

## Early days of Raman Research Institute – Some personal reflections\*

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I had the greatest good fortune to work closely with C. V. Raman, from 10 November 1949 to 13 October 1960, for a period of 11 years. Padmanabhan had joined a week earlier. There was a typist by name Balakrishna to help Professor with his correspondence. That was the nuclear staff of the Institute at that time.

Bangalore was then a delightful place to live in and the Raman Research Institute (RRI) was a peaceful retreat. The main building was the only structure in the campus, with magnificent views on all sides. In those days RRI was something out of the way and you could walk on the Tumkur Road without encountering any automobile. After darkness fell, one would even be hesitant to walk the dark lonely stretch from the Indian Institute of Science to RRI. It is all a different story now.

*I can picture in my mind vividly, the tall turbaned figure pacing the grounds of the campus. Every inch of the ground was sacred to him and he planted every tree in the campus. Professor knew the botanical names of each one of them. He loved the sight of spathodias, cassias and Jacarandas when they were in bloom. His rose garden was a lovely one. Professor's love of nature was phenomenal.*

In 1950 seven research scholars joined: T. K. Srinivasan, a geologist, S. Chandrasekar, D. Krishnamurti, K. S. Viswanathan, A. K. Ramdas, M. R. Bhat and S. Venkateswaran, all physicists. Pancharatnam was the last Research Scholar to join, sometime in 1954. S. Venkateswaran left after a brief stay. That was the only batch of Raman brand scientists to come out of this Institute. Almost all of them became distinguished physicists on their own right.

The research scholars were first accommodated in a military barrack-type housing unit, just down the Tumkur road, but later were moved to a big house in Malleswaram on Margosa

road near 17th cross, which Professor rented. In 1953 a hostel to house them in the campus and quarters for me and B. S. Venkatachar, Secretary of the Academy, were built and we all moved into the Campus early that year. We all lived like a big family.

A building which we used to call workshop was built to the west of the main building and this housed a huge liquid air plant that Professor acquired from the US. Army surplus, a machine shop, a glass blowing shop, optical grinding and polishing room, a chemical laboratory and carpentry shop. Later, the spectroscopic laboratory with a dome for a telescope was built on the eastern side of the main building. Finally, the Director's quarters was built on an additional piece of 4 acres of land granted by the Maharaja of Mysore, adjacent to the 11 acre main campus. All these buildings were planned by Professor.

The life and activities of the Institute were centered around Professor and he was our only boss. You could meet him at any time and his office was open to walk in after a knock. The familiar voice 'Yes come in' would be heard. Very often he would just call you, when he was taking a walk in the grounds and discuss scientific problems, or the affairs of the Institute. He would often discuss the results obtained by the research scholars with them and offer suggestions right on the spot. I met him everyday to talk about the affairs of the Institute.

Professor spent considerable amount of time with the garden staff, bestowing his personal attention to the flora and to the tidiness of the grounds. Lady Raman was also a frequent visitor to the Institute and would often bring some snacks or refreshments for Professor. She took care of Professor with so much devotion and attended to all his personal needs.

One of the first tasks Professor undertook was to set up several rooms to house his exquisite collection of crystals, mineral and rock specimens,

stuffed birds, beetles and butterflies. Thus he meticulously planned the beautiful museum. The job itself was done by one E. K. Govindaraj, the proprietor of the EGK & Sons (a well-known photo studio and store in Mahatma Gandhi road formerly known as South Parade). Govindaraj had true aesthetic sense, and knew the art of shelf display.

Regarding mineral specimens Professor had an interesting story to tell. He went to USA twice as a member of the Indian delegation to the World Bank, during 1948–49. He used to say 'I do not know why they selected me to be a member of the delegation, maybe because I was once a member of the Indian Audit and Accounts Service, but I used my time in a worthwhile manner. I bought beautiful mineral specimens from several reputed dealers in America and used the time to visit some of the famous labs' viz. Bell Labs. Much later when I joined Bell Labs, older members like Conyers Herring, Walter Bond, J. P. Remeika recalled Raman's visit and how impressed they were with his colourful personality.

Professor wanted the display to be effective, and aesthetically pleasing. Thus he paid meticulous attention to each specimen. Many many hours were spent on this, with Padmanabhan and myself assisting him. The luminescent minerals was his favourite show and he used to mesmerize the visitors by switching on the UV lamps and then show the specimens in ordinary light, with so much enthusiasm and gusto. He would not stop until the visitor resonated with him in the excitement.

He had kept all the rooms under lock and key and the key bunches themselves were neatly arranged in order, in a heavy iron safe located in the now Director's room. This room also housed the collection of diamonds. His memorabilia consisting of honorary degrees, colourful doctoral gowns he wore on various conferments and the medals he had been awarded, including the Nobel

\*Based on a talk delivered at Raman Research Institute on 7 November 1998.

Gold Medal, with the beautiful engraving of Alfred Nobel on it. He would show all these to a few chosen visitors. It was indeed a sight to see Professor walking with a bunch of keys and opening the doors himself to show the visitors round.

Princes and politicians, statesmen and scholars, scientists and students thronged to the Institute to meet Raman, see his Museums and hear him talk. A visit to the RRI was a thrilling experience to one and all, and Raman with his exuberance and child-like simplicity entertained visitors. It was like taking a tonic to visit the Institute and meet Raman. But in later years he found visitors an intrusion and put up a board to discourage them.

