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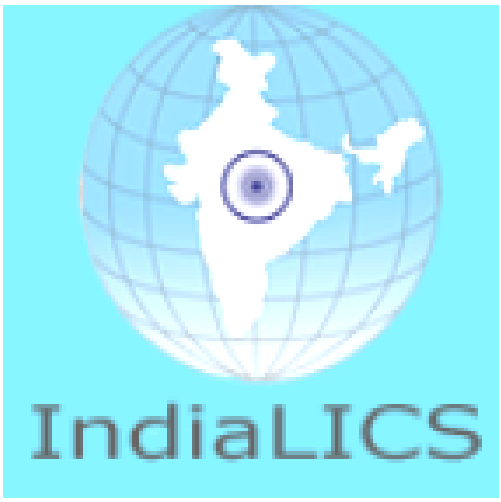

DOWN THE MEMORY LANE: RECALLING INDIA'S NATION – BUILDING EXERCISE

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DOWN THE MEMORY LANE RECALLING INDIA'S NATION – BUILDING EXERCISE*

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Late Prime Minister Indira Gandhi

I would like to thank the Centre for the Study of Science policy of the Jawaharlal Nehru University, RIS and CSIR-NISTADS for having organised this fine function. It is very good of all of you. As I look back over some forty years of my Professional and Personal life, two things stand out. My commitment to Nation Building and Self Reliance, Therefore, these two facets of my life form the corner stones of this lecture of mine. I was born in Madras in July 1940 to an unusual couple of parents – an Iyengar Brahmin father and a Parsi mother. Where did they meet? The usual place Oxford University in the U.K. My father was doing a B.A (Hons) degree in. Politics, Philosophy and Economics (PPE) at Wadham College, while my mother-to-be was doing English, Language and literature at St. Anne's College. This was in the early 1930's. My father had earlier studied History at the leading college of the then Madras University viz. Presidency College, while my mother had studied English literature at Queen Mary's College of the same University.

The 1930's were a decade of great ferment, practically all over the world. The German dictator Adolf. Hitler had come to power in Germany in 1930 and the Soviet Union was rising by adopting the pioneering socio-political-economic ideological system of Communism. Left-wing political economic and social views were the order of the day. The UK was a particularly important place for such views and Oxford, Cambridge and the London School of Economics were major centres of left-wing ideas, ideology and scholarship. My parents were therefore actively involved in such ideas.

My father, who was a cricketer of high standing-he had played as a member of the Indian national team in the series of Test Matches which were held in the country against a visiting U.K. Test Team led by the famous Lord Tennyson in 1931 and had distinguished himself by his fine Spin Bowling- he was known particularly for his famous Googlies – and hard-hitting middle order batting. It was no surprise that he should get a "Blue" at Oxford in Cricket. He also got a Blue in Hockey.

At that time, no Indian in the UK did not know the firebrand Indian V.K. Krishna Menon. Menon had founded the India League in London in 1934. The League was an organisation of leading Indian Scholars and Journalist and liberal English men and women who were fighting for Indian's freedom from Britain. Both my parents got to know Krishna Menon very well.

After completing his M.A in PPE at Oxford in early 1936, my father joined the famous newspaper, the London Times as an Intern for six months. My mother stayed on at Oxford to do her M.Litt (Master of Literature).

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In 1937, my father returned to Madras and joined the famous, nationalist newspaper, The Hindu as an Assistant Editor. My mother went to Lahore and joined the famous Fateh Chand College as Professor of English. While she was in Lahore, she was contacted by the famous textile Magnate and Chairman Calico Mills to come to Ahmedabad as English Tutor to Ambalal's five daughters and two sons-one of whom, Vikram was later to be a renowned Cosmic Ray and Space Scientist and to be the father of our Space Programme and whose Special Assistant I was over 1967-70. My mother was at Ahmedabad tutoring the Ambalal Children for about a year. 25 years later, I learned that the father of my wife-to-be, Vibha, a scholar called Vasant Nayak was similarly tutoring the Sarabhai Children in Gujarati! It was a small world in those days.

After six months at Ahmedabad, my mother went back to Madras in 1938 joining the Queen Mary's College of the then Madras University as Professor of English.

In 1939, my parents got married in Madras. As they belonged to different communities, they could, at the time, get married only under what was known as the Special Marriage Act. Both their families boycotted the wedding. There were only six persons at the wedding. They included the famous lawyer, and member of the (banned) Community Party of India, later to become Union Minister of Steel and Heavy Engineering in Indira Gandhi 1971 Cabinet.

Then came the great day! My birth on July 11, 1940. At this, there was a sea change in the attitude of my father's parents particularly, in my grandmother. She and the other senior women folk said to themselves, "If this 'Mlechi'person out of the chaturvarnam of the Hindu Pantheon meaning my mother could produce a Boy/ there must be something in her. "My grandfather (on my father's side) who was then in Srinagar as Prime Minister to the Maharaja of Kashmir, Hari Singh and who in 1945-46 was to be one of the nine men who wrote the Constitution of India under the Chairmanship of the venerable Dr. B.R. Ambedkar, even invited my parents to come to Srinagar so that he could see his grandson."

My parents were deeply involved in the Freedom Struggle, My father writing many anti-British articles in the nationalist Hindu newspaper. He also played a lot of cricket.

In 1941, my Mother took up a part-time position as an Announcer and a News Reader in All India Radio. There were many occasion in which she introduced my father to the listeners!

In 1942, Gandhiji gave the people of our great nation the stirring call at the historic Gowalia tank in Bombay: "Quit India. Enough is enough; The British must go." My father went to Bombay to cores the historic event for the Hindu and wrote two long articles in the paper the very next two days after Gandhiji's call, my grandfather who had been knighted by the British in late 1941. He returned his knighthood Gandhiji's call also had a profound effect on to British.

In 1947, the major national newspapers got together and with the support of Nehru set up a national news agency called the Press Trust of India (PTI). The first Chairman of the Board of Directors of the PTI was Mr. Kasturi Srinivasan the Editor-in-Chief of the Hindu. He proposed two things to the PTI Board. First that PTI set up an office in London in collaboration with the world-famous British News Agency Reuters. Second that my father G.P. be appointed as the first Head of that office. Srinivasan's proposals were unanimously approved by the PTI Board.

It was thus that my father left Madras for London in February 1948. My mother and I followed him there, when the summer vacation started in May. My father settled quickly into his new job getting to know the two senior most men in Reuters – Christopher Chancellor, Managing Director and Walton Cole, General Manager. He also quickly built up a team of Indian Journalists. Consequently, the despatches from the London office of PTI were soon getting lapped up by the newspapers at home.

Our family settled down quite quickly. We stayed in one portion of a large Victorian-era house along with three other families in the posh London suburb of Putney. I started going to what the British called a Preparatory or "Prep" school in the neighbourhood. We went to many concerts and dramas.

My father's posting in London enabled both my parents to renew their friendship with V.K. Krishna Menon who was then our High Commissioner to the U.K.They also renewed their old contacts in Oxford University and the London School of Economics and radical left-wing journalists and academics.

Then, as my father was completing four years as the Head of the PTI Office in London, i.e., in early 1952, Kasturi Srinivasan, who was still Chairman of the Board of Directors of PTI contacted him and invited him to return home and take up the number two position in the whole of the PTI – that of Chief Editor, next in the organisation only to the General Manager. This position, which was in the Bombay Headquarters of PTI, enlarged my father's "scope of command." to the whole globe and including by then seven overseas offices.

In early July 1948, my mother and I returned to what I called "good old Madras" as the wheels of our plane touched the ground at Madras' Meenambakham airport. My mother rejoined Queen Mary's College as Professor of English, and I joined the Madras Christian College High School.

Soon after my father became Chief Editor in PTI, he got a long distance call from Krishna Menon in London. Menon told G.P that Prime Minister Nehru wanted him (G.P.) to go, meet and have a detailed "conversation with Sheikh Mohammad Abdullah, the Founder - President of the National Conference party in. Jammu and Kashmir (J&K). At that time the Sheikh had been put in preventive detention by Nehru in the beautiful Tamil Nadu hill station of Kodaikanal. So, my father went to 'Kodi' immediately. He spent two days in Kodi and had six hours of conversations in all with the old man. Throughout those six hours, the Sheikh's constant refrain was: "How can Jawaharlal who I regard as my brother do this to me". After returning to Bombay from his Kodi visit, my father wrote out a six-page account of his conversations with the Sheikh and sent it to Nehru. Two days later he got a call directly from Nehru expressing Prime Minister's deep appreciation for an excellent report.

In late 1952 rumours started doing the rounds in Delhi that Nehru was going to induct two bright Oxonians into his Office – G. Parthasarathi and P.N. Haksar – both well known to each other and well known in political circles for their left-wing views. Thereupon, my grandfather N. Gopalaswami Iyengar who was Defense Minister in Nehru's Cabinet, wrote a remarkable letter ran along the following lines:

My Dearest Partha:

I understand that Nehru has, invited you to join his office. If you are thinking of doing so, I would appreciate it if you could give me reasonable time to wind up my operations here and return to Madras, This is became both father and son cannot both be in Delhi and that too working for the same man (Nehru). As soon as my father got the letter, he rushed to his father and told him he (G.P.) had not received such as invitation from Nehru, but that he had no intention of accepting it even if it were made. My footnote to that event is that some thirty years later my father. G.P. and I proved that both father and son need not be bound by the restriction of New Delhi not being able to accommodate both father and son. In 1983-84, and my father was Chairman, Policy Planning Committee of the Ministry of External Affairs with the rank of a full Cabinet Minister reporting directly to PM Indira Gandhi who held the External Affairs portfolio, while I was Secretary of the Department of Electronics also reporting directly to Indiraji who was also the Union Cabinet Minister for Electronics! But then the 1950's were not the same as the 1980's.!!

In mid-1954, Nehru again sent for my father and told him that he (Nehru) proposed to appoint my father as Chairman of the International Commission for Supervision and Control in Cambodia. Nehru told G. P. that, pursuant to a Conference in on Indo-China held in Geneva a few months earlier to bring peace to all the three Countries in Indo-China-Vietnam, Cambodia, and Laos, three such Commissions had been set up. The Commissions were all composed as follows: an Indian Chairman, and one Member each from Poland representing the Eastern (Communist) Bloc and the other, from Canada representing the Western (Capita list) Bloc. Nehru said G. P. needed to proceed to prom Pen, the capital of Cambodia speedily.

This was a path-breaking decision as it represented a movement of my father from Journalism to Diplomacy. He left for Phnom Penh in mid-1954.

Meanwhile a major transformation was also taking place in the life of my mother. In early 1953, a wealthy lawyer well known in Madras called P.M. Ethiraj decided to put up the money for setting up a private college in his name and he invited my mother to be the founder Principal of Ethiraj College. As in my father's case that appointment represented a watershed in my mother's case as well – from being a teacher to becoming an educational administrator. After consulting my father, she accepted. Over the next five years she put Ethiraj College on the higher educational map of Tamilnadu – indeed even beyond.

As usual, during the summer vacation of 1954, my mother and I Joined my father in prom Penh and over the next six weeks travelled far and wide in that country.

After a year in the Cambodian Commission, my father moved to head the Commission in Vietnam and so my mother, and I visited Vietnam also in the summer vacation of 1956. We not only travelled far and wide in that beautiful country but also had the privilege of meeting the famous Trimurti who had won Independence for their country from the French. 'Uncle' Ho Chi Min, the President of Vietnam and a revolutionary leader in the mould of the great. Mao-se-Dung, the Prime Minister of Vietnam, Pham Van Dong, and Deputy Prime Minister and Defense Minister, the legendary General V. Nguyen Giap who had defeated the French in the decisive battle at Dien Bein Phu.

As the time for my father to leave Vietnam came, President Ho invited my father, mother and myself to a farewell dinner at his house. When the three of us arrival there, we found that

Pham Van Dong and General Giap were also there and to the surprise of all three of us along with their wives. This was a very unusual practice for Vietnam; the dinner went swimmingly well with "Uncle" H. cracking innumerable jokes that put all of us in splits. As the food part of the dinner was coming to a close, Mrs. Ho went inside and brought out a huge glass bottle in which some small white objects were floating in what was clearly Sugar Syrup. Seeing this father said, "Mr. President, I think I know what the small white objects are; we have them in India as well; we call them Rasogollas". With a wry smile on his Face "Uncle" Ho said, I think not Mr. Ambassador for the white objects are a special breed of white mice. "Do try one, Mr. Ambassador" said Uncle Ho. As my father told my mother and me when we got home from the party, my father just said: "Harihara Shiva Shiva" then picked up one of the mice by its tail, opened his mouth and sent the mouse down his gullet!

By now it was July 1956, I had completed my Secondary School Leaving Examination (S.S.L.C) and was about to enter the second Year of my two year Intermediate Course.

In late 1956, Nehru transferred my father from Vietnam to an important neighbour in South East Asia viz. Indonesia. The country had been ruled right from the time it got political Independence from its colonial ruler, viz., the Dutch, in mid – 1945 by the father of the Indonesian, Freedom Struggle, Mohammed Soekarno. Along with Nehru, Tito, Nasser, and Nkrumah, Sockarno was one of the Founding Members of the Non-Aligned Movement. Soekarno ruled the 3000 island archipelago of Indonesia from the beautiful Bogor Palace, 25km from the centre of the capital city of D Jakarta.

As was his special gift my father soon got to know Soekarno very well making several visits to see the President at Bogor.

Then, in late 1956, an insurrection occurred in the island of Sumatra, the largest island in the country. Soekarno's Intelligence agency Chief soon tracked down Soekarno's conservative Muslim Vice – President, Mohammed Hattand as the moving spirit behind the insurrection. While the Indonesian Army and Air force combated the conservative Muslim Rebels, it became increasing clear that the rebels were being financed and armed by the West-chief by the Americans. Why were the Americans doing so? Because they regarded left-oriented Soekarno as a communist and wished to replace him with the Conservative pro-West Halta.

As the fighting in Sumatra intensified Soekarno sent for my father and requested the latter to get Nehru to supply him (Soekarno) with a whole range of weapons. Saying he would do so at once, my father asked Soekarno to nominate a senior military officer who could provide GP's Military Attache Air Commodore Idris Latif (later to become our Air Chief) with a list of exactly what Indonesia wanted Soekarno did accordingly for his part my father immediately spoke to Panditji on the phone and then sent him a detailed Top Secret Telegram seeking Nehru's approval to militarily assist Indonesia. In the event that is what happened, we sent a large transport plane full of weapons to Soekarano's army in a few days and using them. Soekarno was able to successfully quell the insurrection. Soekarno was extremely grateful for Indian help, and he rang up Panditji to convey his thanks.

Nehru was very happy with what my father had achieved in Indonesia. He, therefore, sent my father as Ambassador to China in early 1958; my father came back to Delhi in early 1958 for detailed briefings by all top government policymakers before leaving for Peking. He met all the four secretaries in the Ministry of External Affairs, the Defense Secretary and all the three Defense Service Chiefs. He then had a two-hour long session with the formidable. B. M.

