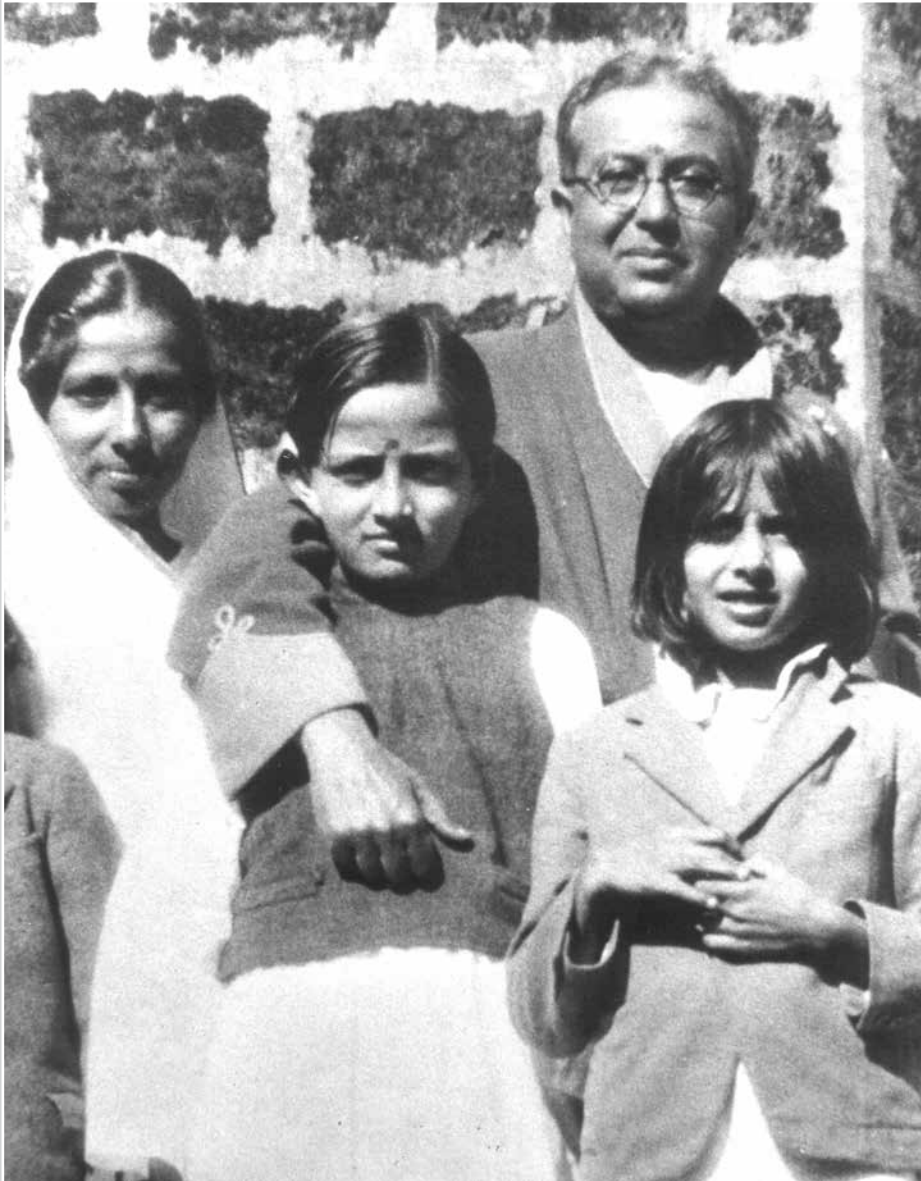
"Only by driving out the British, it is not going to improve matters. We must change our emotions, our thoughts and our attitude. In these lies freedom. Nationalism; I hate the word. There should be a World State."

"We have no power in India and we have no freedom, then how can we form a World State? The first step to a World State is to have a National Government," Vikram persisted.

Young Vikram was fascinated by letter-writing and stamps. One day his parents noticed that he had started receiving letters. Curious to know who was writing so many letters to their son since there was no one they knew of who would write to him, his father, Ambalal Sarabhai, asked Vikram about the letters. He was obviously surprised to learn that Vikram was writing letters to himself and taking the trouble to stick the stamp and post the letters!

In 1936, the teachers allowed him to appear for the matriculation exam – at RC Technical High School in Ahmedabad as an external student. Vikram excelled and also got an award. He then went on to study at the Gujarat College, in Ahmedabad. He stood first class in both standards and then applied to the University of Cambridge. He received the Tripos in Natural Sciences in 1940.

A lot of the characteristics that Vikram developed through the course of his life in dealing with people, respecting other people's views, listening and learning, came from the kind of upbringing he had and the atmosphere at home. When the children were not home, his father had made it a habit to write one letter everyday from work to them. Eight copies of the letter were made on a daily basis and sent to the children by his office.



A family photograph of Vikram with his parents and sister.

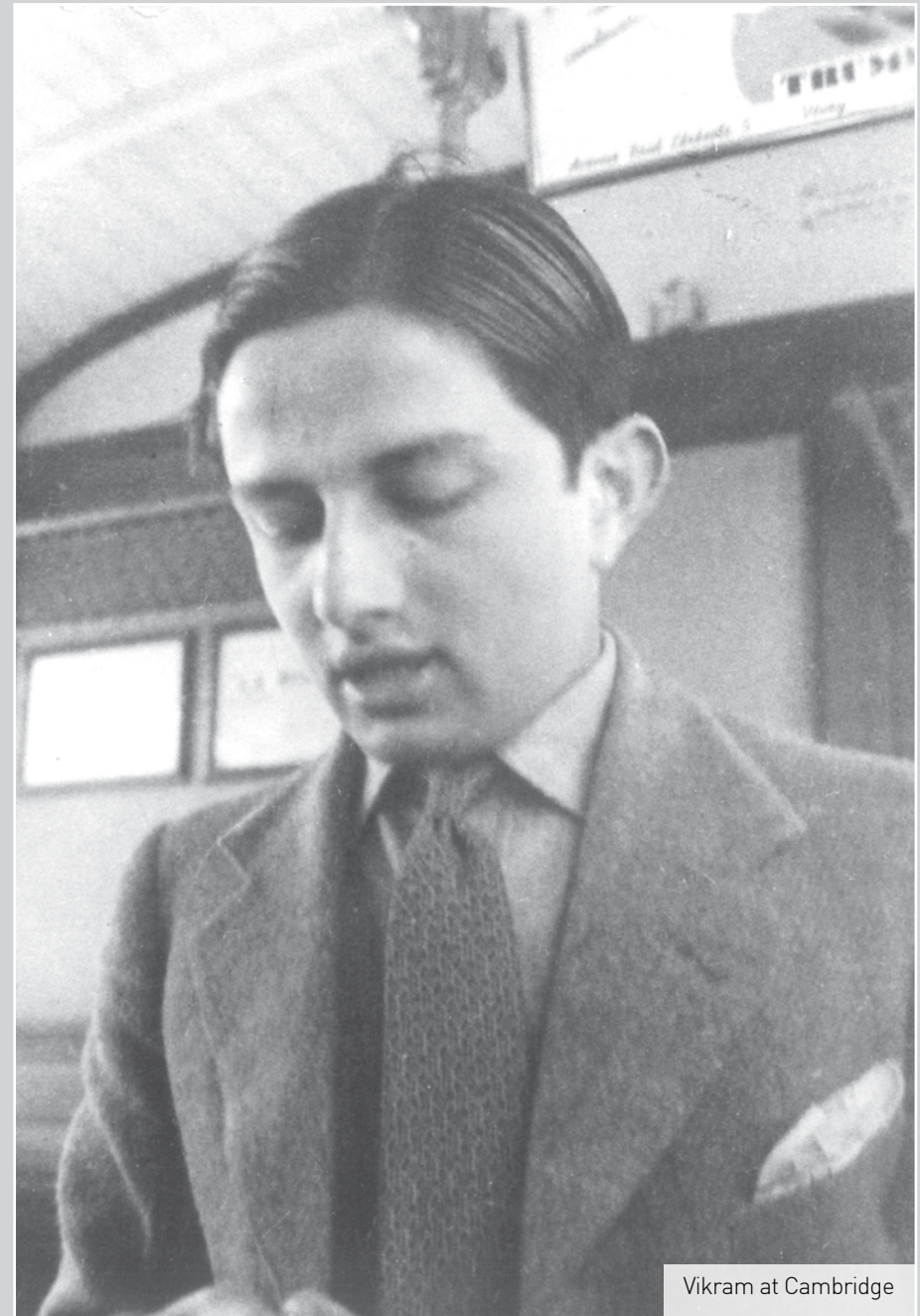
This is a habit that Vikram developed when he was abroad. He would write regularly to his wife and children, whether it was to do with work, his personal life, or just the mundane. It was his way of keeping in touch, like his father.

*Uttarayan
Santiniketan, Bengal*
November 1, 1935.

It is with great pleasure that I recommend the application for admission of Mr. Vikram Sarabhai to the authorities of the Cambridge University. He is a young man with keen interest in Science and I am sure, a course of study at Cambridge will be of immense value to him. I know him personally and his people. He comes of a wealthy and cultured family in the Bombay Presidency and he has a brother and a sister studying at Oxford at the moment. In my judgment, he is a fit and proper person for admission to the University.

Rabindranath Tagore

Vikram was recommended to the University of Cambridge by none other than Rabindranath Tagore.



Vikram at Cambridge

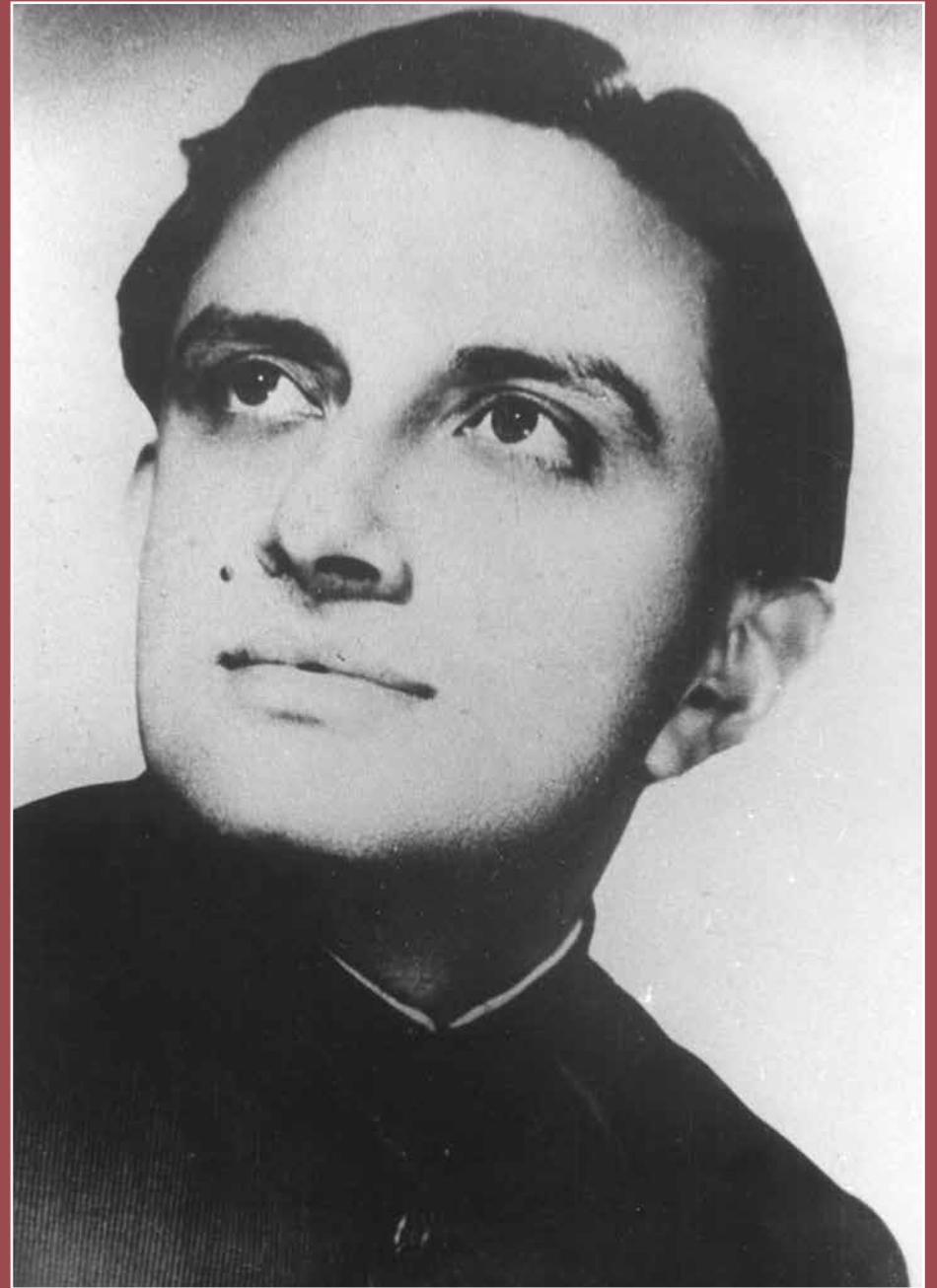


*Those who can apply
their insights to
the problems of the
community and of the
nation discover an
exciting area of activity
where effort is rewarding
even while the results
come slowly.*

A change in one influences the total scheme of things, for in organisational structures and culture, the whole is more than the sum of its parts.