Mallik, the Director of the Intelligence Bureau (DIB). At that time, the Intelligence Bureau dealt with both internal and external intelligence. What is more, Mallik was credited with being Nehru's closest adviser on China affairs. Finally, G. P. met Panditji himself at 11 p.m. on the night of March 18, 1958. When G. P. entered Nehru's beautiful office room in his residence Teen Murti House, Nehru was sitting behind his gorgeous large writing table. After disposing of a file, he was dealing with, Nehru looked up at G. P. and said: "So G. P. what has the Foreign office told you? 'Hindi-Chini Bhai Bhai' don't you believe it. I do not trust the Chinese one bit. They are an arrogant, hegemonistic and imperialistic State. Eternal vigilance must be your watchword. You must send all your important telegrams only to me directly, not to the Foreign Office. It is particularly important that you do not share these directions of mine with Krishna (V.K. Krishna Menon, then-Defense Minister). This is because, although he shares our world view, he has the erroneous belief that a Communist State (read China) would never attack a Non-Aligned State (read India)." It was a greatly sobered G.P. who returned to the house of his cousin S. Ranganathan at the Commerce and Industry Ministry where he was staying.

Normally an Ambassador proceeding from Delhi to Peking would travel to the latter city by air via Hong Kong. However, in G. P.'s case, it so happened that the Flagship of the Indian Navy, the INS Mysore was about to leave for Shanghai on a goodwill visit, G. P. boarded the vessel and landed at Shanghai from where he proceeded to Peking.

After settling in at Peking, my father formally presented his credentials to Chairman Mao Tse Dung President of China on April 16, 1958.

G.P.'s first call on a high official in the wai-china-poo, the Chinese Foreign office was Chang Wen-Chin the Director of the Division of Asia. Over the next three years of his tour of duty in China, it would be Chiang with whom he would have the greatest of interactions.

1958 was marked in China by Mao's "Great Leap Forward" strategy and policy. The Central objective of that policy was a massive increase, in steel production, from 10million tons/year to 24 million tons yr. Thereby equalling Britain's annual steel production. What is more, this phenomenal increase was to be achieved by setting up thousands of "Back Yard Steel Furnaces. What was to be the raw material that was to be fed into those Furnaces? Anything Metallic. In a primarily agrarian society like China, this meant basically agricultural implements, so the Chinese farmers put their hoes and pick axes and their rakes into the primitive Furnaces. Little did Mao realize, what a body-blow to Chinese agriculture this would be, it was not a surprise that in the next year 1959, there would be a major agricultural crisis leading to a huge famine in which western "China Watchers" estimated that around 15 million people died,

1958 was a "good year" in Sino-Indian relations. This led G. P. to not only work with Chiang-wen-Chin on a day-to-day basis but also to meet several times and get to know Marshal Chen Yi a person who came from a noble family and was a senior member of the Central Committee of the Chinese Communist Party.

As usual, my mother and I went to Peking when the 1958 Summer Vacation started in May that year. After we settled down, I got to know quite well a young First Secretary, in the Yugoslav, Embassy called Vlado Sestan. Vlado was an acutely perceptive observer and student not only of contemporary Chinese Affairs, but also of Chinese History. He also spoke fluent Chinese. It was thus that, he took me on a number of Treks to Confucian and Taoist

temples and Monasteries. As in India, most of those structures had been built on the tops of high hills if not low mountains. By the time my mother and I left China at the end of June 1958 to return to the start of the Academic Year, Vlado and I, had climbed to some six Temples and Monasteries. I learned a lot about Classical China and was also able to get a "good feel" about how rural Chinese lived. We also took a number of photographs of each other standing next to "Backyard Furnaces."

Meanwhile, I got to know quite well not only the 10 Diplomatic Officers in our Embassy but also diplomats in other Embassies. I also made several visits to the Science and Engineering Departments of Peking University and the Technological University of Peking.

My mother and I left Peking at the end of June and returned to Madras for the New Academic year 1958-59. That was the First year of my Physics Honours Course at Presidency College, Madras. That College was the premier college of Madras University. It was also the college at which the famous physicist professor CV Raman had done his early work on light.

We were eight students in the physics Honour course – three boys and five girls. And thereby hangs a tale. I had come third in Madras State in my Intermediate Course. So, I assumed that even if the first two applied for and got admission in the Physics Honours course, I would get a seat as there were nine seats in the Presidency College Physics Honours Programme. However, when my mother and I got back to Madras from Indonesia where my father was Ambassador, we found that I was first in the Italian. How did that happen? It was because 7 of the nine seats in the Physics Honours course were "reserved" for persons from the "backward classes". So, I had to wait for two months before enough of the seven backward class students dropped out. And where did we end up overall? By the third month, 7 out of the nine seats had been taken by Brahmins! So much for the utility of reservations.

1958-59, was an enjoyable year at Presidency. Apart from Presidency, there was also a Physics Honours course at Madras Christian College (MCC) so, my classmates' K G Ramanathan and C V. Kalyanasundaram and I used to go to MCC, for Inter-collegiate lectures. Among those who gave such lectures was a Reader in Elementary Patrick Physics called DR. M G K Menon from the famous Tata Institute of Fundamental Research.

In Bombay, little did I know then that the lives of Menon and I would be closely intertwined in later years. I also remember the wonderful lectures by a Distinguished Professor of Philosophy called C.T. Krishnamurthi. I still remember his famous words: "Physics devoid of Philosophy is the impossibility."

Again, as usual, my mother, and I joined my father in Peking when the summer vacation of 1959 came along. I renewed my friendship with Vlado Sestan, and we made several more trips to the seemingly endless number of ever- beautiful Temples and Monasteries.

However, meanwhile black clouds came to hover over Sino-Indian relations. The first Chinese incursions into Tibet and Arunachal Pradesh occurred, and overall relations soured. Nehru started getting attacked for his "week-kneed" China policy. In July 1959 when the Chinese incursions reached an all-time high, my father rushed to Delhi for urgent consultations with Nehru. He also drafted a detailed speech for Nehru to deliver in Parliament on the overall status of Sino – Indian relations. As Sestan and I travelled through China, we were overwhelmed by warmth indeed affection of the common people. However, the Chinese

Propaganda Machine kept vitriolically attacking the Yugoslav Revisionists and the Indian expansionists to "go home."

1959 Progressed on this unsettled basis.

In 1960, I completed my Physics Honours at Presidency College not only getting the First Division but coming second in the State.

Meanwhile, my mother became Chief Professor of English at Presidential College.

As usual, my mother and I, went to join my father in Peking at the close of the academic year in Madras.

Concurrently, I had applied to Corpus Christi College at Cambridge University for admission to do a B.Sc. (Hons) just as we were leaving; I received a telegram from Corpus informing me that my admission had been approved.

The Academic Year in Cambridge University begins in September of each year, so, I had a long Vacation that year-computing my B.Sc. (Hons) at Madras in May and required to be in Cambridge only at the end of September.

So, I travelled further in China again with Sestan. I also gave a lecture on Cosmology at Peking, University and another on "the Galactic Centre" at T Xinhua Technical University also in Peking.

My mother and I used the time I had to undertake in July 1960 a two-week visit to Japan which both she and I always wanted to do. We visited not only Tokio and Osaka but also the old capital city of Nara and the beautiful Hill station of Nikko. We stayed with Mr.& Mrs. Kannam Pilay who had been my father's deputy in Peking and who had gone from there to be Ambassador in Tokyo.

As I had plenty of time in which to reach Cambridge via London and Moscow. I decided to fulfill a life-long Dream of mine-to go from Peking to Moscow via Irkutsh and to see en-route Lake Baikal "the deepest lake in the world-12,000." The train journey Peking to Moscow via one of the largest deserts in the world and Ulan Bator, the unique Capital of Mongolia took four days at that time – now it takes only three the subsequent train journey Moscow-London via the Tunnel below the English Channel took three days. The journey took one through all the capitals of both Eastern Europe. Shestan who had made the same journey a couple of years earlier gave me a lot of tips on the things to see. The only drawback of the journey- if one could call it that was that the only meat sold on the train on the Perking-Moscow leg was beef. So my mother stocked me up with a lot canned food, particularly Vegetables.

I left Peking on September 16th, 1960 with all my Presidency B.Sc. (Hons) Notes and two big books I had always wanted to read – Nehru's World History and Discovery. I had a wonderful journey- I met some Soviet Russian airmen who, much to my surprise spoke passable English. What were they doing on the train? They said they had arrived in Peking two weeks earlier to organize and supervise the crating of 20 Mig-21 Bis Front line Fighter bombers which the Soviets had supplied to the Chinese in 1958, but which they were now withdrawing and taking back to Russia given the Sino-Soviet Split of 1959. As we

approached were at and had passed Lake Baikal I took some colour photographs from the train and managed to capture its famous deep blue colour. As Irkutsk was a major city of the Soviet Far-East, the train stopped there for six hours. As I had a Diplomatic Passport and a Soviet Visa for the whole of the Soviet Union, I got off the train after tripping the concierge of my Compartment liberally to watch over my belongings, I hired a cab at Irkutsk station and drove around that beautiful city for a full four hours with an English speaking lady guide. It was a great experience. I did exactly same when the train stopped at the Famous station of Novosibirsk. The city was known worldwide as the first Science City to be built anywhere in the world. It was on the same Longitude as Delhi. Thirdly it was one of the coldest habitations on Earck peak winter temperatures plummeting to -50 degree C. Some nine years later I would make a second visit to the city – this time from London in the West after attending a Pugwash Conference on Science and World Affairs at Sochi-Albalmy resort on the Black Sea.

On the fourth day, the twin diesel engine train slowly moved into Moscow Central Station at 2.30 p.m. - right on time. While in Moscow, I was to be staying with my father's Friend of long-standing our Ambassador T.N. Kaul in his residence in the compound of the Indian Embassy. So, I was met at the station by P. K. Mittal, a Third Secretary in our Embassy and driven with all my belongings to Kaul's house. TikKibhai as he was called by one and all welcomed me warmly, took me to my room and saw me settled. I then came down and spent a most enjoyable and interesting two hours talking to him. Knowing my deep interest in politics Tikkibhai gave me a detailed account of (a) the political, economic, military and social situation in the USSR at the time including the politics within the Soviet top leadership (b) the causes and present status of the Sino-Soviet split; and (c) the status and prospects of Indo-Soviet relations. All this was a sumptuous Tea and lot of Vodka plus an excellent Cuban Cigar each.

We then came to my stay in the USSR; Tikkibhai advised me that I should spend two days in Moscow and two in Leningrad. As for the former, he was attaching Mallick to me as my friend Philosopher, and guides the confirmed that as requested by me from Peking an appointment had been fixed by the Embassy for 10 a.m. the next day with the great Soviet Astrophysicist and theoretical. Radio Astronomer, Academician, Tsiolsky and with the venerable Academician Pyotr Kapitea, Director of the Soviet Academy's Institute of Physical Problems at 2.30 p.m. also tomorrow. I told Tikibhai that I had requested for the appointment with Tsilkorsky as I had already decided to do a Research Degree in Radio Astronomy after getting my under graduate Physics degree at Cambridge. As for Kapitsa, whose field was low-Temperature Physics? He was one of the most distinguished Physicists in the World, one who had done research in his field in Cambridge during World War II and was in a sense a hero of mine.

Tikhibhai then went on to say as it was my first visit to the USSR; Malik would take me to see the Stalin and Lenin Mausoleums and a tour of the Kremlin. Tikhibhai then went on to say that he would be giving a dinner for me at which I would meet all the many senior officers of the Embassy and their wives. On the third day, I would leave my place at 8 a.m. for Leningrad where I would be received and looked after by our Consul General. Ajai Rohatgi. Hotel bookings for two days and one night had been made by the Embassy in a nice centrally located hotel. My first visit would be to the world-famous Hermitage Museum, one of the wonders of the world. After lunch, I would be taken on a cruise of the river on the banks of which Leningrad was located. On the morning of the second day at 10.00 am appointment had been fixed with Alexii Kozyrev, the Dean of the Faculty of Physics of

Leningrad University. After some more sightseeing, I would leave Leningrad at 4 p.m. back to Moscow. On the morning of the fifth day, I would leave Moscow for London by train-a 2 ½ day journey.

I warmly thanked Tikkibhai for having drawn up such a wonderful and indeed highly exciting programme for me. By this time it was almost 5.30 p.m., so Tikhibai suggested that I go up to my room, unpack and get some rest. Dinner would be at 7.30 p.m.

I did take some rest as advised by Tikkibhai. But I then rang up my parents in Peking and gave them a detailed account of the train journey plus the wonderful programme laid out for me by Tikkibhai in Moscow and Leningrad. Both of them were very happy.

The meetings with both Tselkovsky and Kapitsa were wonderful. The former was 80 and the latter 86. In excellent English, they gave me detailed accounts of what kind a scope of research, they and their groups were doing. In the case of Kapitsa with me, after a conversation 30 minutes, he got a young physicist to take me around the large Institute of Physical and have each scientist explain to me what he was doing. They were most kind.

The visits to the Lenin and Stalin mausoleums were interesting. However, the visit to the Kremlin – the very heart of the International Communist Movement - I found Fascinating.

Dinner with Tikkibhai was very interesting, The Kashmiri food was excellent and the conversation most stimulating as veteran journalist, Inder Malhotra was visiting from Delhi and Dr. K.S. Shelvankar and his wife Mary equally enjoyable. Shelvankar, also a leftist, and a good friend of my father, was the Hindu correspondent in London on a visit to Moscow. When I and my wife to-be-Vibha were in Cambridge over 1960-64, we saw a lot of the Shelvankars. Malhotra, who was to become the first Biographer of Indira Gandhi, was, like the other two, strong Nehru accolades. All three-Tikkibhai, Malhotra, and Shelvankar regaled all present with their huge stock of stories of Nehru and Indira Gandhi. Malhotra took me aback - I think he took the rest of those present also aback-when he suddenly said "Ashok I am delighted you are doing Physics because, as Panditji often said: "The future belongs to Science and those who make friends with Science". I asked him how he came to remember those famous words of Nehru. He replied I cannot forget those words as so many things in life-both big and small-are things I do not understand because I do not have a background in S&T." The other three fully agreed with him. It was past 11 p.m. when the party broke up.

Tikkubhai's dinner for me the next evening when I met all the senior officers of the Embassy and their wives was equally interesting. The focus came to be China and, as I was coming from there after having spent as much as the previous four months there, I was quizzed by both officers and wives as to how things were there. What was the position in regard to Mao's Great Leap Forward – induced Famine? What was the exact status of the Sino-Soviet split? That dinner also ended only past 11 p.m.

My visit to Leningrad was fascinating and exhilarating. The Hermitage is a great cultural heritage of the Soviet Union-indeed of the whole world.

My dinner with Tikki on my second and last night had been meant to be a quiet one at home. But, suddenly at 7 p.m. Tikkibhai said: "Come Ashok I will give you a dinner you are unlikely to get outside the USSR – a Ukranian Dinner. So saying, he rang up his Private Secretary (who also lived in the same Indian Embassy Compound) and said "Raman, book a

table for two at my usual Ukrainian Restaurant for 8.30 p.m. It was thus that I went up to my room and got formally dressed and Tikkibhai did the same. The Ambassador's car pulled up at 8.15 p.m. and off we went to a Ukrainian dinner. I had so many dishes I had never had before that I shall always remember that dinner with great fondness. I also think I have never drunk more alcohol on any other occasion. We came back to the Embassy at 11.30 p.m.

After coming back from the dinner, I fully completed my packing as my train for London was to leave at 9.30 a.m. which meant the morning would be rushed. After a hurried breakfast, repeated warm thanks to Tikkibhai for making my stay in Moscow and Leningrad so memorable, useful and enjoyable I caught the train for London.

The Moscow – London segment of my train Journey was relatively uneventful except for the number of cities we passed through, and the train journey through the English Channel Tunnel or "chunill" was an experience of its own.

When my train pulled into London's Liver pool Street, station, on September 25, 1960, I was met by Jennifer and Sally the daughters of Walton and Pamela Cole with whom I was to stay for a day before going on to Cambridge Walton Cole like T.N. Kaul in Moscow was an old friend and colleague, of my father, but, in this case, not in diplomacy but in journalism, when G P Setup the London office of the PTI in 1948 in the Reuter's building in 85 Fleet street under a Memorandum of Understanding between Reuters and PTI, Cole was the General Manager of Reuters at that time. Now, almost exactly 20 Years later he was Reuter's Managing Director.

The Coles stayed in a large flat on the top(8th) floor of the Reuter Building, and that was where I was taken by the two young Ladies. As it was a Sunday Cole was at home, and I was given a rousing welcome. I was first taken to what was to be my room during my stay with the Coles I did some unpacking, freshened up and then joined the Coles in their Living Room.

As it was 7.30 p.m., I was asked by Cole whether I would like a drink and if so what. I settled for a Single Malt Whisky on the rocks. Cole did; likewise, Pamela brought some light snacks. The three ladies took glasses of wine, and we all settled down to chat and to "catch up on things" since we met last-which was almost 15 years ago. Cole began the conversation by saying "Ashok, though the Cole family has many friends around the world, we have not met anyone who has come to London after an 8000 miles Journey from a place as far away as Peking and that too over land on the Trans-Siberian Railway. I told them about my exciting Journey, emphasizing, Lake Baikal, irkutsh and Novosibirsk on the one hand and what I did in Moscow and Leningrad on the other. After I had finished, there was a round of applause. Cole just said, "You are a lucky chap wanting desperately to turn the conversation away from myself, I asked about things at Reuters."

"Mr. Cole", I began. He stopped me short. For God's sake, Ashok calls me Wally as everyone does. So, I said: "Wally, what is new in Reuters." He replied' many things, many things. In the last decade, we have added ten new stations. We are trying furiously to digitalise as many of our operations as we can. This has meant we have been able to diversify and expand the scale of our operations by around 90% in the same period. We have also cut costs by 60%. All in all, Reuters is now a leaner, meaner and more efficient organisation than we were a decade ago." I expressed my appreciation for what was a huge achievement. He said "We really no option if we are to continue to stay ahead of the competition globally.

I then asked young Ladies what they were doing. One of them said she was a Merchant Banker, while the other, said she was doing Art.

By then, it was time to go to dinner; Pamela began with the usual concern of a hostess when a guest of unknown eating habits arrives not only for dinner but to stay overnight. I tried hard to put her at ease by saying, "Please don't worry about me – I eat everything-beef and pork included." At my remark, Pamela appeared to relax a little. She said it is good to hear that, but I have played safe by marking Chicken this evening. I said, that is fine by me. So, we had mushroom soup, roast chicken and vegetables and Lemon Souffle.

The matter of food settled the Coles asked about my parents.

I told them what my parents were doing. When I finished, Pamela said, "My God, what talented and successful Parents you have Ashok, You are a lucky man." I agreed with her fully.

I then said "Wally, as the Boss of a Global News Agency like Reuters you must do a lot of international traveling. How come you have never come to India? Or is it that you have come but have not let your dear chum of long-standing G. P. about it." He said, I do undertake a lot of international travel but, alas nothing has taken me to your great country. Ashok, I regard your father G. P. as one of my closest and dearest friends. That is why you are here with us today and why we are all so happy to have you with us. Do you really think I would even plan a visit to India without first consulting G.P. about the matter? Never "Wally seemed genuinely upset. So I tried to soothe his feelings by saying no, no Wally. All three of us are sure you would have consulted him.

Again trying to change the subject, I said: "Wally and Pamela, my plan regarding London and Cambridge this time is to take a surface train from Liverpool Street around Noon, so that can get to my college by around 2 p. m. can you kindly check from the Railway Time Table if this would be possible- it was the pre Internet era, and so Wally brought out the Railway Time Table and started looking for trains to Cambridge from Liverpool Street. After a few minutes of study, he said Ashok there is a fast train to Cambridge from Liverpool Street departing at 12.15 p.m. Running time, 1 hour and thirty minutes Would that suit you Ashok. I said "Perfectly" However, as I have quite a lot of Luggage. So, I would like to take a taxi from here. When should I leave here? Wally said "Ashok, as you have Luggage I suggest you leave here by Cab at 11.30 a.m. At this both the girls said, "Daddy, we will take uncle Ashok to Liverpool Street Station and put him safely on the 12.15 train to Cambridge" I remonstrated "That is very sweet of you ladies, but I do not wish to trouble you." But they insisted. We'll all leave at 11.30 p. m. I said "How very kind of you. I do appreciate it very much. "By then it was 10.15 p. m. Noting that, Pamela said, I suggest we now all call it a day. She went on to say Ashok, have you had a proper look at your room. Is there anything else you need" I said, I had checked my room, and everything was fine. I then asked when the Coles rose in the morning. Pamela said. Actually, we rise at different times, but as you must be tired, I will wake you at 7.30 a.m. and give you some hot tea. Would that be O.K" she asked I said "Absolutely Perfect." We then said Good Night all around and retired to our rooms.

Next morning everything went like clockwork. I was woken at 7:30 a.m. by Pamela and given Tea. Then breakfast at 9 a.m. As Wally was understandably in a hurry to go to the

office, I took leave of him with a warm embrace and mumbled à million thanks to that wonderful Cole. There were tears in both my and Wally's eyes as we parted.

After fully finishing my packing, I rang up Porter's lodge at Corpus and informed the porter that I would be checking into the College around 2.30 – 3.00 p.m. that afternoon. After checking and confirming that my name was on "the New Boys list," he said that would be O.K. It was September 26, 1960. I then took leave of Pamela with profuse thanks. I then gave her the little gift which my mother had given me as "the gift for the Coles." We embraced each other warmly. The girls called the Taxi; we went down to the street level my luggage was loaded into the Taxi, and off we want to Liverpool Street station. There was another tearful bye bye there. All three of us took my considerable baggage to the concerned railway platform. But even then the girls would not leave. "We will leave only when all your baggage has been loaded in the train." They said the train came to the platform. My luggage was loaded, and I was seated in the correct seat in the correct compartment. I then kissed the girls on their cheeks, and they left me after the last embrace.

As I put my foot down on the railway platform at Cambridge, I knew that a new chapter in my life was opening. I collected all my luggage hailed a cab, said "Corpus Christi College Please" and sat back in my seat. My thoughts instinctively went back to my parents – wonderful parents particularly my wonderful mother' who had made so many sacrifices in order that I may do well in life. My reverie was broken, by the Cabby's saying "Corpus for you Sir. I paid the fare and gave him a good tip. I then said:" could you please help me take my rather voluminous luggage to the Porter's Lodge looking down at the tip he said "With pleasure Sir. Then I asked the Porter whether there were any formalities or paper work to be done now. He said "No, Sir," you are in room No. F-4, i.e., the fourth room in F staircase. Come, I will help take your luggage to your room." So both of us trooped up to F-4. He kindly helped me take my luggage one flight of steps up and into my room. I then asked him what about the dining/eating arrangements were. He said the kitchens would open only in the morning of the next day, i.e., the morning September 27. "As you may know, Sir, Term starts only on October 3," Said the porter Lectures start on October 5. So, I am afraid you will have to take your dinner out tonight. But Breakfast will start at 8 a.m. tomorrow morning. Breakfast timings are 8.00 a. m. to 9.30 a.m. "I thanked the Porter and put a substantial tip in his hand and said. "Thank you very much, Sir. Good Night" he said.

I unpacked enough to go to bed and dress appropriately in the morning.

I watched around the main sections of Cambridge quite a bit. Then, I found a small restaurant called the Whim It was open. They offered Welsh Rarebits, Grilled san sausages Green Salad and a sweet called Trumping-ton Pudding named after the main street of Cambridge, Trumpington Street. I went in and had a good dinner which was also reasonably priced. I never knew then that the Whim would soon become a place for good and frugal dinner outside the college. I then went back to my room, changed into my Pyjamas increased the Central Heating slightly and went to bed for my first night sleep at Cambridge University.

The next morning, I called on Mr. Michael Mc. Crum, the senior tutor of the College. Mc Crum, who had commanded a Destroyer in the Second World War received me warmly and said." I hope you will have a happy stay at Corpus." Later that day I did likewise with the Nobel Prize-winning physicist Sir. George Thomson who was the Master (Principal) of the college. I then walked around the famous Cavendish Laboratory. Little did I know then that I would work there myself. I did more on the spur of the movement, I walked into the Radio

Group and knocked at the door marked Martin Ryle. Ryle, who was in the room, looked up and said "Yes" I introduced myself and said I have come to Cambridge to do Radio Astronomy under you. He asked me what my background was. I gave him my background. After listening to it, he said "Well, you are the kind of person we need. Stay in touch with me as you go through your tripos (B.Sc. Hons Degree) and we will see. Normally, the Cambridge tripos is a three-year course. However, in the case of students who have done a three-year Honours course in a foreign university, Cambridge permits them to get the Honours degree by writing only Part II of the Tripos in two years. With my B.Sc (Hons) degree from Madras University under my belt, therefore, I did only Part II at Cambridge.

As I had to do my Tripos degree examination only at the end of the second year, I went to lectures given by such luminaries as the Cosmologist Professor Fred Hoyle and the Biologists Perutz and Kendrew. The latter two, both working at the Medical Research Council Laboratory at Cambridge, later got Nobel Prize.
My first friend at Cambridge was a Sardar called Rahul Singh, Rahul, who was studying History at King's College, was the son of the Famous Sikh scholar, novelist and writer Khushwant Singh. When our family was in London in 1948-50, and Krishna Menon was our High Commissioner to the UK, Kushwant was his Press Adviser.

Rahul and I got on famously, and he was the first friend of mine to whom I introduced my wife-to-be, Vibha Nayak who was studying Geography at Newnham College.

At that time, there were several notable Indian Scholars at Cambridge. There was the noted Historian, Professor, Anil Seal at Queen's College and the already distinguished economist Professor Amartya Sen at Trinity. Vibha and I saw a lot of both of them Vibha and Amartya's wife Nabaneeta, who was a noted Bengali writer, got on famously.

My Tutor at Corpus was Dr. Thomas Faber an outstanding Low-Temperature physicist working at the famous MOND Centre of the Cavendish Laboratory In 1960, the year I started working with him, he was just 40, but had already been awarded the distinguished Scientist Prize by the University. Two years later, at the very young age of 42, he was elected a Fellow of the Royal Society of London, Tom who belonged to the family who owned the famous international publishing company, FABER and FABER was a superb teacher and an able Tutors. His lectures were lucid, and as a Tutor he made his student think and think along un-conventional lines.

Another brilliant Scientist also working on Low-Temperature Materials at the MOND and a fine teacher was Professor Brian Pippared who, at the time he was teaching me Thermodynamics was also an F.R.S.

A fellow Indian scientist who was up at Cambridge when Vibha and I were doing our undergraduate work was Jayant Narlikar. He was working for his Ph. D. with the famed cosmologist, Fred Hoyle. Narlikar went on to make major intellectual contributions in the application of Hoyle's Steady State Cosmological theory to Radio Galaxies. He later came home and researched at the Tata Institute of Fundamental Research at Mumbai and the Inter-University Centre on Astronomy and Astrophysics at Bengaluru.
I played both Cricket and Table Tennis for the University against Oxford and got a Blue in the Former and a Half Blue in the latter.

When the summer vacation of 1960-61 came around, I left for Peking where my father was still Ambassador, but this time my journey was by air.

My old Yugoslav friend Vlado Sestan was still there, and we continued our treks to famous Confucian and Tauist Monasteries and Temples. As in my 1960 vacation, I gave lectures on Cosmology and Astrophysics at both Peking University and Tsin-Hua Technical University also in Peking.

My father's three-year term in China was coming to an end (April 1958 to June 1961). He decided that he should lay down office and leave Perking on June 21 and return to Delhi The night before he (accompanied by my mother and me) were to leave Peking we were invited to Dinner by the Chinese Foreign Minister, the formidable Chenyi, a full member of the Central Committee of the Chinese Communist Party and of the Committee's Political Burough in his personal residence in the Compound in which all of China's top leaders lived, called Zongninhai Such farewell dinners for departing Ambassadors were rare; for the farewell dinner to be given by the Foreign Minister of China was even rarer. Indeed, it was unheard of. When we arrived at Chenyi's house at the appointed time, of 7 p. m. Chiang Wen-Chin, the Director of the Asia Bureau of the Chinese Foreign Office who was, in a sense, the counterpart of my Father was already there and surprise of surprises along with his wife! So was Cheny's wife. After a little stiffness at the beginning, soon, everyone,relaxed and the three ladies got into animated conversation. As for the men, they also started the light conversation.

Then, suddenly, there was a stir, we soon realized the reason for the stir. Who should come in but Prime Minister Chou-en-Lai himself? As soon as he entered the room, Chou went straight to my father shook his hand warmly and embraced him. As soon as Chou-in-Lai had settled down, the famous ultra-strong Chinese Rice wine was served. The four men then discussed everything under the Sun except Sino-Indian relations! Chou was in a jovial mood cracking traditional Jokes which Chang-wen-chin translated for us. Then, almost exactly 45 minutes after he came in, Chou picked up what was clearly a gift and presented it to my father with much aplomb. "Please open it Mr. ambassador", said Chou in perfect English. My father did so and out came a beautiful deep green. Jade Rui. In China, a Rui is a good luck symbol. Then to the astonishment of everyone present and above all the Chinese, Chou said, again in perfect English: "Mr. Ambassador you have been long enough in China to know what a Rui is. It is a symbol of good luck. May you have the best of luck in the rest of your life and may you work hard to improve Sino-Indian relations "So saying, Chou slipped out as unobtrusively as he had slipped in.

When Chou left, the dinner began, I counted 22 dishes in all. Then came another surprise. The entire conversation –the Chinese ladies included was in perfect English.

As soon as the dinner ended, Chenyi , and Chiang wen Chin became serious Chenyi said, Mr. Ambassador, Comrade Chiang has a couple of requests for you.

Chiang opened by saying: "Our information is that Prime Minister Nehru will be attending this year's UN General Assembly Session in September (1961) as usual. However, after that, he will be on a State Visit to the USA as the guest of President Kennedy. Our request is that Mr. Nehru uses his good offices to request with President Kennedy that, to defuse tension in the Taiwan Straits, the President agrees to a reduction in the number of patrols by the US

seventh fleet in the Straits. For our part, we are willing to practically cease our shelling of the islands of Quamoy and Matsu located in the Straits!

My father was speechless. On the one hand the Chinese Media was attacking Nehru personally in vitriolic terms bordering or insults every day and Chinese incursions all along our common Border had reached new heights and here was the Foreign Minister of China as it was clear that Chiang was really speaking on behalf of Chenyi requesting Nehru to help solve or at least to drastically reduce the intensity of the most serious dispute between China and the USA! What atrocious arrogance and perfidy.