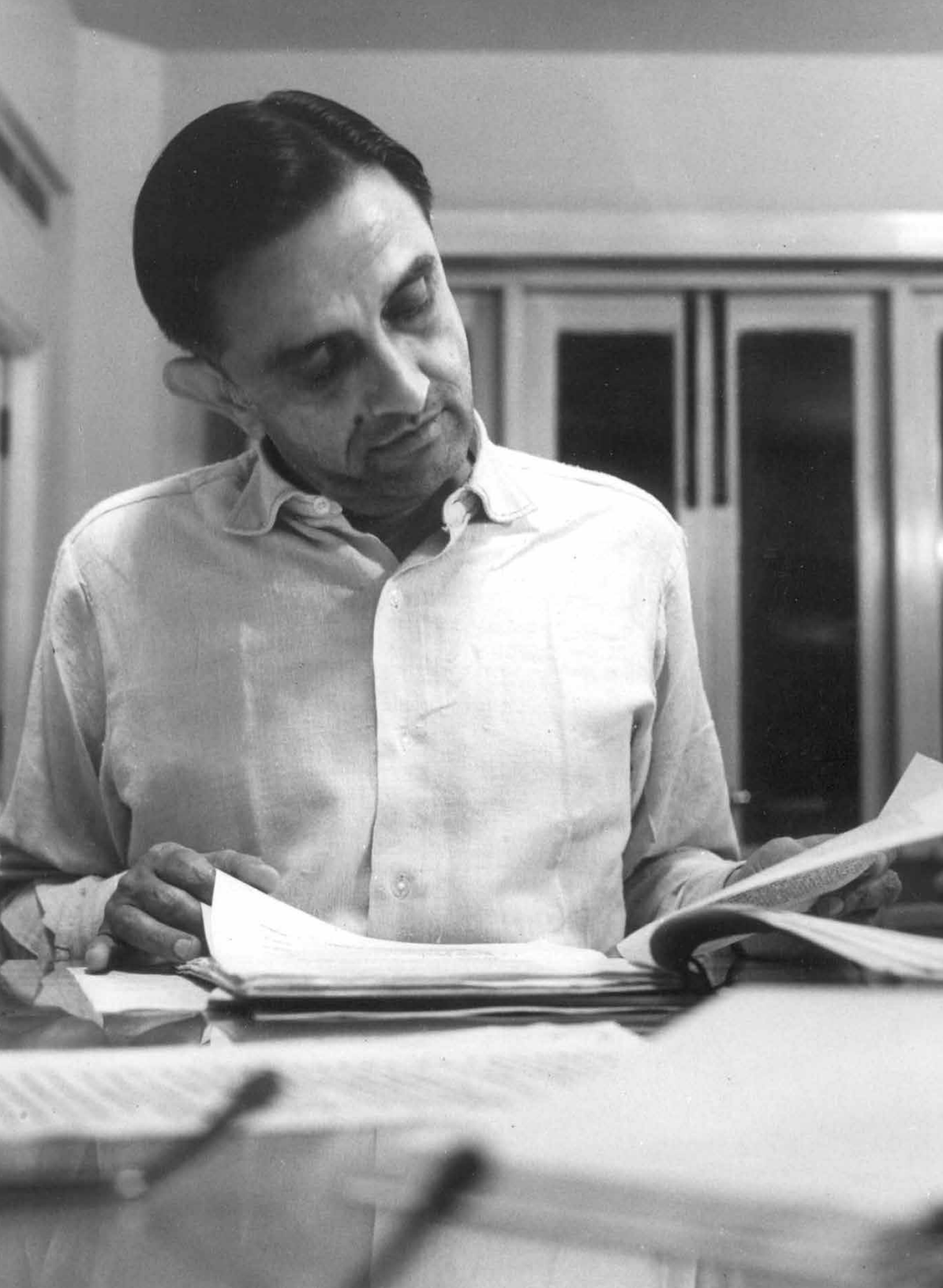
Knowledge born out of personal experience has to substitute inhibitions or adherence to authoritarian order or fear of consequences thereafter.

*Trust cannot be taken
for granted. It has to be
continually created and built up.*



*If only one listens to the music in the
(apparent) noise, the work becomes
very rewarding indeed.*

*In implementing change, we need to
apply ourselves to people before we can
apply ourselves to problems.*

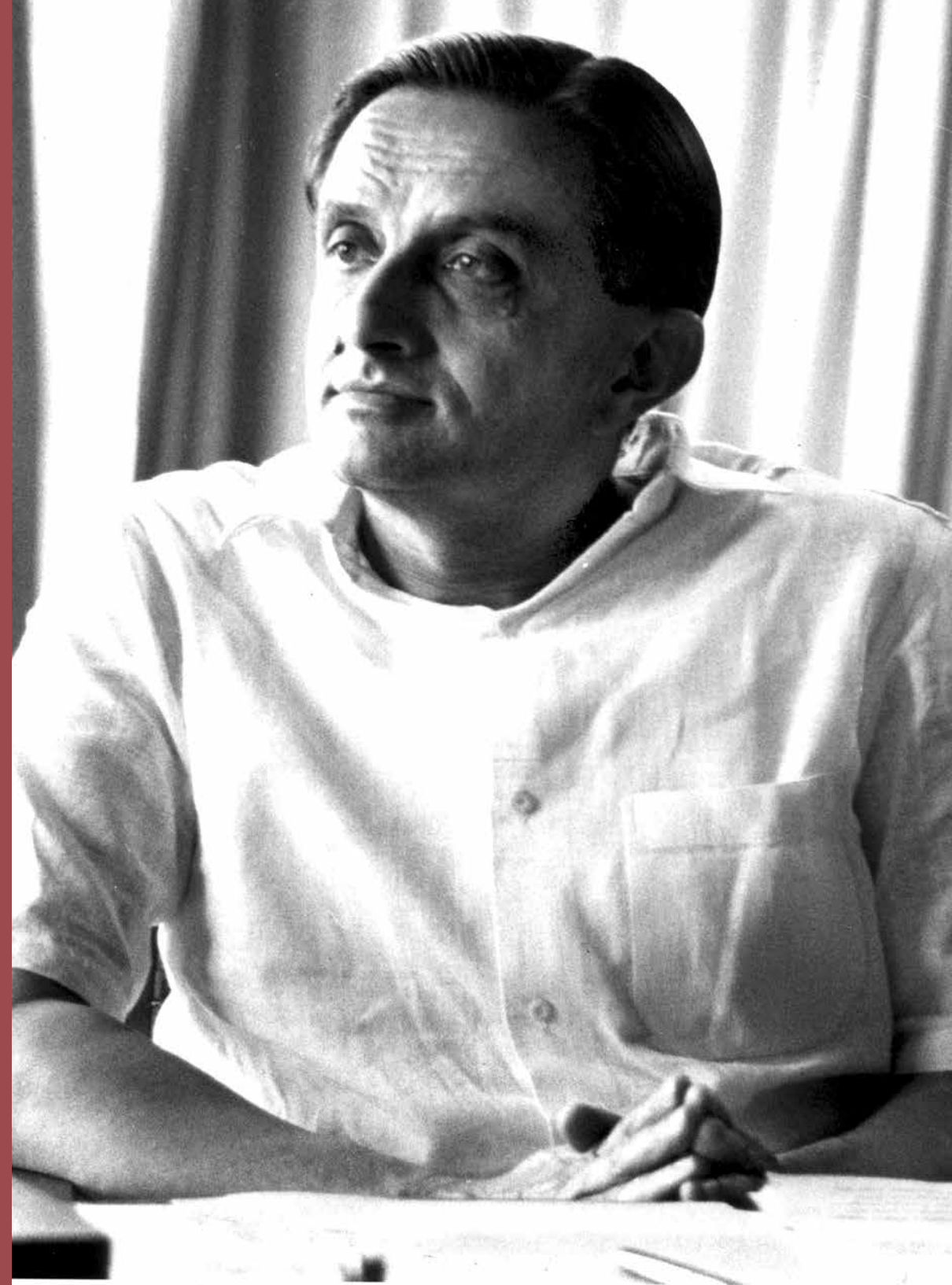


There are some who question the relevance of space activities in a developing nation. To us, there is no ambiguity of purpose. We do not have the fantasy of competing with the economically advanced nations in the exploration of the moon or the planets or manned space-flight. But we are convinced that if we are to play a meaningful role nationally, and in the community of nations, we must be second to none in the application of advanced technologies to the real problems of man and society.

It is good to recognise how to relate oneself to other specialities without going through a sense of failure. This is an outlook difficult to attain, but is, nevertheless, essential before one can really reach one's goal.

It is really the behaviour of people, of institutions by which the real working culture of the company develops.

In nature, left to itself, control is maintained through an ecological balance. Order is not imposed from above, but arises through the interaction of each unit with its environment in a dynamic equilibrium.





The Second World War had just begun and Vikram returned to India. He decided to visit the Indian Institute of Science in Bangalore and meet Dr. C.V. Raman, the only Indian Nobel Laureate, to request him for work at this institute as it was the only place in India where the research being conducted was similar to his own. Dr. Raman wrote to the University of Cambridge to ask if they would allow him to take Vikram on as a student. They agreed and Vikram began to study under Dr. Raman. Around the same time that Vikram initiated his



Dr. Vikram Sarabhai with his senior Dr. Homi J Bhabha. Dr. Bhabha was ten years his senior but the camaraderie between the two was excellent.

research in Bangalore, Dr. Homi J Bhabha, another accomplished scientist returned to India. He was Vikram's senior by ten years.

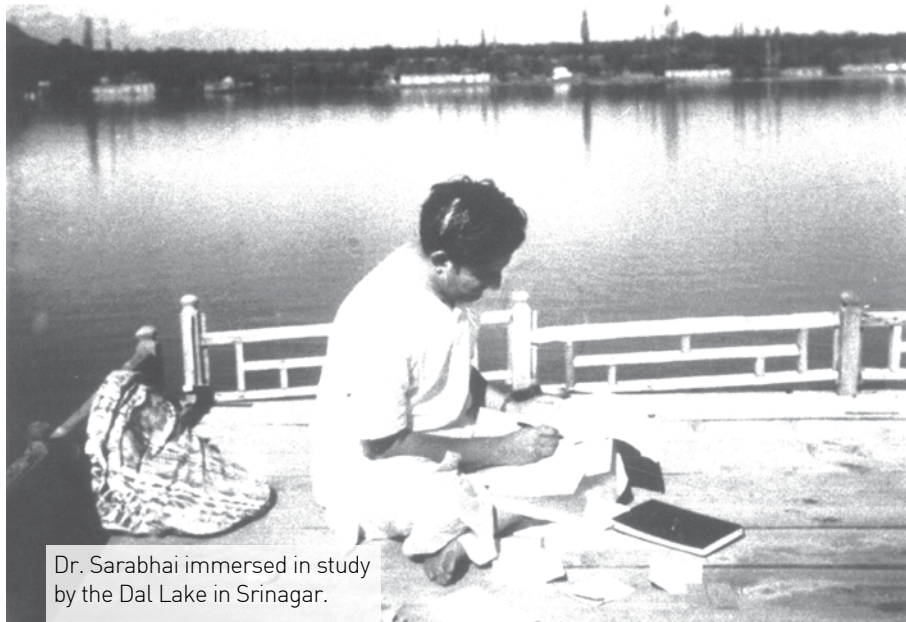
The Tatas' had set up the Indian Institute of Science (IIS) in Bangalore, and Bhabha was a Reader. His interest lay in studying nuclear energy and at that time, Vikram was the only one working on research on cosmic rays in India. Vikram worked on his research in Bangalore till 1945. Between 1940-1945, during the time that he worked on cosmic rays, he had no access to scientific facilities as none were available. He would go to Kashmir and conduct research and to Pune as Pune was home to the Indian Meteorological Department where Dr. K R Ramanathan was then the Director. Vikram was very impressed with his approach and knowledge. He requested Dr. Ramanathan to join him in setting up a new laboratory in Ahmedabad. Dr. Ramanathan saw the promise of doing something new in Vikram's eyes, and shared his vision. He agreed to join Vikram in 1948 after his retirement. And he followed through on his promise and worked closely with Vikram in the years to come.

Bangalore, then too, was a cultural hub as it is now. The IIS had set up a club where cultural, social, and recreational events were



Dr. Sarabhai had the conviction when he started research on cosmic rays that it would lead to bigger things.

hosted to entertain members. And Vikram was always involved in the arts. He decided to set up a theatre for the workers at IIS and went to visit the studio of an artiste in Bangalore. There he met Bharatnatyam dancer and his wife-to-be, Mrinalini Swaminadhan. They exchanged notes, became friends and over the years their relationship grew. He was very interested in her



Dr. Sarabhai immersed in study by the Dal Lake in Srinagar.

art form and she was very taken in by his perspective on life and science. Their common interests for the arts, music and poetry also brought the two of them closer. Also, Mrinalini had spent a lot of time at Santiniketan, under Rabindranath Tagore, whom Vikram knew well as his parents were close friends of his. Both Vikram's and Mrinalini's mothers were social workers and knew each other.

As Mrinalini writes in her autobiography, "Science is so similar to Art, both disciplines are a search for unknown galaxies in the universe, both spiritually aware of the indivisible wholeness of the cosmos. A scientist looks for new horizons in knowledge, a dancer for inner horizons of understanding. A scientist speaks about the spaces beyond our planet and its mysteries. A dancer

searches spaces within for meaning. Vikram as a scientist, and I as a dancer, shared a togetherness that was hard to define."

Vikram was in love with Mrinalini but she did not want to get married. Yet, with the country tense after the Quit India movement, Vikram's parents were keen that he return to Ahmedabad and he did not want to go without her. As one thing led to another, Mrinalini and Vikram decided to get married at her home in Chennai. The backdrop was the freedom movement and the situation in the country was tense. Vikram's entire family was scheduled to travel to Chennai for the wedding, an entire train coach was booked - but due to the freedom movement only Mrinalini's parents, Vikram and his loyal and devoted driver, Lala Inkayya were present on the special occasion.

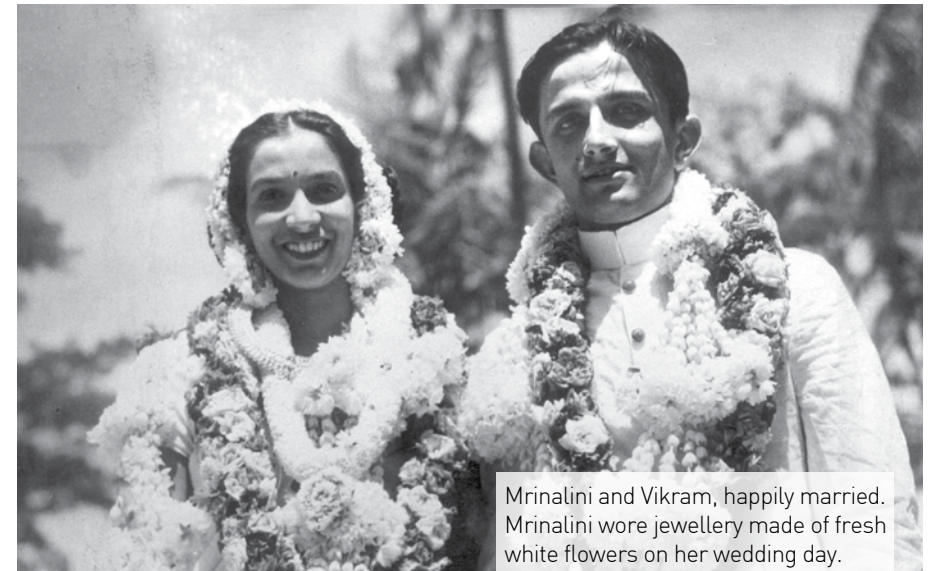
This was also the time of demonstrations and arrests. Vikram's entire family was very involved in the fight for India's independence. They participated in the demonstrations and were also arrested on several occasions. In September 1942, just after they got married, Vikram and Mrinalini were at a demonstration in Ahmedabad when Mrinalini was suddenly hit by a tear gas shell on her forehead. Her situation was critical and she was bedridden. It was at this time that Vikram and his father looked after her, with care and diligence, till she recovered fully.