With the sternest demeanour he could muster, my father turned and looked at Chenyi and said "Excellency, I will convey the request of the Chinese Government to Mr. Nehru."

Chiang then moved to his second "request." The request was for Mr. Nehru to again request President Kennedy for a Time Table for the official recognition of the People's Republic of China by the USA. My father again said he would convey Cheny's second request also to Mr. Nehru.

After some general conversation a while, my father stood up, shook Chenyi's hand (but not warmly) and said "Excellency it is now 11 p.m. and so my family and I would like to thank you and your wife for a wonderful evening. I hope we can receive you in India at an early date".

In the car going home, my father conveyed Chenyi's two "requests" to Mr. Nehru. My mother was shocked beyond words.

I learned later from my father that when he conveyed Chenyi's "requests" to Nehru on his return to Delhi, the old man exploded.

All three of us took a plane to Hong Kong the next day, June 21, 1961. From, Hong Kong my parents flew to Delhi while I took a flight to Rome where Vibha was to meet me after a holiday in Greece. I arrived in Rome on June 23, and, as planned Vibha came to my hotel later in the day.

Both of us then had a two week holiday all over Central and Northern Italy, then took a boat ride down the Rhine in Germany, spent five days in Holland and returned to Cambridge on the first of July.

The Academic year 1961-62.Was absolutely crucial for me as I would have to take my B.Sc (Hons) Tripos degree at the end of that year. So, starting July 1961, my routine was work-be with Vibha-work. I must have worked 7-8 hours a day right through the Year. However, I kept in close touch with Martin Ryle throughout the year.

My many friends in Cambridge who, on the rare occasions I met, them ask me: "Where are you Ashok? We don't see you around at all." My answer always was, I am working hard on my Part II of the Tripos Exam due in April-May 1962. However, my sustained hard work finally paid off. I got a first in my Tripos exam.

As soon as I got my results in June 1962, I went straight to Martin and gave him the good news. He congratulated me and said "Your Fellowship is ready. When do you want to start? I

replied: “At once” It was thus that, I joined the Radio Astronomy Group in the Carlndish Laboratory and worked at the Mullard Radio Astronomy Observatory (MRAO) as soon as I completed my B.Sc (Hons)and MA in Physics in May 1962. After many discussions with Ryle and his senior colleagues in the MRAO – Antony Hewish, Graham Smith and John Bald win – all of whom, like Ryle, of course, were already Fellows of the Internationally Famous Royal Society of London, it was decided my research subject would be “The Polarisation of the Radio Emersion from the Centre of our Milkyway Galaxy at 610 Mega cycles a frequency band internationally allocated solely for Radio Astronomy. The “equipment” I was to use to study the above problem was a World War II vintage 1945, Radar Dish Antenna, a collection of highly sensitive receivers ‘which had’ been bought from the U.K. Army disposals. I was also required to design and build and test the electronics myself. I did that with considerable ease and in a time so short that Martin himself was surprised.

I then began to test the complete system – antenna, receiver and connecting cable. I then pointed the antenna at a very cold object radio wise viz. our Moon. That gave me a base line. I then pointed the antenna at the most powerful radio source in the Northern Hemisphere viz. the galaxy Cygnus. That gave me a “top line,” i.e., the other end of the scale. I then designed, built integrated and installed the polarimeter – a device for measuring the degree or percentage polarisation of the incoming radio waves. Starting around June 1962, I built up a large and systematic data base by the end of the year.

However, in early 1963 a totally unexpected development took place. We were testing out a powerful new radio telescope, later to be known as the Ryle Telescope. It consisted of three 60 foot diameter dishes of very high surface accuracy-technically of 1 cm root mean square (r.m.s.) accuracy. It was, at that time the most sensitive Radio Telescope in the world. Suddenly, exactly at 1 a.m local time GMT, a powerful pulsed radiation came on, driving all our sensitive receivers to shut down automatically. Exactly 24 hours later, the same phenomenon occurred again. Then it cured again a further 24 hrs later. All of us graduate students then got together and went to Martin and complained that, as was a technical term used “we were losing sky,” i.e., that the patch of sky we were losing each day, we would get to see only the next year, i.e., 365 days later. Martin said “You boys –there were no girls in our group-have no need to worry. I am taking action on the matter.

What did Martin do? He rang up his old friend Professor Bernard Lovell, the Director of the Manchester Radio Astronomy Centre (MRAC) and enquired whether MRAC was facing the same problem. Lovell confirmed that they were. So, the two Observatories prepared a joint plan to identify the source and determine its characteristics. Over the next three nights, both radio astronomy observatories tracked the source together. They then exchanged the data each had collected. We at Cambridge developed a piece of computer software to analyse the characteristics of the source. When the source came on again the next night, we ran the software programme, and a remarkable thing happened. The Teletype Mechanic – we had no high-speed line printers in those days. Printout:

Peak Power of the Radar 20 MW.

Pulse Repetition Frequency 10/Sec.

Martin came to the Teletype Machine, took one look at the Printout, tore off the paper carrying the above data and said: “Shut Down, Everybody go Home”.

Of course, “home” was the last place we graduate students were going to! We went to the nearest pub, bought each other a round of beer, and started calculating what the (now obviously Radar) source was. After half an hour’s work, we concluded that there was only one Radar in the world which had the above Peak Power and Pulse Repetition characteristic viz. NATO’s Ballistic Missile Early warning Radar located at the huge US Air Base at Thule in Greenland. What the Americans were doing was trying to see if they could extend the already long range of that Radar, viz., 1000 KMs, by bouncing the Radar’s signals off the Moon. Now, we all knew that as per an international treaty signed by all major countries in 1958, the Moon was to be kept “Radio Quick,“ i.e., not do precisely what the Americans were doing. So, what had come off our, Teletype were the key characteristics of the Western world’s most secret radar. With this established, we, graduate students went home thrilled to the core.

The next morning, Martin called the Canadian, Australian, Nigerian and Indian (me) graduate students to his room and said: “you boys saw nothing last night. You are not to mention anything about it to anyone” he directed. We all remonstrated, saying we had lost almost a whole week of the sky. He said “Yes I know I am having the matter taken up by our Foreign Office with the country concerned. I said, “Martin, we all know what that radar is. It is the BMEW s Radar of the USA located in Greenland, and the USA is trying to extend that radar’s already long range by bouncing its emissions off the Moon so as to overcome the range limitation flowing from the earth’s curvature. We (the graduate students) also know that the USA doing so is a violation of the International treaty all our countries have signed Martin replied: “I will neither confirm nor deny what you have said Ashok.”

Later that morning, at the usual tea break (11 a.m.) in the workshop of the Radio Group in the Cavendish, I went up to Martin and said “Martin, regarding the BMEWs, you called in only us foreign graduate students. What about the British students? He said you are foreign nationals and so I have no hold on you. As for the British students “They do not have to be cautioned as they have been keeping their mouths shut from Mother’s Milk. I remember thinking as I went back to my work place in the laboratory of the Radio Group. “ It was on British Mother’s Milk that the giant British Empire which once covered two-thirds of the world was built and maintained from the 1850s to the 1950s.

I finished my research and wrote up my M.S. thesis by early 1984. My presentation of my work to the whole Radio Group was a great success based on my research thesis Martin, and I published two long papers in the internationally famous British Journal, Nature, if the letters to the Editor following the publication were any indication our papers well received by the global astronomy community. Martin wanted me to stay on and do my Ph.D. with him as my Supervisor as had been the case for my M.S. I readily agreed.

However, meanwhile, two things happened. My mother fell seriously ill with kidney failure in mid-Jan 1964 in Karachi (the then capital of Pakistan) where my father was Ambassador. She had to be flown post-haste to London and admitted to the Hammersmith Hospital there. After six weeks at Hammersmith, the doctors opined that, as both her kidneys were badly affected, there was not much that they could do and so we should take her back home with the recognition and acceptance that she would be ”an invalid for life.”

So, my father came from Karachi to London, and he and I and the Medical Adviser in the High Commission in London took her back to Delhi in August 1964. I explained to Martin how these personal problems of mine had necessitated my now being unable to accept his

very kind offer to stay on in the Radio Group of the Cavendish to do my Ph.D. He was very understanding and warmly said: “Come back to us as soon as you can Ashok.”

My mother gradually recovered in Delhi’s Safdarjung Hospital under the treatment of the venerable Colonel R. D. Iyar. So much so that she was able to return to Karachi by the end of 1964.

My wife-to-be-Vibha and I and my father and her parents acutely conscious that my mother may not last long decided that we should get marriage at earliest. It was thus that we got married in Vibha’s hometown of Nairobi in Kenya. The wedding took place on April 16, 1965.

Meanwhile, I got admission with a handsome full fellowship to do a Ph.D. in Radio Astronomy, from Harvard University in the USA. Harvard also had a powerful Optical Telescope, and so there were many exciting investigations combining both Radio and Optical Astronomy In parallel, Vibha, my wife, got a fine fellowship to do a Master’s in Education at Harvard University.

However, given my mother’s health, we gave up both of our higher educational programme and returned to Delhi, so that we would not be too far from my mother in Karachi.

I got an Assistant Professorship in the newly established private Technology University. The Birla Institute of Technology and Science (BITS) at Pilani, Rajasthan 100kms from Delhi and Vibha joined the Birla Public School at Pilani. When I took possession of my new Fiat Car in October 1965, we left the home of a very close friend of my father so close that I called him “mama” or uncle-Mr. C. Subramanian who was then ushering in the “Green Revolution” as Minister of Food and Agriculture in the Government of Prime Minister Lal Bahadur Shastri, I drove my brand new Fiat Car into the Rajasthan Desert.

As it happened our first house in Pilani was the last house in the BITS Campus with desert on three sides! Later, we moved into a much better house in the campus of Vibha’s Birla Public School.

At the Physics Department of BITS I built a brand new optics Laboratory for M.Sc. students which was greatly appreciated by the Head of the Department Professor Sarin the Dean of the Science Faculty Professor Tiwari and as also by the Director of BITS, Professor, V. Lakshmi Narayanan.

During those monthly visits, G D Babu made it a point to invite only the foreign-trained Indian faculty to have lunch with him and lesser members of the Birla family in the beautiful Birla Haveli. The purpose of the invitations was to “pick- the brains” of these Birla-assessed. “supermen” (sadly no women) about how to improve BITS. After two or three such visits, I asked G D Babu why he was not calling any of the locally trained faculty. He replied that he felt the foreign trained specialist were superior totally incorrect assessment, but one only to be expected from a caste hierarchy-based G D Babu.

Next door to the BITS campus was the Central Electronics Engineering Research Institute (CEERI) (a CSIR Laboratory) Making friends with the highly competent Director of CEERI, Dr.Amarjit Singh; I Said I would like to do some Radio Astronomical Experiments at CEERI and if Singh agreed. I would secure a Research Grant from the CSIR to do my work. Amarjit

was very happy. I then told Amarjit that would welcome any CEERI scientists collaborating with me in my work. Amarjit, whom I got to know very well in later years, reacted very positively saying I could freely use all the facilities of CEERI. He also gave me the names of a couple of middle-level scientists who he knew to be interested in Radio Astronomy and so should collaborate with me in my work. I readily agreed.

Over the next four months, I set up a complete experimental system to enable measuring the polarisation of radio waves in the 325 MHZ Radio – Astronomy reserved band 320-330MHZ. After extensive testing, the total Antenna and Signal Processing Electronics and on-line computerized data processing system went operational on the 16th of April 1964. My hypothesis, based on the intensity and frequency distribution of the Synchrotron Radiation limited-by high speed Electrons in the Strong magnetic fixed at the Centre of our Milky Way Galaxy, was that as Pilani was at a latitude of 28 degrees north while Cambridge was at 52 degrees north, the intensity of the polarised radio waves picked up by my CEERI based "Electronic Detector, should be approx. 100% greater than at Cambridge. I then worked out a theoretical explanation for the result in terms of the theory of Synchrotron Radiation. Based on these results I published a paper in the world famous seine Journal Nature.

Again, driven by the criterion of being close to my mother despite her health improving to such an extent after the shift from Karachi to New York, I was able to get a quite munificent Fellowship from the Carnegie Endowment to get another Master's Degree in the new / emerging field of teaching and research called S&T Policy Studies in the School of Social Sciences at MIT. Concurrently Vibha did likewise in the area of Education at Harvard University. Both our universities were in/around Boston.

So we moved to Boston from Pilani in September 1965. This offer came at just the correct time, as my father G. P. had meanwhile become our Ambassador to the United Nations in New York and my mother, now much better, had begun to teach English at Columbia University, in New York City.

So, on February 1, 1966, Vibha and I left Delhi for New York via London. We spent two days in the U.K. London – one with the Coles in London and the second with Martin and Rowena Ryle at their beautiful home in Cambridge. Both groups were delighted to see them and us.

We landed in Boston on a beautiful Sunday and took an apartment on the Boston side of the Charles River.

I joined the School of Social Sciences at MIT and began taking a course in Sociology, Political Science, and International Relations. I also made a courtesy called on I Thiel de Solla Pool, Chairman of the School. My M. S. Supervisor was Professor Ergine Sholnikoff who had joined the S&T Policy Program at MIT after having served for five years as a Senior Staff Member to Professor Jerome B. Weisner, S&T adviser first to President John F. Kennedy and then to President Lyndon Johnson.

In parallel with taking the courses mentioned earlier, I began thinking about and discussing with Sholnikoff about my thesis topic.

In the USA, it was the practice that major government R&D laboratories owned by major government agencies such as the Department of Defense and the National Aeronautical and

Space Administration (NASA) although, owned by the agencies, were operated and managed by leading technical Universities such as MIT and the California Institute of Technology (CIT). This was on the grounds that the organisational culture and managerial practices of the latter were more flexible and so better suited to the culture of the laboratories the second issue at that time was the growing criticism in the US Congress that the major Technological Universities were not contributing enough by way of "Spin-off companies" to the local economies in which they were located. So, Sholnikoff suggested that my thesis topic should be "The Impact of a Major Government Laboratory on the local Economy in the Boston area."

Accepting Sholnikoff's proposal, I chose the largest and most significant of the Government Laboratories run by MIT viz. the Lincoln Laboratory. Lincoln was the United States major Radar Lab dealing with all types of Radars - Ground-Based, Airborne, Ship Borne and Satellite-borne Sholnikoff spoke to Dick Wilson, the Director of Lincoln, about my back ground and briefly the study of Lincoln I was proposing to undertake.

With such a strong introduction I went and met Wilson, showed him my Summary CV and a letter from Ryle.

Wilson said he could assure me that everyone in Lincoln would extend to me all the help I needed. He also designated an Assistant Director of the Lab Charles Kendrew who would be my friend, philosopher guide for in my study.

I started work on January 10, 1967. After a long talk with Kendrew, I first worked on preparing an inventory of all the companies which had "spun off "from Lincoln in the preceding ten years. I then prepared a distribution of the companies by size – both Sales Volume and no. of employees out of the total of 30 spin-off companies, I chose 10 with the entire size distribution from the largest to the smallest covered in the 10. Then, I started the interviewing with a strong focus on (a) why they had "spun off," (b) what Lincoln had contributed to each entrepreneur in the Spin-off and how the spin-off was doing commercially viz. how many were making money and how many were not.

I then went and met the CEOs and Senior Professional staff of each one. While doing so, I realised that the 10 – indeed all the 30 – were located on a near circular road around Boston designated Route 128.

After the visit, I prepared a structured questionnaire tailor made for each of them faxed the questionnaires to them giving the 10 one week to complete the questionnaire and fax it back to me. I then spent ten days studying and analysing the excellent replies I had received. Based on such a study, I prepared a list of questions to be put by me in a meeting with their CEOs. The meetings usually lasted for about 2 hours in each case.

Then began the detailed analysis such analysis revealed some interesting features of each one

a) The role of the CEO had been crucial in each case.
b) The "Back-up" from Lincoln was the second most important feature.
c) Product selection was the next most important feature – e.g. whether it was based on a formal market survey or not.
d) Help from the Boston Chamber of Commerce was also a crucial factor.

With these tentative findings I did two things:

1) Interviewed the Head of the Division in Lincoln from which the CEOs came
2) Had a long meeting with the CEO of the Boston Chamber of Commerce and collected a vast amount of literature on the industry in the Boston Area as a whole.

Finally, I did an exhaustive survey of both the formal literature on Spin-off-Companies and the only two previous studies which had been done on my subject and Magazine and News Paper articles. With all this material I started writing the thesis, punctuated only by attending the wonderful lectures of the Technology and Society Programme at the John F. Kennedy School of Government, the main figures of which were: Don Price, Emmanual Mesthene and Harvey Books.

I finished my 300 Page M.S. Thesis in October 1964. It was the practice in Cambridge University that when a graduate student had completed his/ her thesis, he/ she was required to present it in a formal seminar to a group composed of the complete faculty body, and graduate student body. Accordingly, I did so on October 28, 1964. My presentation and the question and answer session which followed were highly appreciated by one and all. Martin and the other senior faculty then urged that I publish the main findings of my thesis in the prestigious Journal of the US Academy of Arts and Science called Science. I took their advice and submitted a 1500 word paper in November 1964. The paper was published without any changes in the January 1965 issue of the Journal. If the number and quality of the letters to the Editor were any indication, the paper was a great success.

In February 1967, Vikram Sarabhai, then Chairman, Atomic Energy Commission (AEC) and Chairman Indian Space, Research Organisation (ISRO) came to MIT. He was a Cosmic Ray and Space Scientist of International repute. Sarabhai had had a long association with MIT with many professional and a personal friend there going to MIT annually was an important part of his annual schedule.

Sarabhai contacted me in Boston and invited me to breakfast at the Faculty Club of MIT. He told me that he had now been Chairman AEC and Chairman ISRO for about a year. His experience over that year had brought him to the conclusion that he badly needed a Special Assistant. The kind of person he wanted was one with a good knowledge of Physical Science-Physics and Electronics, in particular, combined with S&T Policy expertise and experience. After considering several persons, he had zeroed in on me. Would I like to take the job?" I said Vikrambhai I would be honoured to join you". We then discussed how soon I could join. I said on June 1 (1967). The breakfast ended with his saying "You will be hearing formally from the Department of Atomic Energy soon.

When I returned home and told Vibha of Vikram's offer, she was also thrilled. She recalled, how her father, Vasant Nayak had tutored the five daughters and two sons, Vikram a Gautam of the famous Ahmedabad-based Calico Textile Mills patiarch Ambalal Sarabhai in the late 1930's – indeed at the same time that my mother SuburMugaseth was tutoring them in English. She added that the timing of my joining VikramJune 1, 1967 also suited her well, as she would have completed her M.Ed. at Harvard by end April and after going to Nairobi to spend May with her parents, she would join me in Bombay by end May.

I then told my father in New York, and he was also thrilled, my only regret was that I could not tell my mother, as she had passed away in October 1966.
We stayed on an interim basis in a very nice flat in the Hindu Newspaper's Guest House in Bombay until we got our own flat.

Apart from work on Electronics – first in the Secret aria of the Electronics Committee of the Government of India chaired by Sarabhai and the subsequent full-fledged Electronics Commission chaired by Prof MGK Menon and some of the important institutions set up by the EC – the National Radar Council and the National Micro Electronics Council, the setting up of the National Informatics Centre (NIC) and the Computer Maintenance Corporation the Semiconductor Complex Ltd (SCL), the Electron Tube Complex and the National Silicon Facility.

First, as Special Assistant to Dr.Vikram Sarabhai, the then Chairman, Atomic Energy for three years (1967-70) and then as Special Assistant to Prime Minister Indira Gandhi, I was closely involved in all the above policymaking , Planning, Programming, and Institution Building.

In 1968, I Proposed to Sarabhai that we set up a Programme Analysis Group (PAG) as Policy Planning and Management Services Unit of the AEC. Vikram readily agreed and my paper proposing the setting up of the PAG was approved by the Commission. As Director of PAG, I then went out to staff the unit with professionals who had both a B.Tech in Physical Sciences followed by an MBA from one of the better Indian Institutes of Mangement. By the time I left the DAE to become Special Assistant for S&T to late Prime Minister Indira Gandhi in June 1970 the PAG had a strength of 10. It had worked out in detail and proposed to the AEC five policy papers covering he following matters.

a) A Technology Transfer and Intellectual property Policy and Practices for the R&D Centres of the DAE
b) Cost of Nuclear Power
c) How should the DAE actively promote the generation of "Spin-off" companies from its R&D centres.
d) How to steeply increase interactions and collaborations between DAE's R&D Centres and the Universities and other Higher Educational Institutions.

The Sarabhai – Sethna Battle

Right from the time, Sarabhai joined DAE as Chairman AEC (February 1966) Sethna who became the Director of the Bhabha Atomic Research Centre (BARC)the largest R&D Centre of the DAE did everything possible to make life difficult for Sarabhai First of all, he practically prevented Sarabhai from entering BARC. Second, he did everything possible to position himself as "the Self Reliance Man- the Do it in India man, vis-a-vis Vikram penchant to keep drawing on foreign expertise and foreign collaboration. Thirdly Sethna went out of his way in meetings to score technical points and shoot down Sarabhai's proposals not only in internal meetings but in meetings of the Atomic Energy Commission itself fourthly to create a totally baseless and indeed dangerous for the entire Atomic Energy Programme schism between "engineers" like himself vis-à-vis "scientists" like Sarabhai. Fifthly to publicly denigrate Sarabhai appointees in key positions in the programme like A.B Shah whom Vikram brought into the programme and made him Chairman of the Atomic Power Authority, the body to oversee the nuclear power programme from the private power company, the Ahmedabad Electricity Company.

I, P. N. Haksar Principal Secretary to Prime Minister and PM herself watched these tragic developments with increasing trepidation. Finally, it came to pass that they could take it no more; the whole nuclear programme was suffering deeply.

So, in early November 1971, Indiraji sent for Sarabhai and told him somewhat bluntly that he (Vikram) would have to give up his Atomic Energy Portfolio and concentrate wholly on being Chairman ISRO and driving the Nation's Space Programme to great heights.

Sarabhai was mortified. He felt the PM's decision reflected a lack of confidence in him. So, when a deeply dejected Sarabhai reached his suite of rooms in the Ashoka Hotel in Delhi he rang up his old friend and Mentor G. Parthasarathi and told G.P. – Indiraji's closest adviser - of what had transpired. He then said "G. P. can I come and see you now. The older G. P. said "Vikram: please come; I will give you an excellent South Indian Meal. G. P. then rang up one of his closest friends in Delhi and a person who was also close to Indiraji – C. Subramaniam, Cabinet Minister for Planning and S&T who lived just opposite G.P., told 'C. S ' what the problem was and invited the latter also to the dinner.

When Sarabhai arrived at G.P.'s residence an hour later, he found C. S. already there for the next 3 hours – including over the one-hour long dinner, the two older men tried their best to disabuse Sarabhai of any concern that PM had lost her confidence in him. At one stage in the discussion, G. P. said: "Vikram if you go on like this you will kill yourself." It was 11 p.m. before, and much-better-feeling Sarabhai left G. P.'s home and went back to the Ashoka.

Both G.P., C.S. and I were after that so busy with the Bangladesh War that the next we heard of Sarabhai was that he had passed away in his sleep at his Guest House in Thumba near Thiruvanandapuram in Kerala State.

It was a big blow to me; Sarabhai was not just my Mentor but my "Scientific father. So, I rushed to Haksar told him I was going to Sarabhai's funeral in Ahmedabad, got a Special Air Force plane from Air Chief P. C. Lal and dashed off to Ahmedabad. When I arrived, I was met by a special car from the Space Applications. Centre of ISRO located in Ahmedabad and rushed off in it to Sarabha's home in Usmanpura. There, I condoled, with wife Mrinalibehen who was a family friend of 40 years standing and with Sarabhai's children, Kartikeya and Mallika. The entire ISRO – DAE family of Scientists-were there-SethanaRamanna, A S Rao, Brahm Prakash and MGK Menon.

After staying till the Cremation was over, I dashed back to Delhi. When I entered Haksar's Office, he was chewing his pipe. He said only one word: "Who"? By that question he meant "who should succeed Sarabhai to head the Space Programme, My answer was immediate "Satish Dhavan "Where is he" asked Haksar. I said," He is at his alma mater Caltech in the USA". Shall I, speak to him Haksar asked". I advised that it would be better if MGK Menon speaks to him. "Where is Menon," asked Haksar. I said he was at the funeral and so you can speak to him only tomorrow. Next day Haksar spoke to Menon. Menon said he would speak to Dhavan and get back to Haksar which he did. Menon's assessment was that Dhavan was agreeable, but needed a week to think about it. So a week later Indiraji wrote a personal letter to Dhavan inviting him to accept the position of Chairman Space Commission and Secretary, Department of Space. That vital letter was sent by a Special Diplomatic Bag from the Prime Minister's Office in South Block in Delhi to T.N. Kaul our Ambassador to the USA in Washington, D.C From there (the Embassy) it was taken by Counsellor of the Embassy –a middle to senior level Officer- and hand delivered to Dhawan at his residence on the Caltech

campus in Pasadena, California. When the Counsellor enquired of Dhavan whether he should stay or go Dhavan told him he could go and that he viz. Dhavan would send for him from Washington when he (Dhavan) was ready with his (Dhavan's) reply to PM.

About a week later Dhavan runs up the same Counsellor in Washington D.C. to say his (Dhavan's) reply was ready and he (the Counsellor) could come and collect it which the ounsellor did. Dhavan's reply then came back to us in PMO the same same way.

When PM opened the envelope, she found a six-page handwritten letter laying out a complete space profile from the current Sounding Rockets of the Ionosphere through the Scientific Satellite Aryabhatta the Remote Sensing Satellites. Dhavan called Bhaskara, to the Application Technology Satellite -6 to the APPLE to the SLV-3 our first Satellite Launch Vehicle to the Indian National Satellite (INSAT) to the Polar Satellite Launch Vehicle for Launching Sun-Synchronous Communication Satellites in Polar Orbits to, finally launching Geostationary Satellites called the Geostationary Satellite Launch Vehicle (GSLV).

Having read Dhavan's long letter, PM passed the letter to Haksar, saying ÿes," what Dhavan has laid out seems to be what we should be doing in Space". Haksar then read the letter and concurred with PM as I also did after I had read the letter.

It was then decided that Haksar should immediately write a short letter to Dhavan saying PM had seen his letter and had decided that what Dhavan had laid down in his letter was, what India should be doing in Space and asking Dhavan to indicate when he could take over as Chairman, Space Commission and Secretary, Department of Space, Haksar's letter which went out the same day was sent to Dhavan by the same route as it had come viz., via one letter-carrying Diplomatic Bag, Delhi – Washington DC. CALTECH.

A couple of days later, Dhavan telephoned Haksar to say he was honoured to take the job. Two weeks later, Dhavan returned to the Country, landing in Bombay. His objective in landing in Bombay was to meet J. R. D. Tata (who had been a colleague of Dhavan on the Atomic Energy Commission) and seek his (Tata's) advice on Dhavan taking up the Job; Tata strongly recommended to Dhavan to do so.

Dhavan then came up to Delhi and met Indiraji. The 20-minute meeting went very well. Dhavan laid down three conditions for his finally taking up the job. First, that the Space Commission and Department of Space should have the same kind of powers and responsibilities as did the Atomic Energy Commission (AEC)' Secondly, like the AEC again the Head- quarters of the Commission and the Department should, not be in Delhi but in Bengaluru, what with headquarters of the mammoth Hindustan Aeronautic Ltd, the National Aerospace Laboratory (NAL) of CSIR and the Aeronautical Development Establishment (ADE) and the Gas Turbine Research Establishment (GTRE) both of the Defense R&D Organisation Bengaluru was the Aerospace Capital of the country. Dhavan's third and last condition was that it would be difficult- indeed in correct-for him and the institution he was currently heading- the Indian Institute of Science (I. I. Sc) also in Bengaluru to suddenly and abruptly terminate a 25-year long association by his (Dhavan's) leaving it. So he requested PM to agree to there being a smooth and gradual transition of the following kind. Dhavan would continue as Director IISc for a three year period after he took over as Chairman Space Commission. However he would appoint as his successor the distinguished Materials Scientist Professor S. Ramaseshan as Joint Director and over the three year period Ramaseshan would take on more and more of the responsibilities of Director IISc so that by

the end of the third year, he (Dhavan) would cease to be Director IISc and Ramaseshan would take over fully. Prime Minister accepted all of Dhavan's three conditions.

After concluding his meeting with PM, Dhavan came over to Haksar's room, and the three of us had a long conversation on the next steps to be taken. It was decided that, as in the case of Electronics, the Cabinet Secretary, T.Swaminathan and I would prepare a note for the Cabinet Committee on Political Affairs (CCPA) (the "inner Cabinet") regarding Government setting up the Space Commission and Department of Space in the closest of consultation with Dhavan.

Through close interaction with Dhavan, Cabinet Secretary and I prepared the draft Cabinet Note by end February 1972. Then Haksar went over it carefully. Then Indiraji went over it for a day. The note was then presented to and approved by the CCPA on March 6, 1972, and the Space Commission and Department of Space were Gazette notified on March 15.

The Space Commission held its First meeting on April 7, 1972. The Members (part-time) of that first Space Commission were: Haksar, Swaminathan and Dr. Roddam Narasimha, the Director of the National Aerospace Laboratory (NAL) of CSIR. Its Member (Finance) was the Finance Secretary H. N. Ray. The (Full time) Member (R&D) was Dr.Brahm Prakash, till then Director Metallurgy Group of the Bhabha Atomic Research Centre (BARC).

The Agenda for that first meeting was quite short. The Commission decided that the Space Science and Technology Centre (SSTC) at Thiruvananthapuram be renamed the Vikram Sarabhai Space Centre (VSSC) and that the giant 35-meter diameter Satellite Earth Station of the Overseas Communications Service (OCS) located at Arvi, 60 kms from Pune, be named the Vikram Earth Station. The latter was done in honour of the fact that it was Vikram Sarabhai, as Chairman of the Electronics Committee of the Government of India, who stopped the import of that Earth Station and got it built at home in the teeth of opposition by the Ministry of Communications.