14.6.1943:

LETTER FROM SHRI AMBALALBHAI TO
DAUGHTER MRIDULA

"Viki and Mrinal are very affectionate. This is the first time we stay with them after their marriage. They get on very well, are very fond of each other, deeply engrossed in their respective studies at the same time in each other and both cooperate in running the house efficiently and well. Vikram has a great quality rare amongst men, of not looking upon any other including wife as one who is bound to be subordinate for inclination in life to suit his. In other words, he has no possessive instinct in respect of human....."

Dr. Sarabhai's father wrote to his children regularly. This is an excerpt of a letter he wrote in 1943 to his daughter Mridula about a visit he made to Vikram and Mrinalini's home.



Mrinalini and Vikram, happily married. Mrinalini wore jewellery made of fresh white flowers on her wedding day.

As the Second World War ended, Vikram and Mrinalini left for Cambridge. Vikram immersed himself in his research. He used to spend twenty out of twenty-four hours working on his research at the Cavendish Laboratory. In 1947, he submitted his doctorate thesis. At that time, there was no professor at Cambridge to examine the thesis due to its nature of expertise, so the University of Cambridge requested Sir P.M.S. Blackett in Manchester to conduct the viva. On 24 May, 1947, Vikram was awarded the degree. Sir P.M.S. Blackett and Dr. Sarabhai kept in touch, worked together and developed a great friendship.

Many years later, when Sir P. M.S. Blackett came to India, he recalled a beautiful memory of Mrinalini at Manchester wearing a gorgeous red sari when she went with Vikram for his viva to Manchester.

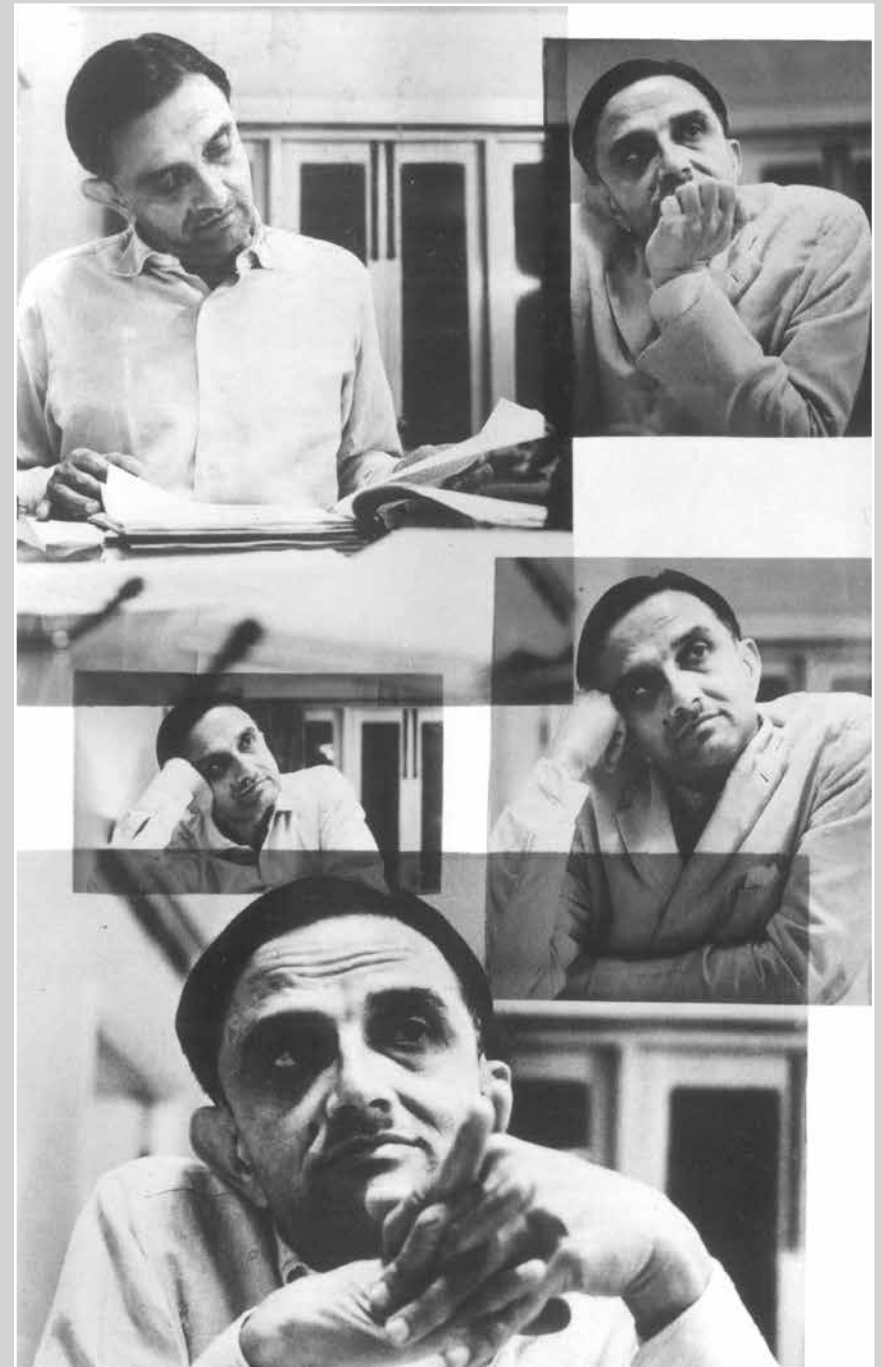


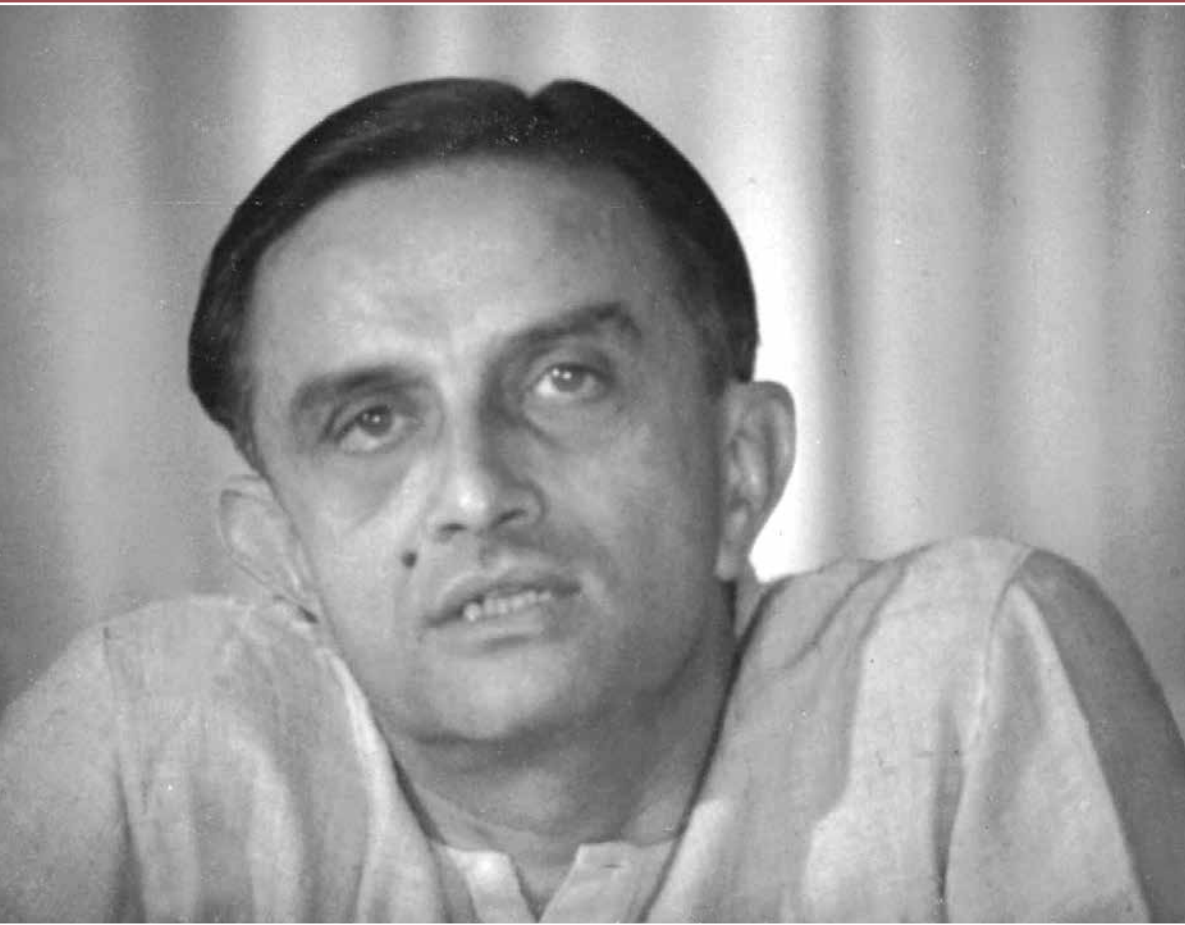
*The important ingredient
for satisfactorily meeting
the challenge of the
changing environment is
not experience, but an
ability to learn.*

*Technology is not an objective
to be aimed at, but a tool to
be used for the benefit of the
common man.*

*Vertical controls usually
specify what cannot be done.*

Is Gandhiji dead or alive? No matter what the cynics in our midst may say, Gandhiji does not die because what he represents rests on a basic reality of our physical and social environment.



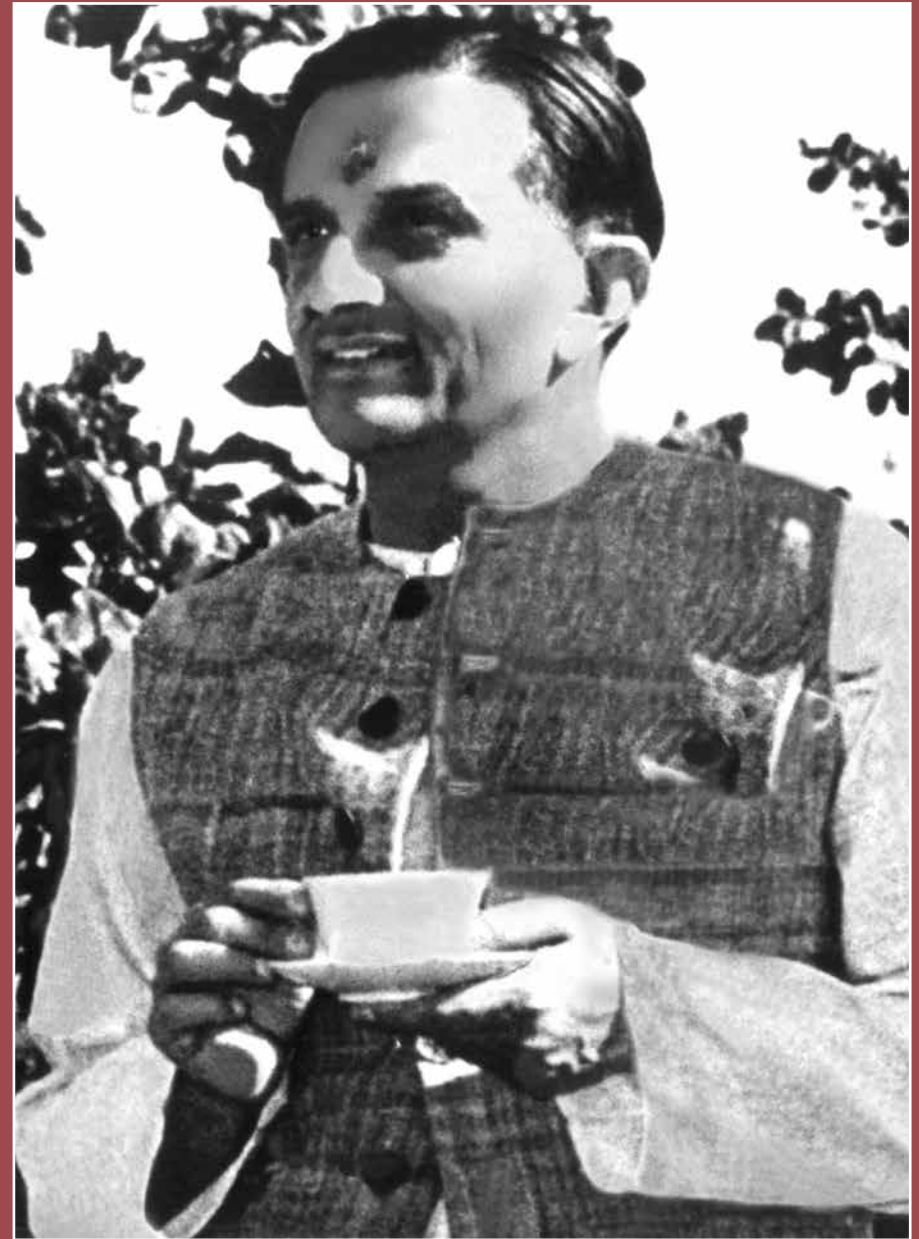


A question that often arises is whether we are today in the midst of a qualitative or merely a quantitative change. I would like to suggest that with the release of the energy of the atom, the growth of electronics and man's ability to operate in outer space, 'the world' has been created. This demands a change in our values.