THE NCST AND THE S&T PLAN

Another major development of 1971-72 was the decision of Indiraji to agree to the proposal of Mr. C. Subramaniam - the father of the Green Revolution in Agriculture whom PM had made Minister of Planning and S&T in the February 1971 Cabinet that should go into a five year comprehensive, multi-sect oral plan for S&T in Development and Security Such a plan was to be drawn up monitored promoted and for implement by a 10-man Committee of some 10 of our best Scientists and Technologists This Committee was to be called, the National Committee for S&T Mr. Subramaniam and I as Special Assistant for S&T to PM then had along meeting at which we identified who the 10 should be having got a composition for the Members of the NCST so as to cover all sectors from Defense and Atomic Energy, from Chemical Engineering to Earth Resources, and Oil & Gas, Subramaniam sent a Note to PM for her approval which he got A distinctive feature of the NCST, which its predecessors, the Committee on Science and Technology (Cost) to Cabinet and the erstwhile Scientific advisory Committee to Cabinet SACC, was that NCST members were to devote 33% of their time to the work of the Committee.

At a public function held in Delhi's largest auditorium, Vigyan Bhavan the NCST was formally launched on October 9, 1971, by the then President of India, Mt. V. V. Giri in the

presence of Prime Minister Indira. As a very important function attends by both the President and the Prime Minister, the event received wide publicity.

The C. Subramaniam-chaired NCST then got to work. The Secretariat of the Committee was provided by the Department of S&T, the Nodal Department in the Government of India for S&T matters. However, 5 out of the 10 NCST Members also identified and appointed senior professionals in their respective areas called Project Coordinators. Then 24 working, Groups were formed each for one Ministry, e.g., Defense Electronics, Chemicals, and Pharma, Heavy Engineering, Oil Gas, Public Health Education, etc. Each Working Group was composed as follows – a senior representative from the Ministry corned., the Head of the Division in the Planning Commission dealing with that Ministry, the Head of the main operating Agency / Company in the sector, the head of the main R&D Laboratory in the area and two Scientists from the leading 11 T / university in the area.

The NCST members then started collecting a vast amount of data and information on their assigned Sectors, not only as it related to India, but from all over the world. The Planning Commission representative and the Ministry representative for the area analysed all that data. The same two persons were asked to prepare a Profile for the requirements of the products in the area up till 1978-79, the last year of the Fifth Five year Plan (1974-79) of the country with the S&T plan to (1974-79) be matched and coterminous with that plan.

Then the main operating Agency (in)of the sector and the Head of the Main R&D Laboratory (ies) on the working a Group were asked by the NCST Member Heading the Group to Prepare a "Technology Requirements Profile "to help the Various working Group in preparing their sector plan, I prepared a control. The document entitled: "Framework and Format for Sectoral S&T Plans.

The NCST as a whole met every two months to review progress and decide on future work. Then, in early 1972, the Committee decided to prepare a document entitled An Approach to the S&T Plan". This defined the policy frame for the Plan in all respects the last chapter of the document set out the goals of the Plan, in particular, the fact that the investment on S&T nation-wide would increase from 0.5% of GDP which it was in 1971-72 to a full 1% GDP in 1978-79, the last year of the plan. This document was then submitted for approve by Mr. C. Subramaniam. After a two hour meeting, Cabinet approved "the Approach" this was a milestone in the history of S&T policy-making and planning in the country.

Once a quarter, the full NCST also had a meeting with the Planning Commission so as to ensure that dovetailing of the rolled by Development Plan and the S&T Plan was on Track.

As 1972 and then 1973, the S&T Plan came to be formulated Sector by Sector. The NCST then did another thing which had never been done before. It analysed the 5th Five Year Plan proposals of the Department of Atomic Energy and in particular the composition of the Rs. 175 Crores which the, DAE had sought from the Planning Commission for R&D. The NCST then went through the Programmes and Projects in the Rs. 175 Crores which were generic, i.e., were not specific for Atomic Energy. When isolated these programmes and projects were found to involve an outlay of some Rs. 65 crores. The whole NC&T then had a meeting with the Atomic Energy Commission chaired by Homi Sethna. I was also invited to that meeting as S&T Adviser to PM Subramaniam said that while the NCST had nothing to say and would incorporate as such in the S&T plan the Rs. 110 crores of purely nuclear R&D, the

Committee would like to discuss the Non-Nuclear Programmes and Projects in the DAE, 5th plan proposals involving an outlay of 65 crores which were Non- Nuclear.

Sethna exploded as such a proposal had never been made before. But he could not annoy Subramaniam, as the latter as Minister of Planning would decide the financial outlay of the main Atomic Energy Programme So, after initially demurring, Sethna finally agreed that the projects and Programmes falling in the Rs. 65 crores would not only be analysed by NCST but would be decided on by NCST. The person in a spot was Raja Ramanna.That was cause, on the one hand, he was Director BARC, while on the other hand, he was a Member of the NCST and its Defense Sub-Committee – Ramanna R.V. Tahmanhar Director of the Defense Metallurgy and Research Laboratory (DMRL) assisted. Mr. Subramaniam when the latter had a meeting with Defense Minister Jagdivan Ram and the Scientific Adviser to the Defense Minister and Director General Defense Research and Development organisation (DRDO) Subramaniam 'main point to Ram again was that the latter should not look at the DRDO as his sole source of R&D MOD should supplement and complement DRDO by the capabilities of non-Defense labs as well Jagjivan Ram agreed although it had never happened before. This was historic.

By January 1974, NCST had completed the entire S & T plan Subramaniam then requested PM for a special meeting of the ('inner' Cabinet) the Cabinet Committee on Political Affairs (CCPA) to consider and approve the nation's first fully integrated multi-sectoral S&T plan as also the total financial outlay of Rs. 11,500 crores over the 5 years. The above figure would amount to 1% of GDP in 1978-79 assuming the economy. I grew at the 6.5% postulated in the Development plan by the Planning Commission.

An evaluation of the S&T Plan undertaken in 1980 revealed that, of the around 3,000 programmes and projects included in the plan, around 70% had been successful. A particularly important aspect was the approx. 300 International Patents which had been taken out by the various R & D Laboratories involved in the plan.

THE COST OF NUCLEAR POWER

In March 1972, we in the Prime Minister's office (PMO) received a draft Note for the Cabinet Committee on Political Affairs (the 'inner' Cabinet) seeking its approval for setting up the second unit of the Madras Atomic Power Project (MAPP-II) As in the case of MAPP-I, MAPP-II was also to be of 230 MW capacity. It was to be built wholly indigenously due to Export Controls imposed on us by all NATO countries.

As usual, I undertook a detailed analysis of the case: I found that in working out the cost of power from the project, the cost of the Heavy Water Moderator had been taken as follows. All the then existing six heavy Water plants were to be owned by a Departmental Undertaking (not a commercial company) called the Heavy Water Board(HWB). The HWB then leased not sold). The Heavy Water to the power projects, at a lease charge of 6% which was much less than the going interest rate of 14%. Similarly, the Nuclear Fuel for the Power plants was made by another Departmental Undertaking called the Nuclear Fuel Complex (NFC) whose capital investment was provided by the Government at an interest rate of 7%. Finally, the Capital Investment of the Power Project as a whole was to be covered at an interest rate of only 14% instead of the going commercial rate of 18%. All this meant that the entire capital cost of the power plant as a whole was massively subsidized by the Government at all levels.

I then worked out the Capital Cost of the project on a fully commercial basis. It came to30% more than what DAE had taken. So, I reworked the cost of the nuclear power on a commercial basis when costed on such a basis, the cost of power generated increased from the 4.8 P/ kWh claimed by DAE to Rs. 7.65 / kWh.

So, I took my analysis and the draft CCPA Note to Prof P. N. Dhar Economic adviser to PM. He fully agreed with my analysis.

I then drafted a letter from Professor Dhar to A.Bhaktavatsalam, the Additional Secretary, in DAE from whom the draft CCP A Note had come. After making a few minor changes, Dhar signed the letter, and we sent it off to Bhaktavatsalam.

Two weeks later we got a detailed reply from Bhakthavatsalam In which he tried his best to debunk our criticism. I then wrote up a point – by – point rebuttal of Bhaktavatsalam's reply and I sent it to Principal Secretary to PM P N Haksar who was also a part-time Member of the Atomic Energy Commission through Professor Dhar two days later, the Note came back from Haksar with the following Minute:

"Our Atomic Energy Programme has to move ahead. So the Note for CCPA from DAE may be kindly approved by PM. Meanwhile, I have no objection to the debate with DAE on the cost of nuclear power continuing ".

On the basis of that Minute by Haksar PM approved the DAE's CCPA Note.

When the file came back to me via Haksar and Dhar, I took it to Haksar and remonstrated with him. I said, "Sir you know DAE's Calculations are wrong. Nuclear power is not competitive with coal-fired power in our country today. Why are we continuing to pour our scarce capital into it". Haksar replied: "Ashok I agree with you I do not think we will ever have a large nuclear power programme. It is, I agree just too expensive. But, you know better than me that the plutonium we extract from the spent nuclear fuel from nuclear power plants has an end, use in addition to being fed into fast Breeder Reactors.

That is why we have to continue with our Nuclear Power Programme. I am sure you understand. Yes, I did. Haksar was alluding to the fact that the Plutonium could be used for making Nuclear Bombs.

THE NATION'S AIR DEFENSE PLAN

Based on the experience of the 1965 War with Pakistan, the Air Force drew up an integrated air defense plan. The IAF then presented the plan to the Defense Committee of the Cabinet (DCC) in April 1970. After careful consideration, the DCC approved the Plan as proposed by the IAF at a ten-year financial outlay of Rs. 5000 Crores. The plan called the Air Defense Ground Environment System (ADGES) involved the following:

A string of High Power Radars Located at ten sites from Srinagar in the North, to Bhuj in Gujarat in the west and Pune in the South. These radars were inter-connected through a series of Troposcatter or "Over the Horizon" Communication Links. These Links in turn terminated in powerful computer-based Automatic Data Handling systems on ADHS located at Airforce Command Head Quarters which then had backward links to the Air Bases. To design,

engineer and construct this mammoth System the DCC approved the setting up of a new organisation, called the Radar and Communication Project Office (RCPO) Work on the design and engineering of ADGES started in May 1971. The frontend High Power Radars were to be the THD 1955 Radars from the French firm Thomson. The Technology for these radars was acquired from Thomson and the radars built by Bharat Electronics. The same approach was taken in regard to the PSM-33 Medium Power Transportable Radars. The network terminated in a string of Low power Radars to be designed and developed by the DRDO Laboratory, the Electronics and Radar Development (LRDE) located at Bengaluru.

The over – the Horizon Communication links had been developed, by the Himalayan Radio Propagation unit and (HRPU) and were to be made by our leading telecommunication company, Indian Telecommunications Ltd or ITI. However, the heart of the overall system was – the ruggedized TDC- 316 mini computer-based Automatic Data Handling Systems designed, developed and produced in terms of both Hardware and Software by our national computer manufacturer the Electronics Corporation of India Ltd (CEIL). This ADHS which went with the Thomson, CSF 20 Megawatt High power radar and the Mobile Data Handling System MDHS which went with the PSM-33, Transportable Medium Power Radar were totally embargoed from our country by the Nato-Power, was a key element of the overall ADGES plan.

THE BANGLADESH WAR

Although my principal portfolio and responsibility in the Prime Ministers Secretariat, was S&T. Indiraji asked me to deal with a super-secret Project during the Bangladesh war of 1971. This was to work with the Soviet Union in the deployment and use of that country's Antonov-126 Airborne Early Warning (AEW) aircraft. This aircraft was deployed in the Western Section of the War viz. over West Pakistan. Its powerful Radars tracked all Pak fighter and Fighter Bomber aircraft in West Pakistan – both on the ground and in the air. A special Antenna in the form of an Elliptical Dish was jointly designed and built by our and Soviet Engineers and located at a secret place to receive signals from the An-126 and then pass them on to both IAF and Army Headquarters The invaluable data so received was used to target in coming Pak fighters and destroy them using either IAF aircraft or ground-to-air missiles. It gave use huge force multipliers throughout the Bangladesh War.

"THE BREZHNEV LETTER"

As time rolled on during 1971, the inevitability of a frustrated Pakistan launching a full-fledged War against us continued to mount. Our own intelligence and that we got from the Soviets, led both leaderships to agree that Pakistan would open the War on December 3, 1971.

At about 6 pm on the cold evening of December 2, the Soviet Ambassador to our country, Stanislav, Lewinski came to see P.N.Haksar, in the latter's Office in South Block. As soon as he entered Haksar's room, Lewinshi put a bulky envelope on Haksar's table. He then said that, he did not know what the envelope contained as it had come to him from Moscow through KGB circuits with the instruction to personally deliver the envelope to PM failing which to Haksar, saying which the Ambassador left.

Haksar then opened the envelope and looked at its contents. They were a letter from Leonid Brezhnev, President of the USSR, Chairman of the Central Committee of the Communist Party of the Soviet Union and Chairman of the Central Military Commission of the USSR, Based on my memory of it when I saw it six months later, I reproduce the text of the letter below.

"Dear Madam Prime Minister,

We in the Standing Committee of the Polit Bureau of the Soviet Union have watched with admiration our very friendly country, India; under your wise, a courageous leadership has successfully faced the severe difficulties of the last 8-9months. It is a truly heroic saga. We in the USSR have done our very best to help you and brave Indian people in every possible way we can. The war that now looms over the Sub-Continent is not of your makings. It is the making of the dictatorial leadership of Pakistan. We in the USSR are fully confident that friendly India will emerge success full in the war. You can always count on the unconditional support of the Soviet Government and the Soviet People. With warmest regards.

Yours Sincerely
Leonid Brezhnev

Having read this Momentous letter and being deeply moved by it, Haksar rushed off to show it to Indiraji.

A remarkable thing happened on the next day- December 3, 1971. Indiraji first rang up her Personal Secretary N.K. Seshan and informed him that she had decided to make a day's visit to Guwahati. Asked by Seshan what she wished her programme to be in Guwahati, Indiraji replied-"a meeting with the youth, a meeting with women, a visit to the Guwahati Oil Refinery of the Indian Oil Corporation and a public meeting at around 4 p.m. Please make all arrangements" PM instructed Seshan.

A shocked Seshan informed Principal Secretary to PM, P N Haksar and then called me up at around 7 a.m. to give me the stunning news, hardly had my Sacrophone conversation ended and I got a call from Jagjivan Ram, Defense Minister. Babuji said "Ashok she wants to go to Guwahati, of all days today. She is fond of you and like all of us values your advice. Go immediately to Indiraji and persuade her not to go. In the next 20 Minutes, I was at her residence. When I tried to dissuade her from going but failed, Indiraji said: "Ashok I want all our people and the whole world to know that we did not start the inevitable war."

At 5 P.m. on December 3, 1971, the Pakistan Air Force (PAF) struck all our forward air bases from Srinagar and Avantipur and Leh in the North, Bhuj in the West and Pune in the South. PM returned from Guwahati, went straight to her South Block office and called a meeting of the "Inner Cabinet "- the Cabinet Committee on Political Affairs (CCPA). The CCPA considered the state of affairs and decided the nation had to go to war. It, therefore, turned the conduct of the war to the three Service Chiefs India struck back by 11 p.m. that night, Karachi harbour was totally ablaze end to end. Huge Pakistani stocks of Petroleum, Oil, and Lubricants (POL) were destroyed. So severe was the attack by the Indian Navy. By 1 a.m. all major PAF air bases had been struck by the IAF, In both the Western and Eastern Sectors.