*'Experience' is less relevant than
'knowledge' and the 'ability to learn
and innovate.'*

*Gandhiji, like those who have
imbibed the spirit of science, had
an unflinching adherence to insights
born out of his experience so that
even in the social and political
context he insisted, as a physicist
would do, that if a procedure does
not work in theory, it cannot be
made to work in practice.*

Most tasks encountered in the contemporary world call for organisations wherein creative thinking and innovation are essential ingredients of survival as well as growth.





Training, Institutes and Industry Development

The Sarabhais returned from England just a few months before India's independence. Dr. Sarabhai was twenty-eight, and eager to start a science laboratory in Ahmedabad. His parents started a trust called the Karmakshetra Education Foundation. Under the Trust, he set up the Physical Research Laboratory (PRL) in 1947. Over time, this laboratory became the cradle for India's Space Programme.

Ahmedabad was always known for its business and trading community and more so, it was well known as the textile city of India. Ahmedabad was also known as the Manchester of India. The doyen of industrialists of Ahmedabad – Kasturbhai Lalbhai wanted to modernise and develop the textile industry that had long been ignored due to the negative policies of the British. He wanted someone with an astute vision and good leadership to develop industrial methods for it to grow in the future. He was also the Chairperson of the Millowners' Association. He requested Dr. Sarabhai to take up the challenge.

Even though Dr. Sarabhai knew nothing about textiles, he accepted Lalbhai's proposal and Ahmedabad Textile Industries' Research Association (ATIRA) was born. He became its honorary director.

Dr. Sarabhai had to hire faculty for ATIRA. Instead of hiring people with experience, he placed an advertisement saying 'Candidates with previous experience need not apply'. Most unusual for its style, but Dr. Sarabhai hired four scientists with knowledge of scientific methodology to work on modernising the industry, with no prior knowledge of textiles.

Each person was asked to select one mill and conduct an in-depth study - end to end, for six months and present an analysis. They had to study from where and how the raw material entered the mill, how it was processed until the final product left the mill. This is an interesting case-study for a group as the four people who were sent to the mills came back to Dr. Sarabhai to say that the workers did not cooperate with them.

The reason Dr. Sarabhai comprehended was simple. The people freshly hired went as experts to review the systems instead of going as learners keen to understand the systems and how they could be bettered. Even the millowners misunderstood the gesture and did not take well to an outsider. This was also the time that the younger generation

of the families of the millowners was returning to India after having been educated abroad. Dr. Sarabhai reached out to them, convinced them and the changes he envisioned for the textile industry began to play out.

PRL and ATIRA were both initiated in 1947, the year India achieved independence. It was also in November of the same year that Dr. Sarabhai's son, Kartikeya was born. 1947 saw Dr. Sarabhai become a father, a researcher on subjects hitherto unknown to him, an institute builder and an industrialist.

ATIRA needed finances to fulfil its targets but Dr. Sarabhai did not want a government grant for the institute. He wanted to start a co-operative body with contributions from millowners. Here too, he did not use a conventional system.

He asked all the millowners to send in the number of spindles they had in their mill and then he would decide the amount depending on the number of spindles. There is a very interesting story that when his father (who owned Calico mills) was approached, he refused to pay. Ambalal Sarabhai had always given a lot of attention to labour welfare. The staff residences, schools, hospitals and amenities were provided by him for his staff.

He was keen that ATIRA have a human relations department too as he saw labour welfare as an important tool for the industry to grow. At his father's behest, Dr. Sarabhai set the same up and Kamla Chowdhry who had a doctorate in psychology became the head of the department. Kamla and Vikram worked together from then on, on several projects, and shared an excellent rapport for all times to come.

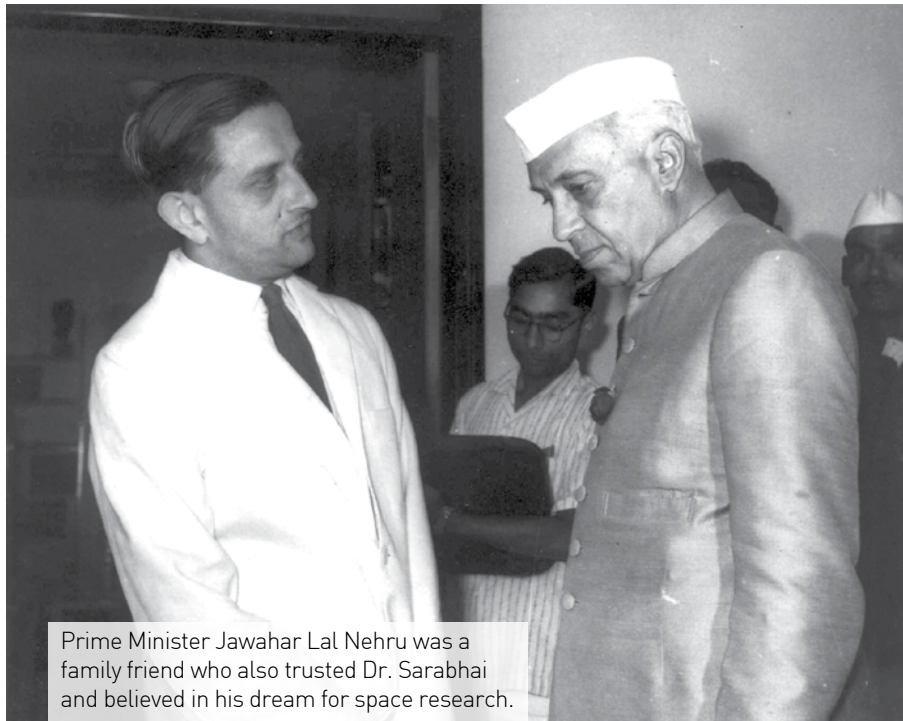
As mentioned before, Dr. Sarabhai's father's approach to work had a great impact on him. There is an incident that reflects the maturity and trust among the family and it's deep belief in their ideals. Before Independence, in 1918, there was an episode when the Ahmedabad textile labourers went on strike as they wanted their wages increased. Ambalal Sarabhai was the President of the Ahmedabad Millowners' Association and his sister Ansuyaben Sarabhai was the Founder and the President of the Ahmedabad Textile Labour Association.

During the strike, even though they lived together in one house, ate together on one table, they did not let their differences come between them. Each day his sister would leave the house

in the same car as her brother and at the gate of the Calico Mills, she would get off and join the labour in their demonstrations and each evening, when her brother drove out of the mill, she would return home with him in the same car. Even the labour force never doubted her devotion to their cause as they had full faith in her. The strike was ultimately resolved amicably after Mahatma Gandhiji's intervention. Historically, this was the first time Gandhiji used fasting as a weapon for change.

From the neighbourhood, the Maharaja of Baroda observed the progress and development of industry in Ahmedabad. He requested Ambalal Sarabhai for assistance in building industry in Baroda. Dr. Sarabhai's father had a small pharmaceuticals and chemicals unit there. By 1966, under Dr. Sarabhai's supervision, they had more than a dozen successful units – with a reputation of manufacturing the best pharmaceuticals in the country.

Meanwhile, ATIRA grew from strength to strength. For Pandit Jawaharlal Nehru, it was the first modern institute in post-independent India. Dr. Sarabhai then planned ATIRA's first management conference. Mr. S K Patil, the then Minister for Commerce was invited and he accepted the invitation. Several prominent industrialists participated and ideas were exchanged



Prime Minister Jawahar Lal Nehru was a family friend who also trusted Dr. Sarabhai and believed in his dream for space research.

on how to take India forward. The government had also decided to set up two management institutes at the time – one in Kolkata and one in Mumbai. The University of Mumbai was keen to have the institute under the university umbrella and not as an independent, autonomous body. Dr. Sarabhai saw that as an opportunity. He convinced the Indian government and the Ford Foundation to shift the Indian Institute of Management (IIM) as an independent body to Ahmedabad. Ultimately, they agreed and Ahmedabad was selected as the location for IIM.

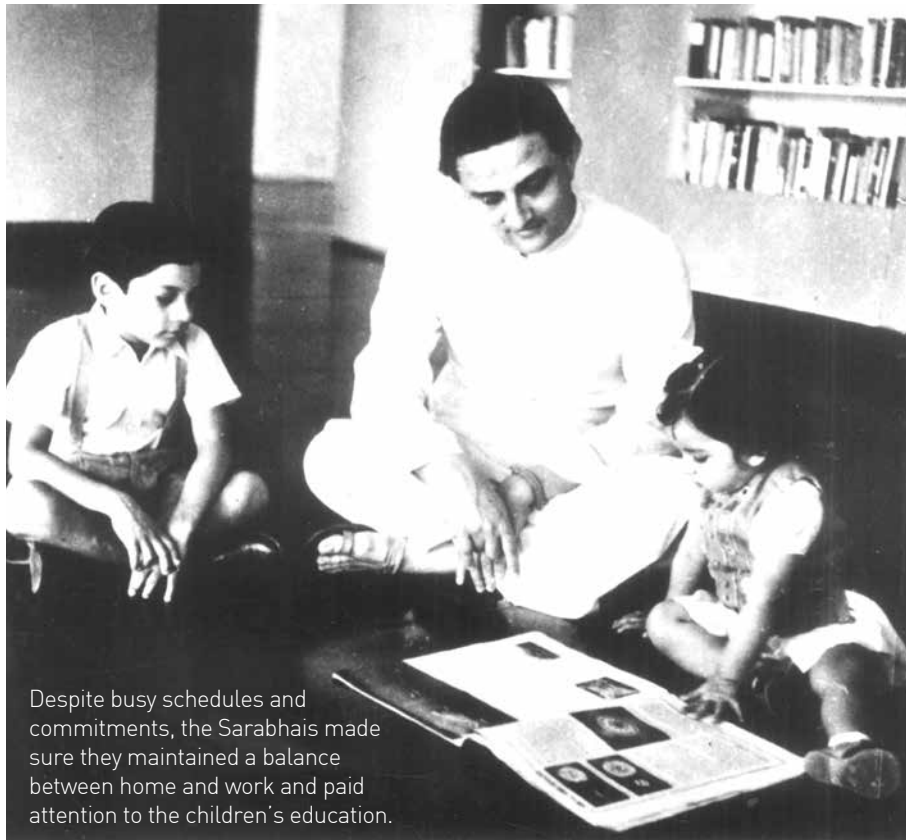
From the forums in ATIRA, the Ahmedabad Management Association was formed, with Dr. Sarabhai as the Founder



Convocation ceremony at IIM, Ahmedabad.

President. Even today, the Association is well known and widely respected. The foundations of its systems and thinking were laid by Dr. Sarabhai. In 1948, he wanted to take PRL to another level by inviting young scientists to do their post graduation and doctorates there. In 1953, Mrinalini and he were blessed with a daughter, Mallika.

By this time, they were both busy with their careers, which required a lot of travelling. But Mrinalini and Dr. Sarabhai always gave their home and family importance, and were able to strike a balance. Dr. Sarabhai stood as a rock behind his wife and helped her build her career as a dancer of international acclaim. He supported her in every way as she held enthralling performances across the world. He would travel with her, babysit when required, and even help with lights and camera behind the



Despite busy schedules and commitments, the Sarabhais made sure they maintained a balance between home and work and paid attention to the children's education.

sets when needed. Mallika grew up in an environment where she could not even imagine any gender disparity or inequality among men and women in society.

As Mallika Sarabhai writes, "We grew up in total ignorance of the fact that society had a bias against women. I do not think that I realised that we were supposed to be different from (let alone inferior to) males in anything. Of course one knew of the physical difference which, one thought, would only be relevant when the issue of child-bearing arose. Other than this, our



A connoisseur of the arts, he is seen here presenting a memo to renowned maestro, Ravi Shankar.

parents' hopes and expectations of both Kartikeya and me were the same."

Dr. Sarabhai always wanted to set up a world class theatre in India. Also, by now, his wife was inviting dancers and musicians home for performances. While her father-in-law had given her a space in the garden, and then later when they had their own home, the Sarabhais had a beautiful amphitheatre by the River Sabarmati; there was a need for a performing arts institute for Mrinalini to develop her legacy. In 1949, the Darpana Academy of Performing Arts was set up in Ahmedabad.

Darpana was also very close to Dr. Sarabhai's heart. Gujarat had a culture of folk dance and music, but not the classical dances. Dr. Sarabhai was also of the view that South Indian culture was true Indian culture, in the sense that dances like Bharatnatyam were not just mere entertainment. Darpana was a platform to develop the arts, bring the North and South together, and present Indian culture to the world.

The training programmes Dr. Sarabhai set up, the systems he put into place, the organisational structures he created, the

In deep discussion with his mentor Dr. C.V. Raman.



manner in which he linked one idea to another with a larger, wider, and more international and long term objective were the hallmarks of Dr. Vikram Sarabhai's vision. They became the foundation of industry and commerce and continue to be management lessons for business and entrepreneurship.

Space and Technology

In October 1957, the world was abuzz with news of the Soviet Union having launched Sputnik, the world's first artificial satellite launched into space. Sputnik is the Russian word for satellite and its launch marked the beginning of the "Space Age". All of a sudden, the developed world was talking about the space programme and of going to the moon.

Dr. Sarabhai with a specialisation on cosmic rays was no outsider to the discussions. His vision for India was one of self-reliance in developing India's space programme. He had no grand elitist vision to develop the programme. Instead, he wanted to use space technology for development – for the benefit of India's farmers and its villages. He saw space technology as a unifier, a balancer that could hasten progress and development by several years. A satellite he said that could transmit information through television sets to villages across India on rain forecast and other significant data could harness the productivity of the harvest, connect and inform people, who would otherwise be in remote sections of rural India, and many a time, not educated. To have

this vision then in 1957 which we today see as a reality is truly remarkable!

After Sputnik, many countries started to develop their space programmes. In 1958-59, the International Geophysical Year commenced and several countries participated in it. Dr. Sarabhai and his students also submitted their proposals. By then, PRL had become a focus of significant international research on space, science and technology. Research was being conducted at PRL under two departments – one was Atmospheric Physics (under the guidance of Dr. K R Ramanathan), and the other on Cosmic Rays (headed by Dr. Vikram Sarabhai).

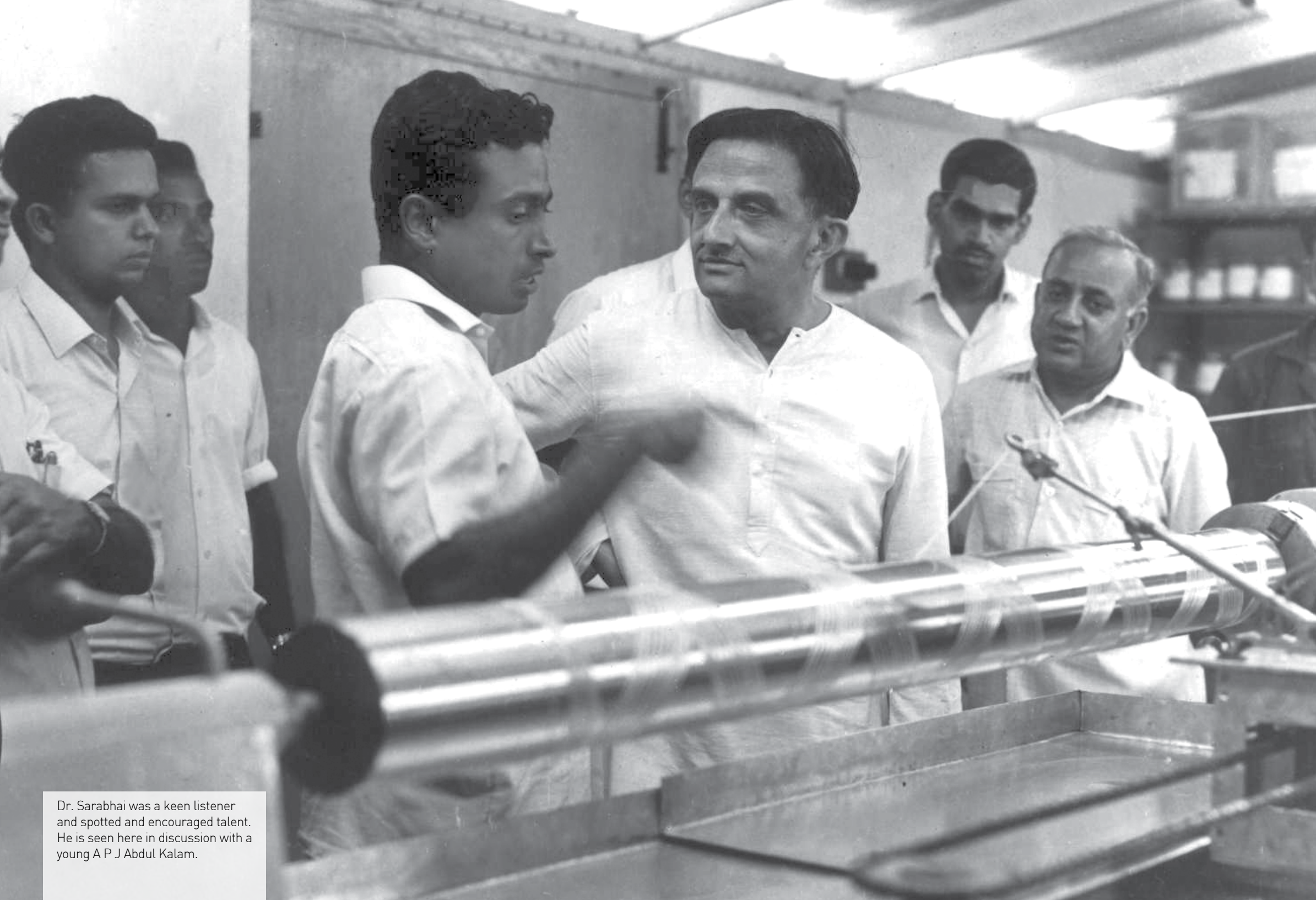
The professional relationship, trust, respect and deep friendship between Dr. Ramanathan and Dr. Vikram Sarabhai deserves mention. Dr. Ramanathan kept his promise from several years ago to join Dr. Sarabhai on his retirement from Pune. Dr. Sarabhai had so much faith in him that when he set up PRL, Dr. Ramanathan was its Director and Dr. Sarabhai remained a Professor and Head of the cosmic rays department. That was the deep faith he had in Dr. Ramanathan. He knew that Dr. Ramanathan would steer his institute's growth in the right direction.

Launch of India's Space Programme

In 1961, Dr. Sarabhai sent a proposal to Prime Minister Nehru to start India's Space Programme. Nehru sent the proposal to Dr. Bhabha who was the Chairman of the Atomic Energy Commission of India in Mumbai. Dr. Bhabha sent a committee to review the research at PRL. They came out with a positive report. On their recommendation, in 1962, Nehru set up The Indian National Committee for Space Research (INCOSPAR) under the Department of Atomic Energy and Dr. Sarabhai was made the Chairman of the Committee.

Dr. Sarabhai worked optimistically on the ground, formulating a theoretical, technological framework for the space programme that impressed the world. In a spectacular TV interview, he talked about the idea of breaking away from the concept of having a few people surrounding a computer because they needed to share the knowledge in it, but asking the world to imagine if a satellite could convey the information to anyone anywhere; then people would not need to be restricted to just one computer. Today, we see that come true through telecommunications and the internet. We see satellites connect us through our cellular networks.

He spoke of spreading equality and education through telecommunications – by bridging the gap between the urban and the rural through information. He was not afraid of failure



Dr. Sarabhai was a keen listener and spotted and encouraged talent. He is seen here in discussion with a young A P J Abdul Kalam.

while trying out various experiments. It was this vision, and his management skills and excellent people and relationship management that helped him realise his dream for India. That is the reason Dr. Vikram Sarabhai is recognised as the Father of the Indian Space Programme.

In 1962, Dr. Bhabha made PRL the headquarters of INCOSPAR, with all administrative powers vested with Dr. Vikram Sarabhai. Dr. Bhabha wanted to keep his focus on the nuclear research and he gave Dr. Sarabhai full freedom to develop his ideas further at PRL through INCOSPAR. Ten to twelve scientists joined INCOSPAR, but not Dr. Bhabha.

The success of the space programme is also merited to Dr. Bhabha, who despite being Dr. Sarabhai's senior, encouraged him, allowed him to grow and succeed as they had a shared vision for the development of the country through scientific knowledge. 1962 was also the time when India was facing a war with China. After the war, the government set up the Electronics Committee – Dr. Bhabha was made the Chairman and Dr. Sarabhai was a member. This was the same year that Dr. Sarabhai was awarded the Shanti Swaroop Bhatnagar Award for Physics. He used the prize money to start a trust which later became the Nehru Foundation for Development.

In 1963, after the establishment of INCOSPAR, Vikram focused all his energies on launching the first rocket at Thumba. Thumba was a small fishing village in Kerala which fell on the



Though his research was on nuclear technology, Dr. Bhabha gave the green signal for space research under Dr. Sarabhai at INCOSPAR.

magnetic equator, essential for a satellite launch. As Dr. Vikram Sarabhai had researched in his doctorate, in the south of India, in Kerala, a magnetic equator was found which was crucial for space research and study.

What is magnetic equator?

The magnetic equator is defined as the line around the earth where the magnetic field is horizontal, or parallel to the earth's surface. It does not circle the earth as a smooth line like the geographic equator, but instead it meanders north and south.

Under Sarabhai's supervision, India's first rocket launching station was set up in Thumba in 1963 alongwith the support of nuclear physicist Dr. Homi J. Bhabha. The country's first rocket called Nike-Apache, made at NASA was launched from here on 21 November, 1963 and India entered the Space Age.

The Thumba Centre came to be known as Thumba Equatorial Rocket Launch Station (TERLS) and later merged with Space Science and Technology Centre (SSTC) to become the Vikram Sarabhai Space Centre (VSSC). Dr. Sarabhai, then chairman of the national committee on space research carefully selected a few young scientists for the project which included Dr. Abdul Kalam and Dr. R. Aravamudan.



The Thumba Centre in Thiruvananthapuram (formerly known as Trivandrum), which was Dr. Sarabhai's dream and the birthplace of India's Space journey.

Dr. Sarabhai selected the 16th century St. Mary Magdalene Church as the launch facility for the rocket. The church was located at the earth's magnetic equator. Scientists first test and study the stream of electrons that exist in the magnetic equator called the 'Electrojet'. The first step to prepare to launch a rocket is to conduct an atmospheric research.

Dr. Sarabhai felt St. Magdalene Church was the perfect location to launch the rocket. He reached out to the Bishop and the congregation with his proposal about the space mission. The Bishop readily agreed to support the programme. Soon the villagers were relocated and work commenced for the team.

Dr. Kalam writes: "The St. Mary Magdalene Church housed the first office of the Thumba



The St. Mary Magdalene Church housed the first office of the Thumba Space Centre.

Space Centre. The prayer room was my first laboratory, the bishop's room was my design and drawing office."

The rocket and satellite were transported on a bicycle and a bullock cart. Dr. Sarabhai was thrilled at the success. "Gee whiz wonderful rocket shot" read his telegram to his family! Dr. Kalam has also written about how Dr. Sarabhai had personally congratulated the team and shared his dream of an Indian satellite launch vehicle.

On 21 November, 1963, INCOSPAR launched the first rocket and India entered the Space Age. The news did not make a worldwide impact as the next day, on 22 November, 1963, US President Kennedy was assassinated and newspapers across the world were focused on the tragedy and the shock.



The satellite was transported on a bullock cart.



The team watches their dream come alive at Thumba as the first rocket makes a successful launch.

Ind. Area
Lecture:
21/12.
FILOFAX REGD. TRADE MARK

Madras.

1. Solar activity.
 - a. & Magnetic Field
 - b. ~~A~~ Mytilin ^{Location.}
 - c. ~~C~~ Zonal structure & asymmetry.
- Radio bursts.
2. Solar Wind.
 - a. Comet tail.
 - b. Deflection of the earth's magnetic field.
- Actual measurements:
 $v = 300 - 500 \text{ km/sec.}$
 few protons/e.c.
 $\text{Temp.} \approx 10^6 \text{ degrees.}$
3. Parker's Solar Wind.
 Expansion of the Corona.
 Isotropic.
1. Archimedes Spiral
 Mag. Field.

Notes from Dr. Sarabhai's journal.



Dr. Sarabhai was very clear that the technology they were developing was only for peaceful use, in line with Mahatma Gandhi's ideology and Nehru's view on non-alignment.



The success at Thumba catapulted Dr. Sarabhai into the limelight. He became even more busy organising space research. His usual day was eighteen hours of work, sleeping a mere two or three hours and then getting back to work. On a regular day, he would return home for dinner, and then go back to PRL to work, then come back home and listen to Mozart, perhaps, and read his student's papers so that he could advise them. He would sleep late and wake early, at around 5 am. He sometimes enjoyed a game of Bridge, and a power nap for five minutes post lunch, but that too while he was sitting up and reading the newspaper!

His eating habits were very simple. He was a vegetarian. He enjoyed his salad, and his *khakra*, which is a thin Gujarati cracker. Even on all his travels abroad, he would sit with his guests, order their food, and when everyone sat down to eat, from his bag would come out a *khakra*, which he would enjoy immensely. He was a vegetarian, because 'it was just aesthetics'. He could not imagine killing an animal to consume it to fulfil his hunger. Just in the same manner, he was very vocal about not using space and nuclear technology to promote wars, but he was always very focused on promoting the development of the technology for peaceful growth, in line with Gandhi's ideology and with Nehru's views on non-alignment.

Offers and projects began to fill his schedule. Every year for six weeks he gave lectures at Massachusetts Institute of

Technology, in America. He was also invited to Athens to participate in an exchange of ideas between leading luminaries from across the world hosted by Constantinos A. Doxiadis, an architect who ran the Athens Centre for Ekistics. The objective of the organisation was to discuss the settlement for poor economic countries. Together with Dr. Bhabha, he was also a member of the Pugwash Continuing Committee. Pugwash was a small village in Canada. The programme was started by Lord Bertrand Russell, with a message of disarmament to the world. Dr. Sarabhai and his wife were introduced to Lord Russell by J. Krishnamurti. Dr. Sarabhai was very deeply connected to the cause. It inspired him to start the Indian Pugwash Committee.

An interesting fact about Dr. Sarabhai was that no matter how busy his schedule was and what his travel plans would be, when he was in Ahmedabad, whenever he got time, he would go to *The Retreat* and see his mother every day. His mother was also very fond of him, and just like all mothers, she worried for his health, and well being.

In 1965, Dr. Sarabhai became the Director of PRL after Dr. Ramanathan retired. IGY was an impetus – people across the world saw merit in the cosmic rays research initiatives made by Dr. Sarabhai. In December 1965, Dr. Sarabhai received a



Dr. Sarabhai was very close to his mother, who advised him regularly - her views on education and development helped shape his vision.



Dr. Sarabhai, with Dr. C.V. Raman, Dr. Homi J Bhabha and Dr. Bhatnagar (right to left).
Dr. Bhatnagar was Director, Council for Scientific and Industrial Research.

letter from Dr. Bhabha announcing his appointment as Member of the Atomic Energy Commission (AEC). But before the both of them could work together, most unfortunately and in mysterious circumstances, on 24 January, 1966, Dr. Bhabha died in an air crash. It was a very difficult time for India and for Dr. Sarabhai.