In barely two days December -3rd and 4th, the entire PAF in the Eastern Sector had been destroyed while the PAF in the West suffered heavy casualties for its, part; the Army was

engaged in a major tank battle in Punjab. By December, 16, it was clear Dacca would fall in the next couple of days and in the West, our troop was on the outskirts of Sialkot.

Finally, Dacca fell on December 15th, and the very next day, Lt. General A.A.A. Niazi, Supreme Commander of all the Pakistani troops in the East surrendered to his Indian counterpart Lt. Gen. Jagjit Singh Arora.

On the morning of December 16, the second letter from Brezhnev was received by PM. Basically, it first congratulated her for the total victory in the East. He then went on to say:" Madam Prime Minister: You and Your colleagues in your War Cabinet will now have to decide what you should do in the West. It will be a crucially important decision not only for your country but for the whole of South Asia and indeed for the whole world. My colleagues and I in the Politbureau are sure you will take that decision wisely after taking all factors into account. However, whatever decision you take , you can count on the unconditional support of the Soviet Union.

Indiraji then called a large meeting- Her Cabinet Colleagues in the Committee on Political Affairs – Home, Defense, Finance, External Affairs and their Secretaries, the Three Service Chiefs, the Heads of the Internal and External Intelligence Agencies, Haksar, Dhar and me from her Secretariat plus her closest overall adviser G. Parthasarathi our Former Ambassador to China and High Commissioner to Pakistan. PM opened the meeting by asking the Army Chief, General Sam Manekshaw, "Sam, How long will it take you to get to Peshawar? Sam promptly replied "3 days Madam". A little taken aback by Manekshaw's immediate reply Indiraji said "Sam you seem very sure of yourself."Manekshaw said "As I and my senior colleagues in Army Head Quarters saw the war ending in the East, we did detailed work for me to be able to reply promptly to the very question you posed to me. We are fully ready to be in Peshawar in 3 days and that too with very few casualties". For his part, the Air Chief PC. Lal said," I can guarantee that as Sam's boys move towards Peshawar, there will not be a single Pakistani aircraft in the sky above them." Naval Chief Nanda said "We have totally destroyed Pakistan's only port Karachi.

PM then went around the table seeking views. There was only one view and that was to let Sam get to Peshawar. Mrs. Gandhi, then called on P.N. Haksar to give his views Haksar said:" Madam, I do not have the slightest doubt that our Army can be in Peshawar in three days, and for West Pakistan also to be totally conquered, But what happens then? Do we rule Pakistan? I am sure that militarily we can do so. But would it be politically wise, indeed easily? Yes, initially, the Pakistani people will shout slogans like "Death to Yahya Khan and Tikka Khan, their widely hated current rulers." The Pakistani people may even welcome our (Indian) troops as saviours. There will see huge surrenders by Pak Army Personnel. But what will happen to say in 6 months' time? Will the same Pakistani people not come into the streets and this time shout "Hindustani Bag Jao?"

When Haksar had finished his remarks, Jagjivan Ram, put up his hand indicating he wished to say something. He said "Haksar- saheb has got us all wrong. We do not covet Pak territory. What we want is a return to us of the Territories taken by force by Pakistan in the 1948 War, viz. POK and the Northern Areas of Gilgit, Skardu, and Baltistan. All these areas are shown on the map which the last Maharaja of J & K, Hari Singh had attached to the text of his Treaty of Accession to India." Haksar did not have a word to say in reply.

After a few more minutes of discussion PM closed that monumentally important meeting with the words: “Accha, I will think about the matter.”

As soon as the meeting broke up and Indiraji left, I followed her to her house There; I pleaded with her to accept “the Jagjivan Ram Formula.“ She said,” There was a lot in what Babuji said at the end. “I will think about it’. The next we heard was the All India Radio broadcast that the Government of India had declared a Unilateral Ceasefire in the West.

COMPUTER SOFTWARE EXPORTS

A serious criticism of the Electronic Commission (EC) and the Department of Electronics (DOE) & the DOE was that they had not done enough to promote Computer Software Exports. This is a totally fallacious view. As far back as early 1974-barely three years after the establishment of the EC & DOE in early 1971, the EC formulated a comprehensive policy and programme to promote such exports. The main features of the policy were: (I) permitting 100% Foreign Equity for companies committing to undertake 100% Software Exports; (ii) permitting such companies to import the computer Hardware and Software they needed, totally (100%) customs duty free; (iii) making the profits of those companies totally exempt from having to pay any Income Taxes and (iv) Providing those companies with liberal subsidies on the loans they took from Public Sector financial institutions such as IDBI, IFCI, LIC, UTI and Public sector bank. It may be emphasized here, that those given were even greater than in the case IT software & IT-Enabled services in 1991-92. As a result, by 1980 annual Gross Software Exports were running at USD 10 Billion, while Net earnings were around USD 8 Billion.

THE NATIONAL INFORMATICS CENTRE (NIC)

A major new institution was launched by the EC and the DOE in 1976. This was called the National Informatics Centre (NIC). Its architect was the Director (Planning) in DOE, an outstanding computer professional called Dr. N. Seshagiri He came to the DOE from our foremost basic and applied research institution, the Tata Institute of Fundamental Research, in Mumbai.

The Charter of NIC was to provide computational services and facilities to personnel in all the approx. 16 ministries and department of the Government of India and the State Governments.

NIC had a very large mainframe computer at its headquarters in Delhi costing Rs. 25 crores (at 1977 Prices), Some 200 terminals were located in the ministries and departments in Delhi were connected to the NIC mainframe.

NIC had, by 1978 built up in-house a large core group of some 200 computer engineers and scientists. These “resource persons “ran a huge number of training programmes for the user personnel in the ministries. They also taught the user personnel to build up Digital Data Files of the information they needed. NIC resource persons also taught the user personnel to develop application software to meet their needs. By 1980, NIC had trained and put to work around 10,000 persons covering all 16 major ministries/ departments of the Central Government and around 5000 in State Governments. By 1980 some 2000 government employees were using NIC services. By the same year some Rs. 800 crores had been invested on the NIC System. The Contribution of NIC to build not only computer awareness but

computer – use capability in government agencies, public sector companies, R & D institutes and the IITs and Universities had reached an enormous level.

THE COMPUTER MAINTENANCE CORPORATION (CMC)

In 1976, the Electronics Industry was confronted with a major challenge. IBM had been operating in the country since 1960 through a branch of the IBM World Trade Corporation, New York. From 1960 to 1975, the company had supplied and installed some 1000 systems-Electric Typewriters, Unit Record Machines and second generation IBM 1401 computers used abroad and then "reconditioned" here. In 1975, IBM found that it could not comply with the provisions of the Foreign Exchange Regulation Act, 1973. According to that Act, a Foreign Branch like IBM and that too, one engaged basically in trading required to do two things (a) convert itself into accompany incorporated in India, and (b) reduce its foreign equity holding to 40%. The so-called "parent" company – IBM World Trade Corporation, New York was not willing to do either (a) or (b) So, on November 2, 1976, IBM formally informed the DOE and the Finance Ministry that it would be exiting the country by December 31, 1976.

Professor Menon- led the Electronics Commission on and the DOE to meet this Challenge head-on. He called an Emergency Meeting of the Commission at which it was decided that a new central public sector company to be called the Computer Maintenance Corporation (CMC) would be set up on a cash basis. It was to be headed by that fine computer engineer and marketing specialist called Dr. P.P. Gupta. Gupta was at that time Marketing Director of the UK's Indian subsidiary International Computers (India Ltd) what is more, all though CMC did not meet the normal GOI criteria for categorising public sector companies as schedule A, B, and C viz. magnitude of turnover and magnitude of total capital inverted, CMC, would be categorized as the top-of-the-line Schedule 'A' company so that CMC could attract top Engineers starting with Gupta and extending to the most competent engineers from the exiting IBM. An authorized share capital of Rs. 20 crores and an immediate all-cash investment of Rs. 10 crores were also approved y the EC at its meeting. At that meeting the following decisions were taken:

With those emergency decisions of the Electronics Commission under his belt, Professor Menon came to the Prime Minister's Secretariat to first meet. Secretary to PM, Professor P N Dhar and then Prime Minister herself. In view of the extreme emergency of the matter, Menon requested PM to kindly approve the decision taken by the EC formal approval of the Cabinet Committee on Economic Affairs could be taken later. PM approval such a course of action,

Meanwhile DR. P. P. Gupta, an experienced computer engineer and marketer who had spent the previous five years as Marketing Director, of the Indian Subsidiary of the UK Computer Company International Computers India Ltd was inducted as the Managing Director of CMC. He took charge on November 25, 1976.

Immediately on appointment Gupta called in Ron Taylor General Manager of IBM for a meeting with himself, Seshagiri and myself. After two hours of discussions the following decisions were taken:

(a) IBM would immediately hand over to CMC their complete Bank of Spare parts for all their machines / equipment for a CMC – IBM – DOE negotiated amount of money

(b) IBM would hand over to CMC, all the Technical Documentation which IBM, was currently using to maintain all its Indian equipment
(c) IBM would provide to CMC their complete List of all their employees as on date, along with all their Biodatas

With little choice before him, Taylor agreed to complete (a) to (C) in a week's time.

Meanwhile Gupta and a small core Group of six computer engineers he had brought over from ICL (India), with him drew up a new fully balanced CMC-customer Maintenance contract and got it legally vetted. The first IBM 1401 computers came under CMC maintenance December 1, 1976. By March 1977, Gupta had built up a team of around 200 computer specialists, marketing personnel, and finance personnel. All the 1000 systems were under CMC maintenance and support by end 1977

Concurrent with the indication of Gupta Managing Director of CMC, Professor R. Narasimhan, the Founder of computer S&T in the country through to his 50 strong Computer Group in the Tata Institute of Fundamental Research (TIFR) when he led the Group to design and develop our first, second generation digital computer named TIFRAC and the doyen of our computer community was appointed part-time chairman of CMC. He played a major role along with Gupta in ensuring that the full takeover of all IBM Machines was done smoothly on time and to cost.

INTEGRA:

The Narasimhan – Gupta due then turned to the task of providing customers with state- of-the- art new computer systems. The country was facing a foreign exchange shortage. They, therefore, looked at doing business with countries with which we had Rupee Payment arrangements –mainly the erstwhile USSR. They found that the IBM- compatible RIYAD Series of computers of erstwhile USSR had excellent Central Processing Systems (CPUs). However, they had poor Peripheral Units such as Usual Display Units (VDUs), Line Printers and Magnetic Disc Drives, so they thought up an excellent idea of "marrying" RIYAD, CPUs to Western Peripheral Units six months of R&D at CMC's R&D Center at Hyderabad led to the development of a totally new and state of art computer system. They named the new computer system INGRA – in recognition of the fact that it was created by Italies CPUs on the one hand and peripherals on the other from different sours of supply. By early 1979, CMC started offering three computing power ranges of INTEGRAS to local customers on rupee payment. They supplied such systems which had state of the art Operating Systems built into their CPUs and were backed with a large portfolio of Application Software Packages for both Business and Scientific customers; Of course all INTEGRAS would be maintained and supported by CMC. When CMC's INTEGRAS hit the men hard, they were lapped up by both classes of computer users., The Finance Ministry, which itself bought two INTEGRAS, were thrilled Over 1979-81, CMC sold around 40 INTEGRAS making huge profits But that was not all. CMC was able to also EXPORT 15 top end INTEGRAS to other middle level developing countries such as Indonesia, Malaysia, and Thailand at huge profits earning considerable foreign exchange for the country again to the Finance Ministry's delight.

COMPUTERISED PASSENGER RESERVATION SYSTEM (PRS) ON THE INDIAN RAILWAYS

In mid-1981, the Railway Board indicated to DOE that it wished to computerize its Passenger Reservation Systems. I was dealing with the matter. So, I went to see K.V. Raghavan, Chairman and informed him that CMC could offer the Railways such a system with state-of-art Hardware and Software specially specifically-tailor made to meet the unique needs of the fourth largest railway system in the world. I added that CMC would, of course, maintain the total system for and behalf of the Railways. My meeting with Raghavan was followed up by a fine presentation by Gupta, not just to Raghavan but to the entire six-person Railway Board. The presentation and discussion lasted for two and half hours. At the end, the Railway Board was fully convinced. Gupta said his budgetary price for the complete system was RS 80 crores and Design and Development time would be 18 months would be fully tested out at CMC's R & D Centers at Hyderabad to the satisfaction of the Board. In 18 months from the date on which he Railways placed a letter of intent, for my part I said two things:,

(a) DOE would finance the Rs. 5 crores Design and Development cost of R R S by CMC to the full extent of the Rs. 10 crores CM had indicated.
(b) Member (Engineering) Railway Board and I would co-chair.a Monitoring Committee for their project

Raghavan accepted my proposal, and the Railways LOI was placed on CMC in September 1981.

CMC then asked the Railway Board to depute 5-6 of their best electronics engineers to work with the CMC R & D Team right from the start of the project which Raghavan readily agreed to.

To cut a long story short the combined CMC – Railway Team met both the Cost and Time targets CMC had indicted to the Railway Board. What is more, when the CMC- Railways jointly developed PRS was installed and commissioned on the Northern Railway, at worked superbly, first shot.

Today, PRS operates all over the country and is a great asset to the Railways and our AamAdmi.

Based on the success of the PRS on our Railways as in the case of INTEGRA CMC exported PRS on a turnkey basis to not only the Indonesian, Malaysian and Thai Railways but to the South Korean Railways as well. Later in 1983, CMC won a global tender for a Ticketing System on the London Metro, worth UK Pounds Sterling 200,000.

THE SEMICONDUCTOR COMPLEX LTD (SCL)

In early 1978, the DOE realized that the Electronics of the 1980's would be highly intensive in Large Scale Integrated circuits (LSI s) popularly known as "Microchips". Some R&D on such LSI circuits had been done in both the Tata Institute of Fundamental Research's Solid State Group led by K. R. Ramanathan's group and by a corresponding group in the Central Electronics Engineering Research Institute of CSIR at Pilani Rajasthan led by Shankar Kumar, However both these capabilities were only at laboratory scale.

So, the DOE sent a high-level Technical Team consisting of Ramanathan, Shankar Kumar, P. Sarnat from the DOE, Virendra Mohan, Head of the Semiconductor Division of Bharat Electronics Ltd, Bengaluru headed, by C. R. Subramaniam, CMD of BEL to visit Japan, the USA and Western Europe leading Semiconductor Companies, hold discussions with their top management and see if a techno-commercially viable technology transfer to one of our public sector companies could be worked out. However, nothing came out of their visit.

So, when Indiraji returned to power in January 1980, I went to see her. At her request, I first gave her an account of what had transpired in S&T in the 34 months she was out of power and the Janata Government had been in power. Suddenly, I found her taking notes of what I was telling her, in her famous green pen! I said, "Madam, there is no need for you to take notes. I will give you a consolidated note on our conversation. She said "that is fine, but you use words and phrases well and so I want to put them down as you state them so that, I do not forget them.