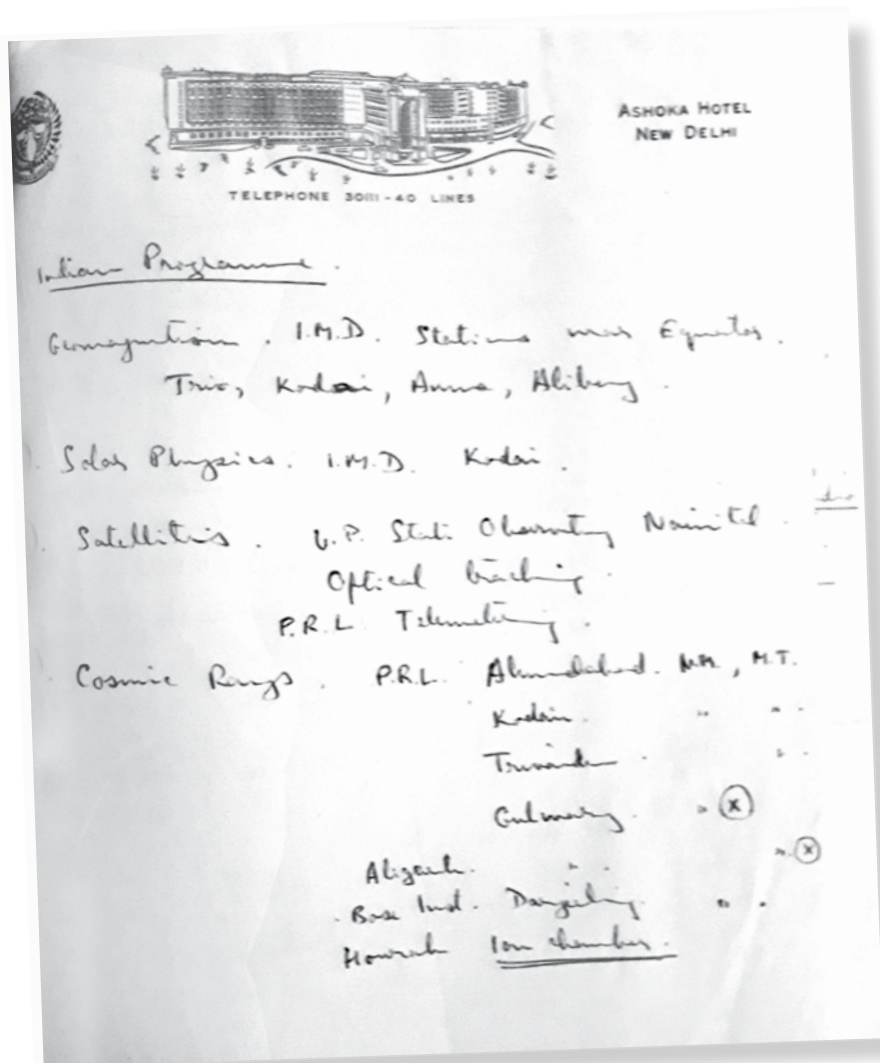
He was the only scientist member in the AEC and he was asked to take over as the Chairman of the Atomic Energy Commission. But he refused. He said that while there were other senior scientists working internationally it was not



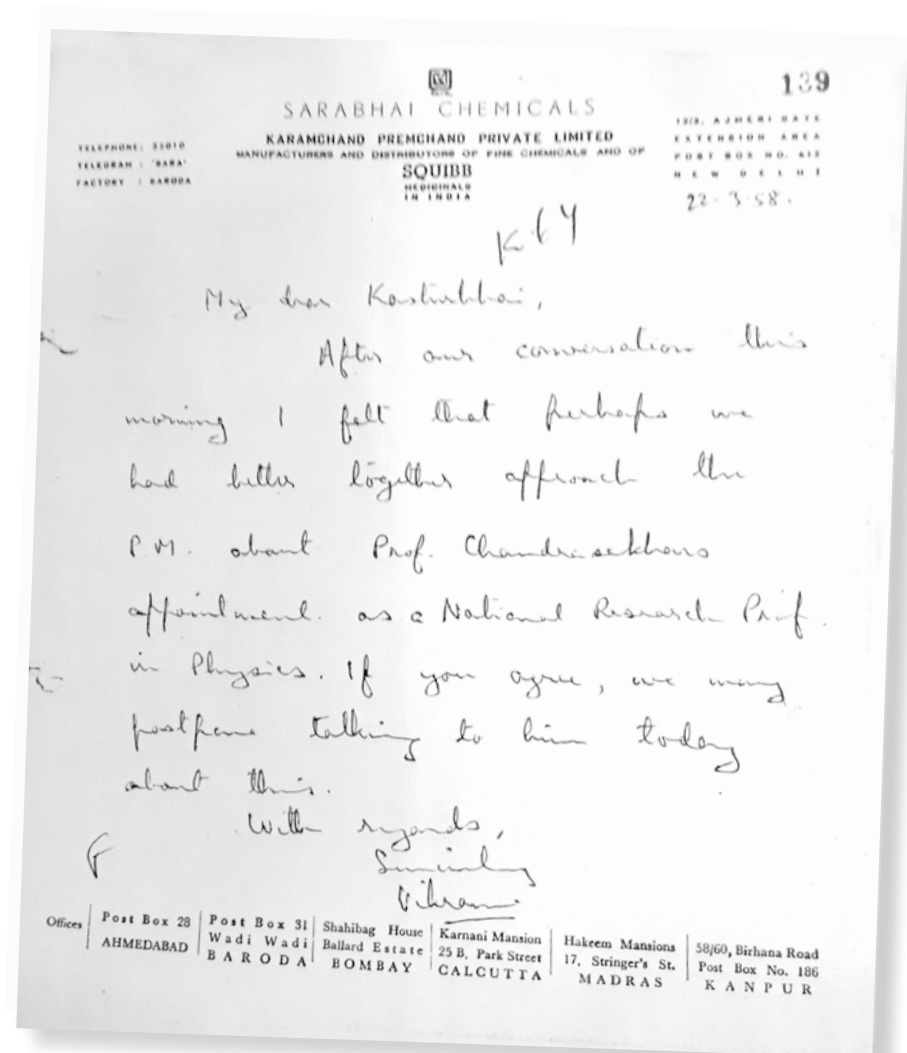
It was well known that Dr. Sarabhai did not need to take an appointment to see Prime Minister Indira Gandhi. He could meet and call her anytime.

appropriate for him to take over the Commission. He suggested India approach an Indian scientist working in Chicago – Dr. S Chandrashekar. He wrote to him and he suggested the same to the Prime Minister. But Dr. Chandrashekar was not interested in returning to India.

In 1966, to honour him, the government awarded Dr. Sarabhai the Padma Bhushan. In June 1966, Dr. Sarabhai became Chairman of the AEC. He was also Chairperson of all the Sarabhai Industries at that time. As Chairman, AEC, he was also Secretary, Department of Atomic Energy.



Notes from his files that he made at Ashoka Hotel, in New Delhi.

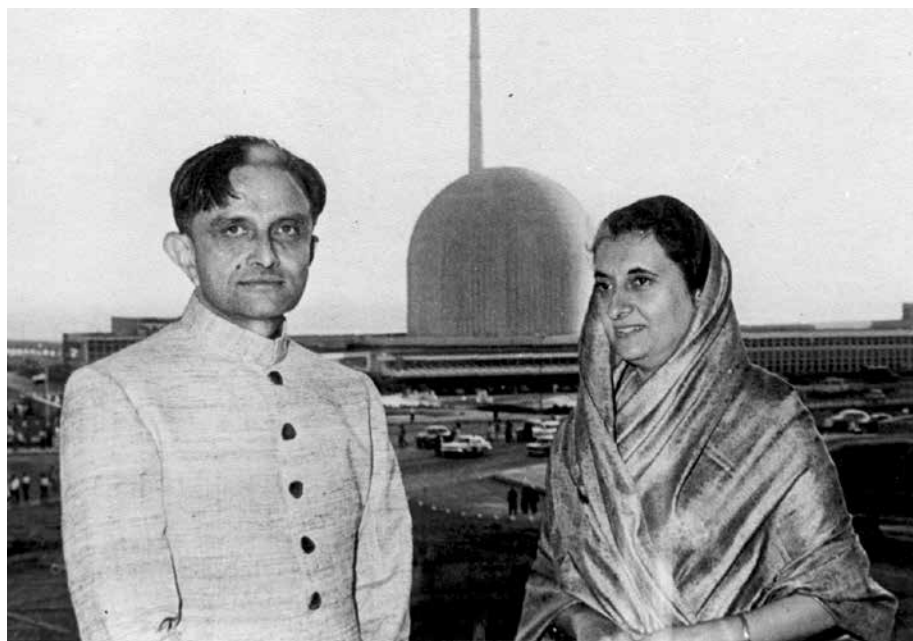


A letter Dr. Sarabhai wrote to Kasturbhai Lalbhai in 1958 requesting that they approach Mrs. Indira Gandhi to suggest Prof. Chandrashekhar's name as National Research Professor in Physics.

He was Chairman, Electronics Committee, and Member of the International Council of Scientific Union (ICSU). As Chairman of the AEC, he had to resign from all his industries.

Mrs. Gandhi had full faith and trust in Dr. Sarabhai and his vision for the space programme. He did not need an appointment to see her. Their meetings were frank, and she allowed him the space and the finances to develop his mission.

1967 saw Dr. Sarabhai's efforts achieve his first unique goal which was the establishment of the first Experimental Satellite Communication Earth Station (ESCES) in Ahmedabad. He then established the very important Electronics Corporation of India



Mrs. Indira Gandhi shared Dr. Sarabhai's dream for a technology empowered India to build its development programme.

(ECIL) in Hyderabad, and in the same year Dr. Sarabhai set up the Uranium Corporation of India Limited (UCIL) in Jaduguda, Bihar.

Apart from being revered as a scientist and a visionary, Sarabhai is also venerated as someone who set up institutions that paved the way for India's growth, in electronics and chemicals.

Sadly, on 13 July, 1967, his father Amabalal Sarabhai passed away.

1968 became a very important and successful year for Dr. Sarabhai, internationally. On 2 February, 1968, TERLS – the Thumba Equatorial Rocket Launching Station – was dedicated to the United Nations by the Prime Minister, Mrs. Indira Gandhi. In August 1968, the first UN Conference on the Exploration and Peaceful Uses of Outer Space met at Vienna and Dr. Sarabhai was appointed as its first Scientific Chairman.

At that conference, an exhibition on remote sensing was on display by the United States of America. Dr. Sarabhai saw it and sensed its potential for India. Almost immediately, he alerted Dr. P.R. Pisharoty, then at PRL. In 1968, the Indian Remote Sensing Programme was started in December, at the annual session of the Indian Academy of Science held at Hyderabad.

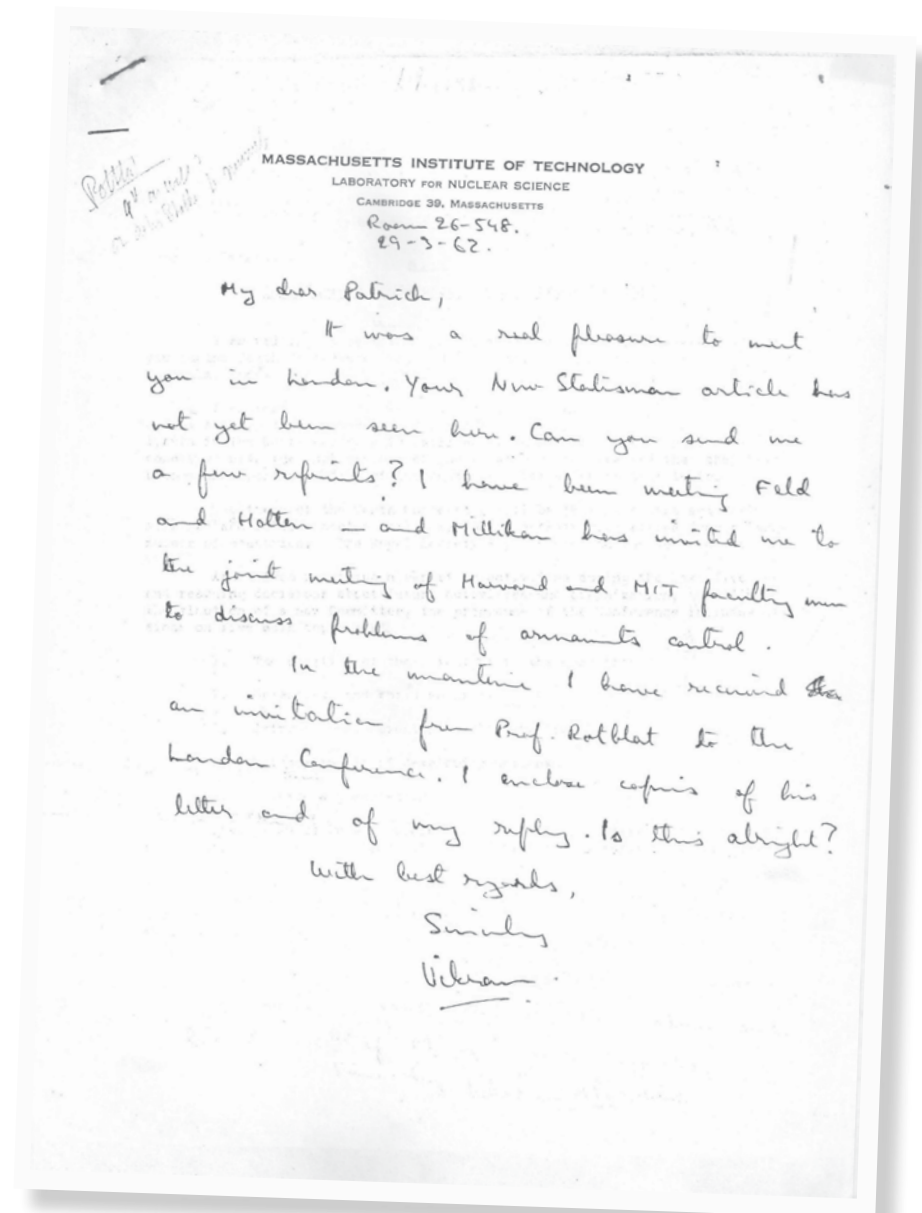
15 August, 1969, was a landmark moment in the history of Indian Science. The Indian Space Research Organisation or ISRO was constituted under the chairmanship of Dr. Vikram Sarabhai. In the same year, on 18 September, 1969,

Dated: 2.3.1963

EXCERPT FROM A LETTER BY DR. SARABHAI
FROM LONDON TO MRINALINI AND THE
CHILDREN :

*"I have walked in the West End,
looking at shops, sitting in coffee shops
The sitting room at the EIV is full of good
old ladies. Average age, I guess is 65. So
at 42, I feel very young and youthful."*

Like his father, Dr. Sarabhai always wrote letters to his family during his travels.



Prof P.M.S. Blackett, who conducted Dr. Sarabhai's Ph.D. viva went on to become close friends with him, and guided Dr. Sarabhai throughout. Here is a letter Dr. Sarabhai wrote to him in 1962.



With the formation of ISRO, Dr. Sarabhai's schedule became even busier. There were times that he flew to Delhi three times in one week!



At the foundation stone laying ceremony of the Thumba railway station with Union Minister for Railways, Sri Hanumanthiah.

Dr. Sarabhai signed the SITE agreement with NASA— which was the Satellite Instructional Television Experiment – a dream come true for him. NASA gave India the ATS satellite for one year and it was used for six states. The satellite proved useful for India in the development of agriculture and animal husbandry; it aided the government's family planning programme initiatives and helped promote health and hygiene. This was the first Indo-US space collaborative programme.

Close on the steps of seeing his vision take form, Dr. Sarabhai was not one to slow down. He saw clearly the path India needed to take in the future. He worked to produce in 1970 the Profile for the Decade for the Atomic Energy and Space Research Programme in India. He was also selected as the President of the 14th General Conference of the International Atomic Energy Agency in Vienna. And he was also made President of the Indian Geophysical Union.



Dr. Sarabhai with his son Kartikeya and daughter-in-law Rajshree

The Sriharikota Range near Chennai was being developed to launch satellite vehicles. In October, 1971, it started functioning with the launch of ROHINI RH-125. This was a momentous occasion for India. The Sriharikota range was later named the Satish Dhawan Space Centre after Dr. Satish Dhawan who took over the Indian Space Research Organisation after Dr. Sarabhai.

Dr. Sarabhai was also nominated as the Scientific Chairman of the 4th UN Conference on Peaceful Uses of Atomic Energy at Geneva in September 1971.

Dr. Sarabhai wanted to achieve more. His travels increased and so did his work load. Sometimes he would travel three times a

week from Thiruvananthapuram or Ahmedabad to Delhi. Those days there were no airplanes like today and the Dakota aircraft was loud, noisy and tiresome.

His next mission was to launch the railway station at Thumba. On 28 December, 1971, he attended the foundation stone laying ceremony of the Thumba railway station by Union Minister for Railways, Sri Hanumanthiah. It was a big achievement by any standard, and one that came with a lot of hard work. On the night of December 29th, he enjoyed a dinner with the scientists in Thiruvananthapuram and went to bed.

But Dr. Sarabhai did not wake up. He died in his sleep.



A postal stamp issued to commemorate Dr. Sarabhai.

The world lost one of its brightest scientists and visionaries at the young age of 52. A family lost a doting husband and father. Teams of aspiring students lost a mentor. Scientific institutions across the country lost their guiding star.

On December 31st, he was cremated in Ahmedabad. In 1972, Dr. Sarabhai was awarded the Padma Vibhushan posthumously. In 1974, a moon crater was named after Dr. Sarabhai. The International Astronomical Union in Sydney in Australia announced that a crater BESSEL (longitude 21, latitude 27.7) in the Sea of Serenity would be known as the Sarabhai Crater.

During his short life, Dr. Sarabhai achieved what would have otherwise taken decades. He laid the path for India to achieve the success it has today in its space programmes and shone the light ahead for many scientists. His charming personality, humour, and wisdom are remembered by all. His power to listen and to take people with different



Dr. Sarabhai was awarded the Padma Vibhushan posthumously in 1972.

viewpoints along with him, and to get things done made him stand out. He was trusted. He was revered. He was loved, by his colleagues, by his staff and by his students.



Mrinalini Sarabhai (centre), and Mallika Sarabhai (extreme left) with members of the Indian Institute of Management, Ahmedabad at the Vikram Sarabhai Library. In the backdrop is the sculpture of Dr. Sarabhai, unveiled by P.N. Haksar (second from left).



A TRIBUTE

by Ravi Mathai

Former Director, IIM, Ahmedabad

There are many such as I, who agreed to work in Ahmedabad because we believed in the honesty and worth of Vikram's ideas.

There are three attributes which set men apart from animals, and it is the apportionment and degree of these attributes that, in a man, separate the lesser from the great. They are the mind, the heart and the soul. If in these attributes lie the measures of greatness, then Vikram was great.

His mind was great. He could see far and in all that he did he had a vision for the future. He spoke in Delhi a few months ago to a large gathering of Managers. He spoke of the vast change

that could be brought about in the daily lives of our people by the peaceful use of atomic energy and space technology. He was concerned with raising standards of living and bringing people closer together through understanding. He had a broad mind. He was a physical scientist but the physical sciences could not contain him. His vision demanded the total use of knowledge that blended disciplines of many fields to accomplish changes which no single discipline could encompass. The institutions he founded and nurtured reflected this. His thesis at the Convocation of the Indian Institute of Management, which he addressed as the founder of the institute, was that the whole was greater than the sum of the parts. Though all of us were involved with him, his was the vision of the whole, and the whole is greater than the sum of the parts. As he was concerned with the future, he was concerned with the problems of the present. He was concerned with translating today's knowledge into goods and services which would enter our lives and so, from the Atomic Energy Commission he spun off enterprises to accomplish this. He was concerned with how organisations will and can change with the environment. Vikram's was a great mind. We cannot measure the length, breadth, nor the depth of his vision.

He had a great heart. He could talk with Governments, he could build institutions, but he could concern himself with the problems of individuals. His heart was big because he gave and asked nothing for himself in return. Those who met him were

better for meeting him because he was concerned about them. He had the patience and the rare gift of listening to understand. A great mind can be cold but his was warm.

He had a beautiful soul because he saw the good in others. The trust he gave was trust returned and we felt cleansed by having worked with him.

In Trivandrum he lay down his heavy burden. He lay down to sleep, but died. And in death he lives in us; the greatness of the man, great of mind, great of heart and great of soul. It could be said of Vikram, in the words of the Old Testament – “Judge me, O Lord, for I have walked in mine integrity.”

The poet Landor wondered:

“I see, and know not why
Thorns live, and roses die.”

“

I do not think that there are many in this hall who knew Dr. Sarabhai as early as 1940, when I was a student along with him at the Indian Institute of Science, Bangalore. In 1943, the Headquarters of the RAF 225 Group was located on this plot of ground, and I was an Assistant Meteorologist attached to that Unit.

Dr. Sarabhai continued to be a student; he was working on the diurnal variation of cosmic ray intensities. His study needed accurate hourly observations of the atmospheric pressure at the ground. I wish to convey how, even in those days, he had the ability to make use of available resources. He installed his cosmic ray equipment within the meteorological office of the RAF 225 Group, where the hourly pressure observations were taken regularly. He also had a feeling that the atmospheric temperatures and pressures at stratospheric levels could be monitored by the cosmic rays recorded at the ground. I am afraid that

the meteorological community is not yet making full use of the measurement of cosmic rays for meteorological research. Significant work on the use of cosmic ray induced radio-active material as tracers in meteorology was initiated by Prof. Peters and his school.

Let me mention another example of Dr. Sarabhai's practical wisdom. Along with Prof. Chitnis, we had been going round to locate a rocket launching station for the study of the equatorial electrojet. We found a good place, close to the magnetic equator, and with the Arabian Sea on one side and a bunch of eight backwater lakes on the other side. It had been more or less decided to locate the rocket launching station there. The name of the place is "Vellana Thuruthi". But when I translated Vellana as 'White elephant' and Thuruthi as 'Sand-bar', Dr. Sarabhai decided not to have any rocket launching station there. He said that he would be in difficulty if newspapers played on the word!

I had the privilege of being with Dr. Sarabhai in Vienna, when he was functioning as the Scientific Chairman of the UN Conference on the Peaceful Uses of Outer Space. He noted a few papers on Remote Sensing which were presented there. He was very quick. He told me: “This is the thing for India; take it up; learn the methodology; let us start Remote Sensing in India”.

He was a master in managing people. He would give half-a-dozen different problems to half-a-dozen different people. Each would be made to feel that he was Dr. Sarabhai’s favourite and therefore had been entrusted with the problem nearest to Dr. Sarabhai’s heart. ”

- Dr. P.R. Pisharoty
Eminent Meteorologist

“ Vikram injected an element of realism into the fairy-tale world in which I was living, Thus, in 1961 he began speaking of the Indian view of Space research; a view that was clearly different from that of the developed countries which were active in space at that time. He spoke of using satellites to provide television for the half million villages of India; TV in which there would be a single video channel, and 14 different sound channels to bridge the linguistic gaps that divide the Indian nation. He spoke of agricultural, family planning and health education being given to the non-urban population by satellite. He argued that it would be faster to use a satellite to provide a high quality, nationwide telephone system than to use a conventional ground based microwave system. That is, he spoke of careful tailoring of space science to the national goals of his country. He spoke of space scientists applying their intellectual capabilities to practical problems, and set the example by doing so himself.”

- K.G. McCracken
Australian Space Scientist

“ Dr. Sarabhai’s scientific contributions can be summarised by a favourite phrase of his: “ If only one listens to the music in the (apparent) noise, the work becomes very rewarding indeed.” He had the skill, the bold imagination, and a great originality of mind which characterised all his scientific work. He provided to the scientists at the PRL a gentle yet dynamic leadership, nurtured them and enabled them to move forward, so that this institution today remains a living monument to his scientific endeavours.”

- S.P. Pandya
Physicist and Former Director, PRL

“ He was a student who planned his own Ph.D. work! Wealthy as his family was, it used to holiday in Kashmir almost every summer. On a couple of these holidays, he took along his own scientific instruments and studied the soft mu-meson component of cosmic rays at Aparwat above Gulmarg on the shores of Alpathari lake, almost 13,000 feet above sea level. The thesis contained a picture of the author with his instruments, sometimes at work, sometimes on a pony, and to us all it was a great source of amusement and, occasionally, even an opportunity of leg-pulling. Whoever mixes enjoyment with, of all things, scientific research! ”

- Dr. R.P. Kane

*Cosmic Rays Scientist and one of
Dr. Sarabhai's first students*

Yours of Dec. 14, 1988 to hand.

Vikrambhai passed away 17 years ago. Whatever I remembered, I put in the two articles I wrote in Physics News and PRL News. I have nothing more to add. Therefore, I cannot send you any more writing.

In early sixties when ground - based Cosmic Ray study was getting somewhat stale, Vikrambhai's imagination flew into space. He visualised leap-frogging into a new stage of technology and asked some of us to take up the challenge. Dr. Ramanathan was sceptical. He said "Vikram, these are all unexperienced people. Don't you think we are chewing too much? Aspiring for moon?" Vikrambhai replied "Dr. Ramanathan, how do we know? Youngsters acheive great heights when challenged. In any case, they will learn, and form a good base for future". How right he was?!

At a later stage, he once said to me "Kane, people don't understand the real meaning of Karmanye vadhikaraste, ... To me it means, do things without undue attachment. This is true for research too. By all means, form hypotheses and theories. That is fine. But don't feel sad when proved wrong. But don't stop further effort either"! I think this is a good lesson in every field!

I once asked him why he seems always happy, at least never worried or unhappy. He said he doesn't really care even if somebody calls him a fool! "After all, the speaker has a right to his opinions and I have to mine. And what I am, the world will finally know, anyway". You rarely saw Vikrambhai ruffled or agitated. May be he should have been. Could it be that he accumulated all wrath in his brain and finally paid for it? I doubt though.

A note by Dr. R.P. Kane

“ Each person, whatever his position, was encouraged to express his thoughts freely and to criticise constructively, without any inhibition. This gave the staff a feeling of involvement in the decisions and an opportunity for training and for building up their morale. It contributed to a fine team spirit in the various echelons of management. Vikrambhai believed in delegation of duties. At staff meetings, even when he was present, he would insist that the Chief Executive should take the chair and he would sit as an ordinary member, even though he was the Chairman of the company. This innate simplicity was reflected in his informal way of dress and in his noble behaviour towards other people. His faith in those working under him was largely responsible for the vastness and versatility of his activities.”

- J.S. Badami

Dr. Sarabhai's teacher, employee and friend

“ It was Dr. Vikram's idea to have at Ahmedabad a school of business management. He approached the Ford Foundation people for the purpose. At that time, Mr. Ensminger was the head of the Ford Foundation in India. He desired the institute to be located at Bombay and not Ahmedabad. Dr. Vikram went to America, approached the Harvard people, won them over and got their agreement to sponsor the institution at Ahmedabad.

His humility, his way of mixing with all types of people, his art of enthusing people to work, his untiring efforts to work for the upliftment of the country, endeared him to one and all.”

- Kasturbhai Lalbhai

Industrialist and well known Millowner

“ Many times I have seen Dr. Sarabhai patiently listening to people who would go on with long incoherent monologues which seemed to convey nothing. Yet, in the end, Dr. Sarabhai would summarise the monologue, giving it a very constructive interpretation and meaning. I am told that, when asked why he suffered fools so lightly, Dr. Sarabhai had replied that in a vast country like India, where people come from diverse backgrounds, not everyone has had a privileged upbringing. One should, therefore, allow for this in listening to people and try to see behind the words what they are trying to say. ”

- Kirit Parikh
Dr. Sarabhai's student

“ There are many people known for their academic distinction, many others known for their outstanding scholarship, still others known for their far sighted vision or their ability to conceptualise their vision into words to put it across to people in power, some others who are able to put ideas not only in words but also in action, and some who are able to translate them into institutions which survive for many years and are able to be of service to society. It is, however, very rarely anywhere in the world that you find all these qualities combined in a single individual - in Vikram Sarabhai we had somebody who had all these qualities. ”

- Dr. I.G. Patel
*Well Known Economist and former
Governor, Reserve Bank of India*

“ ‘When you grow up,’ he used to say, ‘you don’t have to walk step-by-step like a toddler; you can leap, run, you can take short-cuts across the fields. That means you have to start processes, not like a gambler but like a prophet, infallibly accurate as to what the consequences will be.’ That’s what he had tried to do with atomic energy and space research. ”

- M.G.K. Menon

Cosmic Rays Scientist from Tata Institute of Fundamental Research, and later Chairman, Electronics Commission

“ Vikram Sarabhai was truly one of the most remarkable human beings I have ever known. He could engage simultaneously in a number of different activities, each sufficiently demanding to fill the life of a lesser man, without showing any sign of stress, or allowing the preoccupation with his work to affect the warmth of his personal relations...For him scientific research was an act of love towards nature. He had an almost uncanny capability to absorb and store in his mind a vast amount of experimental and theoretical data. Having done that, and guided by what I am tempted to call an artistic intuition, he would then proceed to arrange these data into a self-consistent picture bringing out hidden regularities and relationships; a picture which, through the years, would progressively evolve and become more precise. This is why his death dealt such a hard blow not only to the personal feelings of his fellow scientists, but to science itself. ”