I then came to SCL I First told her about what had happened during the Janata period. I then went on to say that we needed to mount another major effort to acquire state-of-art microchip technology at the earliest. When she enquired what needed to be done, I suggested that I lead a carefully configured team to visit carefully selected microchip companies in the USA, Japan, and Western Europe to hold discussions with their top management to try and acquire a technology package suited our needs. PM readily agreed. I then went on to say that if SCL was to be a success, it was crucially important that we can attract at least 5-6 experienced Indian microchip specialists working abroad, particularly in the USA to return and join SCL. To be able to do so, we would, in my opinion, need to offer them attractive- enough emoluments. My suggestion was to offer them one rupee – for-one dollar salary plus liberal translocation cost coverage plus good housing PM again readily agreed. She said "Ashok, go to and see (Finance Minister) R. Venkataraman. Tell him about your formula and say I have approved it". I promptly went across the road from PM's office in South Block to Venkataraman's in North Block and met him at short notice and got his approval.

It was thus that a broad-based delegation consisting of: then Managing Director, Punjab Semiconductors Ltd (PSL), Virendra Mohan, Sarnot from DOE and Shankar Kumar from CEERI Pilani started doing detailed home-work and analysis of all the leading microchip companies in the three countries, short listed six and I sent telexes to the CEO's of all 6 indicating what SCL was to be and what we sought by way of both content and nature of technology licensing Four of the six replied both positively and, in detail Our evaluation of the four responses led us to short- list three of them – Hitachi from Japan, American Microsystems, Inc from Silicon Valley in California and Solid State Devices Ltd (SSDL) in Boston.

After working out a complete itinerary, we left on August 20, 1972, going first to Hitachi in Japan. Our Counselor (S & T) in our Embassy in Japan joined us in Tokyo.

Our discussions with Hitachi were with a large team led by I Shikava Asano, Senior Vice President Hitachi Semiconductor Group and one of the 16 members of the Main Group of Hitachi. I indicated to Asano, who I soon realized was a highly sophisticated person, that we were interested in a microchip manufacturing process that was capable of producing LSI devices of at least 5 micron line width and, preferably, devices of 3 micron line width which we knew Hitachi had As for the range of devices we wished to cover, it encompassed devices for: Digital Clocks and Watches and several Telecommunication Chips. Asano smiled and

said “Those are ambitious targets for a company and that too a company in a developing country to aim for. However, we are willing to cooperate”.

Then started three gruelling days of negotiation. The Japanese team fully lived up to their reputation of being tough negotiators. After the first day, Asano wanted our delegation to adopt along with Hitachi, the principle of “One step at a time.” We were not agreeable to accept such a “principle.” I said: “You underestimate us Mr. Asano, the senior most member of our team, Mr. Virendra Mohan has fifteen years of experience in the Semiconductor area “. Finally it transpired that the Hitachi team was agreeable only to LSI process technology of 5 micron line width and as for products only LSI devices for Digital Clocks and Watches For such a technology license of limited scope – no Telecom Circuits at all - they asked for USD 10 million plus a 5% royalty of Indian taxes! On the evening of the second day Asano gave us dinner at one of the Hitachi’s many luxurious Guest Houses. During the evening I asked Asano as follows:

“Mr. Asano, you had indicated during our discussions that the sales turnover of your Division was around USD 40 Million a year currently. At the same time, you indicated you were spending USD, 40million on R & D! Where does the latter come from? “He promptly replied “from Toasters and Turbines “We in Japan believe that it is the responsibility of the mature industries not involving hi-tech to subsidize the sun-rise or upcoming industries”. No wonder Japan doubled national income, once in the 50’s, again in the 60’s and yet again in the 70’s! Needless to say, I shared my conversation with the members of my delegation.

We then proceeded to American Micro System Inc (AME) in California. Where also we spent three days, despite AMI’s Sales Turnover being USD 1 Billion (Compared to Hitachi's USD 40 million – or perhaps because of it) the CEO Roy Turnover and his senior colleagues were open and constructive from the very beginning. They not only readily agreed to licensing to SCL both their 5-micron and 3-micron C-MOS LSI process technologies but said they were willing to proceed as follows:

(a) SCL could choose any and any number of microchips from AMI’s portfolio of around 70 circuits, and
(b) They (AMI) would undertake Joint Technology Development with SCL of any new LSI circuit,SCL wanted on a 50:50 and cost and personnel sharing basis.

Moreover, AMI made this offer on the very first day, when our delegation discussed the AMI Offer the whole delegation agreed with my assessment that on every count AMI’s offer met our needs superbly.

More importantly, perhaps the personnel of AMI and our delegation members got on famously as I did with the AMI, CEO, Ron Turner.

This being the ease we signed not only a comprehensive MOU of Technology Licensing and near complete Licensing Agreement, but AMI agreed to prepare a feasibility Report on the SCL – AMI Project for just USD 10,000

Actually, the most important matter that was discussed was GOI (DOE) applying to and securing the US. Commerce Department approval for AMI to export its technology ‘purchase’ to SCL. Ron Turner said he had good contacts in Washington DC, with both the US Congress and US Commerce Department and I thanked him for that, he would activate

them fully with everything tied up to the satisfaction of both parties, Turner threw what turned out to be a riotous party that night.

With the collaboration with AMI so satisfactorily tied up our delegation discussed that night whether we should really visit SSDL in Boston. Finally, the consensus was that we should do so to keep the second string to our bow.

We then turned our attention to the other major objective of our Team's visit. Viz.to try and recruit 5-6 mid-level to senior microchip specialists in silicon valley, through correspondence we had a list of around ten such specialists who had expressed their interest in joining SCL, Particularly after I informed them of the remuneration package, we were offering.

We, therefore, started calling them in one by one to our Hotel and held detailed discussions with them covering both professional and personal aspects. Although we spent 10days on this whole exercise the upshot was, we tied up 50 to 10, practically with no strings attached. Most of the 5 indicated that they only needed three months' notice to leave their present jobs and come to India.

In the event, we finally did not go to SSDL as our objectives had been more than met.

The day after we returned to Delhi, I went to PM to give her, a detailed report of our visit and its many outcomes. As usual, she was warm and congratulated me on the Team's outcome. She was particularly happy that we had got five non-resident Semiconductor specialists to return and join SCL. We then discussed the Export Licence. Indiraji said, "Don't worry Ashok, we will go all out to get it and get it quickly."

I then, told her that I would now start work on preparing the note on SCL-AMI for the Electronics Commission and then for Cabinet she just said: "Do it quickly."

And quickly did we do it the Commission approved Rs. 85 crore SCL-AMI project including the tie-up with AMI on September 15, 1980, and the CCPA (the Inner Cabinet) did likewise on October 10 at the close of the CCPA meeting Indiraji looked at foreign Minister P V Narasimha Rao and said "P V, Please secure the Export Licence from the US Government quickly".

It had been decided that Indiraji would dedicate SCL to the nation on her birthday November 19, Tragically she was, as we all know assassinated on October 31. Even before the formal dedication to the Nation, SCL had launched design and production of a family of LSI chips. The first was for Analogue Clocks and Analogue watches. The Clock chips in a Chip-on-Board configuration was supplied to the approx. 500 assemblers of such Clocks in the small-scale sector. SCL's chip on board was well received by Analogue Electronic Clockmakers, and cash began to roll into the company.

As for the Analogue Watches, we in DOE had required the two major such watch makers – HMT with technology from Citizen of Japan and Hyderabad Alwyn. Ltd with the technology from Seiko, also of

Japan to mandatorily procure the complete Electronic Circuit Block (ECB) from SCL, HMT and Alwyn passed on all the technical documentation they had got from their technology suppliers relating to the ECB to SCL. So by July 1981, two dedicated production plants had

been set up at SCL- one to assemble the ECBs for HMT's Analogue Electronic Watches and the second to do likewise in regard to Alsyn's Watches.

Meanwhile, whiz kid Satyen ('Sam') Pitroda had come to the country from Chicago, USA and had setup the Centre for the Development of Telematics (C-DOT) to design develop and manufacture in the country a whole series of Digital Telecom Switching Systems and he needed microchips to drive and control all the Telecom. Exchanges he was making for the Department of Telecommunication (DOT) and other users. So, I called a meeting of Mohan, Pitroda and G.B. Meemamsi the Executive Director and head of C-DOT. By the time the meeting ended, Mohan had got a complete list of the types and number of microchips C.DOT needed for its digital exchanges, year – by – year for 1984-1990. The money value of this C-DOT requirement came to Rs. 100 crores in 1984-85 building up to Rs. 800 crores by 1990. So SCL was launched techno commercially good and proper.

Later on – around 1987-88,- SCL started supplying LSI chips to the Defense Services and the Defense. Public Sector Enterprises like BEL, Hindustan Aeronautics Ltd and Bharat Dynamics Ltd. The third major area of chip demand were the TDC 316 and TDC 332 Computers and the much simpler computers used in the CLASS Programme viz. Computer Applications for Science in Schools.

The next and final preparatory step to launching SCL was the selection and appointment of Virendra Mohan as the CMD, SCL. I got Mohan's summary Bio-data and took it to Indiraji, while she looked at the Bio-Data she was really listening to me explaining why Mohan was the correct man for the job, when I had finished she asked her special Assistant R.K. Dhawan to call her Principal Secretary, Dr. P.C. Alexander. I rose to leave, but she said "stay Ashok I want you here when I talk to Alexander" When Alexander came in PM explained the matter to him the importance and urgency of the case. She finally said "Alex take my approval to appointing of Mohan today itself and then send a note to secretary DOE saying I have approved and Mohan should be asked to join at the earliest. I then left PM while Alexander rushed back to his room to implement her orders.

THE NATIONAL MICROELECTRONICS COUNCIL (NMC)

While SCL was the heart of DOE's Micro Electronics Programme, in 1985, the EC set up another subsidiary body to itself, like the National Radar Council (NRC). This was called the National Micro Electronics Council (NMC). Like NRC, it was chaired by Deputy Minister for Electronics and Chairman EC, Dr. M.S. Sanjeevi Rao. The NMC had on it a representative set of the major users of Micro Electronics including C-DOT, ISRO and DRDO, R&D institutions active in microelectronics and two IITs and two Universities which had Launched Micro Electronics Teaching Programmes.

THE ELECTRON TUBE COMPLEX

As a complement and supplement to SCL an Electron Tube Complex (ETC) was set up by DOE as a Departmental Project inside the Bharat Electronics Campus in Bengaluru. After almost a whole year had to be spent to negotiate a technology transfer agreement between the ETC and the top of the line US Microwave Tube Company, Varian Associates of California. The TOT Agreement covered four types of high power Klystrons and six types of high power Travelling Wave Tubes (TWTs) While the former were to be hearts of high power ground based Radars, the TWTs were meant for use in Electronic Warfare Systems.

As for RF Tubes used in high power Broadcast Transmitters, DOE had ensured that as the Central part of high power Radio Transmitter manufacture by BEL based on technology sourced and from the Swiss firm Brown Boveri Corporation (BBC) the technology for the local manufacture of the RF Tubes used in those Transmitters was also covered in the Transmitter manufacture contracts. These included a highly strategic Multi Mega Watt Power Electron Tube for use not only in Radio Transmitters made by BEL but also as the heart of the Very Low-Frequency Transmitter made by BEL to enable one-way shore to submarine communication, so DOE made yet another contribution to the nation's strategic strength.

ENVIRONMENT

Indiraji was a pioneer at the world level in being aware of the enormous importance of human beings living in harmony with their environment. But this was not a realization that came to her as a grown woman. Even as a child she was fascinated by the beauty of flowers and the green grass.

It was not surprising, therefore that, when she became Prime Minister, she would design and implement policies and programmes that would protect the environment in all its facets.

In 1970 she set up a national committee called the National Committee on Environmental Planning and Coordination (NCPEPC) under the chairmanship of former Planning Commission member. Pitambar Plant and composed of scientists, technologists, ecologists, lawyers, administrators and the distinguished industrialist, Keshab Mahindra.

The NCEPC began by undertaking a number of studies relating to air, water, and soil pollution. It then undertook a number of what later would be called Environmental impact Assessments relating to planned /upcoming industrial a projects, major dams, etc.

By early 1971 work had started around the world to prepare for the major UN conference on the Human Environment to be held in Stockholm in June 1972. The distinguished Canadian diplomat and banker, Maurice Strong was appointed by the UN as the Secretary-General of the conference. I, was then S&T Adviser to Indiraji on the one hand and who had known Strong from 3-4 Years earlier. When he was the Director-General of Canadian International Development Agency, was brought in by Strong both in my personal capacity as a scientist and as Indiraji's S&T Adviser to help in planning out the Stockholm conference. I for my part brought in Pant and the NCEPC.

My involvement in helping to plan the conference also enabled me to keep Indiraji fully and continuously informed of the progress of the Conference.

About six months before the conference was due to take place, Strong came to Del hi to meet Indiraji regarding her involvement in the conference. He, therefore, asked me to set up a meeting for him with Indiraji, which I did, Strong and PM got on famously right from the word go. After preliminaries Strong told Indiraji that the entire purpose of his visit to Delhi was to formally and personally invite her to give a Special Address to the conference, when it was held over June3-5, 1972 in Stockholm, Sweden. He indicated that this was because, it was universally held around that no Head of State or Head of Government was so concerned about the health of the Environment and who had done so much in her country, not only to spread awareness about the need to protect the Environment in all its many facets as

Indiraji. Strong also emphasized that Indiraji special address to the Stockholm conference would be the only address by any Head of State or Head of Government to the Conference. Deeply moved, PM thanked Strong warmly and accepted his invitation.

That was December 1981, from then all of and us in the Prime Minister's Secretariat started working steadily on Indiraji's special address. The efforts were planned as follows. First, PM to al a meeting of all of us in the Secretariat, her Principal Secretary and P.N. Haksar downwards had a 2- hour meeting with Indiraji at which we discussed and then agreed upon the major points that the address should contain. Then each of the points was assigned to a Particular member of the Secretariat to prepare a draft text on Indiraji then chaired fortnightly meetings on the matter to consider and discuss each person's draft. The Integration of the drafts was then done on a continuing basis by the highly experienced information Adviser to PM, HY Sharada Prasad and myself. The total draft of the speech thus moved ahead smoothly.

Meanwhile, I continued to attend various planning meetings for the conference called by strong in Geneva. I, therefore, had an excellent idea of how the preparation for the conference as a whole was progressing. This enabled me to keep Indiraji continuously informed of conference progress and thereby for her special address to be tuned to not just match with it but go beyond.

Then D-Day, June 14th of 1972, for Indiraji's special address. By then it had been so totally honed and polished that it was near perfect. As expected Indiraji delivered it so wonderfully that she got a full five minutes standing ovation at the end of it. Of course, PM used the opportunity provided by the conference to meet her old friend Olof Palme, Prime Minister of Sweden and discuss matters of mutual interest.

In mid-April 1973, I got an invitation from the Office of Palme for me to attend a small meeting of some of those who had been at the Stockholm Conference to meet and take stock of "one-year after Stockholm." The meeting was to take place on June 4-5 at the country villa of Palme, and my wife was also invited. I readily accepted Palme's invitations.

It was thus that my wife and I were at what turned out to be a wonderful meeting (of course, Strong was also there) of some of the key people involved in the Stockholm Conference. After the formal Seminar on the theme of "One year after Stockholm," Palme called an International Press Conference at which he formally announced that the UN Secretary-General. That had accepted Palme's proposal to designate and celebrate hereafter, June 5 as World Environment Day as is done even today.