- Prof. Bruno Rossi

*Nuclear Scientist, Massachusetts Institute of Technology
Boston, USA*

“ The great intellectual integrity of the universe saw fit to bless me with the friendship of Vikram Sarabhai. I am sure that this blessing occurred because of my life long concern with, study of and attempts of effective instrument realisation of the potential, unique functionings of humans in the universe. No one could have been more concerned with this comprehensive subject than Vikram. ”

- Dr. R. Buckminster Fuller

World Renowned Futurist, Architect and Designer

“ I recall Vikram Sarabhai’s very countenance as significant for our discourse. For the characteristic of his facial expression which I remember most vividly is the naturalness with which he could shift from childlike laughter to deep and sometimes melancholy concern, and back. (I dare to add only in parenthesis that he reminded me, on such occasions, of the double image of Krishna as adviser and interpreter to the powerful and as the radiant boy child disarming all the world with his smile.) But Vikram, in some ways, not only personified, he also had a rare understanding of, the relationship of childhood and adulthood, a relationship which, it seems, must be reformulated from age to age. ”

- Prof. Erik H. Erikson

Eminent Psychologist

“ I would like to recall one major incident during the preparation of the sodium payload. My colleagues, Sudhakar and Bhattacharya, were filling in the sodium and thermite mix and pressing it from a distance. After the sixth stage of pressing, Sudhakar went to the payload room to load in fresh sodium. All hell was let loose! There was an explosion and fire broke out. Sudhakar was in the exact spot. How to save him? We could not use water on a sodium fire. With fast reacting presence of mind, Sudhakar broke the window and escaped with severe burn injuries. He was in the hospital for a few painful weeks. Sarabhai visited him there and administered a healing touch. “Sudhakar, sweat has created fire. We will see that sweat will inflame imagination on rocketry!” Later, we established that a drop of sweat from the face of an engineer had ignited the sodium payload (water violently reacts with sodium). That sweat, as prophesied by Sarabhai, has produced today a spectrum of sounding rockets for the country, comparable to any in the world. This was the foundation laid by Sarabhai for taking us closer to SLV realisation. ”

- Dr. A.P.J. Abdul Kalam

Dr. Sarabhai's student and former President of India

“ I am a person who is not often down-hearted, but I can tell you that sometimes I was a little discouraged. Vikram would come and lift up my spirit and say there was no reason to be pessimistic. ”

- Indira Gandhi

Former Prime Minister

- 1919 Born in Ahmedabad on 12 August
- 1937 Completed the Intermediate Science examination from Gujarat College, Ahmedabad, and joined St John's College, Cambridge (UK)
- 1940 Obtained Tripos in Physics and Mathematics from Cambridge and returned to India due to the Second World War. Joined the Indian Institute of Science, Bangalore, and continued his post-graduate research in cosmic rays as Professor C.V.Raman's student.
- 1942 First scientific research paper published, in Proceedings of Indian Academy of Sciences, A. Vol. 15, p.89.
Married Mrinalini Swaminadhan
- 1945 Returned to Cambridge to work for a Ph.D. in Cosmic Ray Physics
- 1947 Awarded a Ph.D. on 'Cosmic Rays Investigations: Experiments with Gamma Rays' and returned to India. Started the Ahmedabad Textile Industries' Research Association (ATIRA) and the Physical Research Laboratory (PRL) at Ahmedabad
- 1950 Took over the management of Sarabhai Chemicals, Baroda
- 1955 Established Suhrid Geigy Limited, Baroda
- 1957 Took over the management of Swastik Oil Mills Limited, Bombay
Founded the Ahmedabad Management Association
- 1958 Established Sarabhai Merck Limited, Baroda (now called Sarabhai M. Chemicals)
- 1960 Took over the management of Standard Pharmaceuticals, Calcutta
Established the Sarabhai Research Centre, Baroda
Established the Operations Research Group, Baroda
- 1961 Established Synbiotics Limited, Baroda
Established the Sarabhai Engineering Group, Baroda
Established Sarabhai Glass, Baroda

- 1962 Awarded the S.S. Bhatnagar medal for his scientific research in physics.
Appointed Chairman, Indian National Committee for Space Research (INCOSPAR)
Founded the Indian Institute of Management (IIM), Ahmedabad
President, Physics Section, Indian Science Congress, Cuttack
- 1963 Established the Thumba Equatorial Rocket Launching Station (TERLS), Thiruvananthapuram. On 21 November, India's first rocket was launched and India entered the Space Age.
Member, Electronics Committee
- 1964 Convenor, Pugwash Conference, Udaipur
- 1965 Established Space Science and Technology Centre (SSTC), Thiruvananthapuram (now known as the Vikram Sarabhai Space Centre)
Appointed Member, Atomic Energy Commission
Assumed Directorship of the Physical Research Laboratory, Ahmedabad
- 1966 Appointed Chairman, Atomic Energy Commission, Government of India
Secretary, Department of Atomic Energy, Government of India
Chairman, Electronics Committee, Government of India
Founded the Nehru Foundation for Development
Founded the Community Science Centre
Member, International Council of Scientific Union
Awarded Padma Bhushan
- 1967 Established Experimental Satellite Communications Earth Station (ESCES), Ahmedabad
Set up Uranium Corporation of India Ltd. Jaduguda, Bihar
Established Electronics Corporation of India Limited (ECIL), Hyderabad

- 1962-67 Chairman, COSPAR Consultative Group on Potentially Harmful Effects of Space Experiments
- 1968 Scientific Chairman of the UN Conference on the Exploration and Peaceful Uses of Outer Space, Vienna
- 1969 ISRO constituted
Chairman, Indian Space Research Organisation (ISRO)
Signed SITE agreement with NASA, USA
- 1970 President, 14th General Conference, International Atomic Energy Agency (IAEA), Vienna
Presented a profile for the decade 1970-80 for the Atomic Energy and Space Research Programme for India
- 1970-71 President, Indian Geophysical Union
- 1971 Scientific Chairman, 4th UN Conference on the Peaceful Uses of Atomic Energy.
Passed away, 30 December, at Kovalam, Thiruvananthapuram, Kerala, South India
- 1972 Awarded Padma Vibhushan posthumously
- 1974 A moon crater named after Dr. Vikram Sarabhai. The International Astronomical Union at Sydney, Australia, decided that Crater BESSEL (Long 20.0 at. 24.7) in the Sea of Serenity will be known as the Sarabhai Crater.

Major Institution-building Activities by Dr. Vikram Sarabhai (1947 – 1971)

01. Ahmedabad Textile Industries' Research Association (ATIRA), Ahmedabad
02. Physical Research Laboratory (PRL), Ahmedabad
03. Indian Institute of Management (IIM), Ahmedabad
04. Ahmedabad Management Association (AMA), Ahmedabad
05. Community Science Centre (CSC), Ahmedabad
06. Darpana Academy of Performing Arts, (DARPANA), Ahmedabad
07. Nehru Foundation for Development (NFD), Ahmedabad
08. Sarabhai Chemicals, Vadodara
09. Sarabhai Glass, Vadodara
10. Suhrid Geigy Limited, Vadodara
11. Synbiotics Limited, Vadodara
12. Sarabhai Merck Limited, Vadodara
13. Sarabhai Engineering Group, Vadodara
14. Operations Research Group (ORG), Vadodara
15. Sarabhai Research Centre (SRC), Vadodara
16. Systronics, Ahmedabad
17. Swastik Oil Mills Limited, Mumbai
18. Standard Pharmaceuticals Limited, Calcutta
19. Thumba Equatorial Rocket Launching Station (TERLS), Thiruvananthapuram
20. Space Science and Technology Centre (SSTC), Thiruvananthapuram
21. Sriharikota Rocket Range (SHAR), Sriharikota
22. Experimental Satellite Communication Earth Station (ESCES), Ahmedabad
23. Satellite Communication Systems Division (SCSD), Ahmedabad
24. Electronics Systems Division (ESD), Ahmedabad

25. Microwave Antenna Systems Engineering Group (MASEG), Ahmedabad
26. Audio-Visual Instructional Division (AVID), Ahmedabad
27. Remote Sensing and Meteorological Division (RSMD), Ahmedabad
28. Indian Scientific Satellite Project (ISSP), Bangalore
29. Satellite Instructional Television Experiment (SITE), Ahmedabad
30. Indian National Satellite (INSAT)
31. Satellite Launching Vehicle (SLV), Thiruvananthapuram
32. Satellite Communications Earth Station, Arvi
33. Fast Breeder Reactor (FBR), Kalpakkam
34. Nuclear Centre for Agriculture, New Delhi
35. Variable Energy Cyclotron Project (VECP), Calcutta
36. Electronic Prototype Engineering Laboratory (EPEL), Mumbai
37. Electronics Corporation of India Limited (ECIL), Hyderabad
38. Uranium Corporation of India Limited (UCIL), Jaduguda

No. 5 was renamed as Vikram A. Sarabhai Community Science Centre after Dr. Sarabhai's death in 1971.

No. 19 and 20 were merged under the Vikram Sarabhai Space Centre after Dr. Sarabhai's death in 1971.

No. 22, 23, 24, 25, 26 and 27 were merged under the Space Applications Centre after Dr. Sarabhai's death in 1971.

No. 32 was renamed as Vikram Earth Station after Dr. Sarabhai's death in 1971.

More than 25 students studied under the guidance of Dr. Vikram Sarabhai and received their M.Sc. and Ph.D. at the Physical Research Laboratory (PRL).

Dr. Vikram Sarabhai wrote more than 100 scientific research papers along with his students, published in both Indian and foreign scientific journals.

National and International Memberships

COSPAR, IAEA
Fellow, Cambridge Philosophical Society
Fellow, Institute of Advanced Studies, Massachusetts Institute of Technology (MIT)
Fellow, Physical Society of London
American Physical Society
Member, American Geophysical Union
Member, National Planning Council of the Planning Commission
Member, Central Advisory Board of Education
Secretary, International Institute Sub-Committee on Cosmic Ray Intensity Variations
Member, Cosmic Ray Commission of the International Union of Pure and Applied Physics
Member, International Council of Scientific Union
Member, Athens Centre of Ekistics
Member, Pugwash Committee
Founder and Coordinator, Indian Pugwash Committee
Fellow, Indian Academy of Science
Fellow, Indian National Science Academy
Senior Visiting Professor, MIT
Member, The Inter-union Commission of Solar Terrestrial Physics of the International Council of Scientific Union
President, Indian Rocket Society

Memorials

01. Dr. Vikram Sarabhai Postage Stamp – Govt. of India
02. Dr. Vikram Sarabhai was awarded a Padma Vibhushan
03. Vikram Sarabhai Space Centre – TERLS, SSTC merged and renamed – Thiruvananthapuram
04. Vikram A. Sarabhai Community Science Centre, Ahmedabad
05. Dr. Vikram Sarabhai Road – Ambawadi to Vastrapur
06. Vikram Sarabhai Library – Indian Institute of Management, Ahmedabad
07. Vikram Hall – Space Applications Centre, Ahmedabad
08. Vikram Earth Station – Overseas Communications Earth Station, Arvi was renamed
09. A Moon Crater BESSEL in the Sea of Serenity will be known as the Sarabhai Crater.
10. Dr. Vikram Sarabhai Marg, Vadodara
11. Sarabhai Institute of Technology, Thiruvananthapuram
12. Dr. Vikram Sarabhai Engineering College, Thiruvananthapuram
13. Vikram Sarabhai Bhawan, Anushakti Nagar, Mumbai
14. Dr. Vikram Sarabhai Bust at Ambalal Sarabhai Enterprises, Vadodara
15. Dr. Vikram Sarabhai full size bronze statue – Space Applications Centre, Ahmedabad
16. Dr. Vikram Sarabhai full size bronze statue – Physical Research Laboratory, Ahmedabad
17. Dr. Vikram Sarabhai full size bronze statue – River Front at Usmanpura, Ahmedabad Municipal Corporation, Ahmedabad
18. Dr. Vikram Sarabhai Bust at Physical Research Laboratory, Ahmedabad
19. Dr. Vikram Sarabhai Bust at Indian Institute of Management, Ahmedabad

20. Dr. Vikram Sarabhai Bust at Vikram Sarabhai Space Centre, Thiruvananthapuram
21. Dr. Vikram Sarabhai Bust at ISRO Headquarters, Bangalore
22. Dr. Vikram Sarabhai Bust at Vikram Sarabhai Space Exhibition, SAC, Ahmedabad
23. Dr. Vikram Sarabhai Bust at Birla Industrial & Technology Museum
24. Dr. Vikram Sarabhai Fly Over – Drive in Road, Helmet Circle, Ahmedabad

It is necessary in
creative work to be
able to see
squirrels and birds.

DR. VIKRAM SARABHAI
(1919-1971)



Dr. Padmanabh K Joshi heads the Dr. Vikram Sarabhai Archives at the Nehru Foundation for Development in Ahmedabad. He completed his post-graduation and doctoral studies in Political Science from Gujarat University. His doctoral thesis was also on Dr. Sarabhai. His areas of interest include leadership, institution-building and management of scientific organisations.

Divya Arora is a publisher and a bookseller. Educated at Welham Girls' School, Dehra Dun, Lady Shri Ram College for Women, Delhi, Sophia College, Mumbai and the London School of Economics, Divya was nominated in 2009 for the Young Publishers' Entrepreneur Award. In 2013, she received the prestigious Goldman Sachs 10,000 Women Scholarship at the Indian School of Business, Hyderabad. Divya has a keen interest in art and design. She lives in New Delhi with her husband, Dhiraj Nayyar and their dog, Dali.

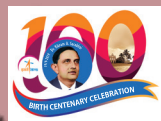


Dr. Sarabhai was a young person with great wisdom. There is a French saying that “if age could do and youth had wisdom, it would be a wonderful combination”. Vikram Sarabhai had that combination. He was a fine blend of the thinker and doer. No one can lead a meaningful life today without combining the two.
– Indira Gandhi

Known as the Father of India's Space Programme, Vikram Sarabhai's interests included space and nuclear energy, architecture, industry and business, institution building, management development, arts, music, and theatre. He was a scientist and an entrepreneur, an educator, and a businessman. When he passed away unexpectedly at the young age of 52, he left behind a legacy few can match, having set up internationally reputed institutions and organisations that have made India proud and put us on the world map.

The first rocket was carried to Thumba on a bicycle.

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Biography for Young Readers



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