Believe it or not, for nearly two years we did not have electricity at the Institute. But that did not deter Raman from carrying out scientific research. He was a firm believer in using sunlight for optical investigations. Did he not almost discover Raman effect with sunlight? We darkened two end rooms on the southern side and brought in sunlight, using a heliostat. The beam of sunlight was focused, or shaped into a pencil beam to study optical phenomena. We used filters to isolate the UV component of sunlight for luminescence studies on diamond. I was a collaborator in many of these investigations and it was a great education to sit with him, when he was making observations and loudly thinking about them. You would be saying 'Yes sir' all the time, just to share his sense of wonder and enthusiasm. He would also let you see what he had seen and wait patiently until you confirmed it. Our first paper was on the structure and iridescence in Labradorite published in 1950 in the *Proc. Indian Acad. Sci.* In that year's Annual Meeting of the Academy in Hyderabad, he gave a public lecture on this topic and I had made some colour slides for the talk. He gave a marvelous lecture and made generous references to my assistance in the studies.

Many other papers on similar lines followed and by that time the Labs had been set up. We had electricity. The X-ray diffraction units became operational and the spectroscopic laboratory became alive. During the time when experimental work was not possible due to the lack of electric power, the research

scholars had to attend lectures given by Madhava Rao, Subbaramaiah at the Central College. Once the Labs became functional, they carried out experiments on the research projects assigned to them by Professor. Several publications resulted out of their studies and they were published in the *Proc. Indian Acad. Sci.* and released as memoirs of the RRI, with a nice cover and a picture of the main building on it. In due course they got their degrees and some of them left the Institute. Krishnamurti, Viswanathan and Pancharatnam stayed on and we were all appointed as Assistant Professors, circa 1956.

Krishnamurti collaborated with Raman on potassium chlorate, a crystal which exhibits multiple twinning, giving rise to Bragg-like reflections at optical wavelengths. Ramdas was a collaborator in the beautiful work on twinning in calcite and the optical effects arising out of this. With K. S. Viswanathan, Professor explored his ideas on lattice dynamics and elasticity of crystals and Viswanathan shaped up as a first rate theoretical physicist. The subject of lattice dynamics, the second-order Raman spectrum of crystals, luminescence of diamond and quantum X-ray reflections in diamond were subjects of passionate interest to Professor Raman, and he came back again and again to these topics and expounded on them in a series of memoirs.

The Annual Meeting of the Academy was an enjoyable event for us and Professor encouraged us to present talks. I was his appointed projectionist, for he could not tolerate any person fumbling with the slides. His public lectures and his comments on other talks given, be it physics, chemistry or biology were very stimulating and we all returned with a feeling of having learnt something. These meetings were called by someone as Raman's circus but certainly they were the best for its scientific quality and inspiration value.

In later years he added a few more to the staff and the salaries were increased. At the height of Raman's reign, the Annual Budget was around Rs 1 lakh.

The Institute was primarily set up to pursue the interests of Raman, and freedom of action for the founder its intent. Professor put his heart and soul into it and nurtured the Institute with all the resources at his command. But he would

never surrender his freedom for the sake of money and refused to accept any big input from the government. If something came without strings attached, it was alright.

Professor always dreamed of building a substantial reserve fund to secure the future of the Institute. Towards this end he prepared a visionary proposal to the Ford Foundation and submitted it to them. He wanted to make his Kengeri Estate a center for Astronomy. But the Ford Foundation did not respond positively and he was very disappointed. I have to tell you this story. He heard from someone that a huge quantity of treasure lay buried in Andhra Pradesh, after the decline of the Vijayanagar Empire. He called me one day and said: 'I just learnt about this buried treasure in Andhra Pradesh. May be we will be lucky and hit a pot full of gold which can be used to build a huge fund for the Institute. Build a metal detector and we will take it in a car and monitor the area. I have been given some idea as to where to look'.

After some study I built an electronic metal detector. But before I could complete the device, Professor felt that it was not a feasible proposition and asked me to shelve it. The powerful radio frequency device that I built was lying in one of the rooms in the main building and I do not know how it was disposed.

Professor had a keen business and financial sense and bequeathed the income producing interests, that he held to the Institute; industrial interests, real estate and property. During our time this income was used to meet the cost of buildings and to buy some more ground to add on to the campus, and for improvements and maintenance.

Professor wanted me to stay with him permanently and when I revealed to him that I was leaving for America he became very upset. It was the most difficult decision for me, but the separation had to come. He trusted me and treated me in a very special way and I felt terrible to leave him.

What did we learn from him? Everything to make you a first rate scientist. We learnt from him the excitement of scientific discovery, however small it is, and the role of intuition in the pursuit of science. He always told us not to be camp followers and to do something

based on your own thought and imagination. It was a great education to be with him, or talking to him. His remarks would, like a flash, clarify something that was difficult to grasp or comprehend. He had the remarkable capacity to see the wood out of all the foliage.

Speaking for myself, I owe my scientific career to him and he made me into a scientist with a broad outlook. I learnt from him to appreciate nature, to

look at things in a simple way and above all have confidence in oneself. He taught me the methodology of scientific research and to go out boldly to accept experimental challenges. Recently I read a book written by Kanigel, the same author who wrote Ramanujan's biography. The title of the book was *Apprentice to Genius*, which describes how great minds influence people around and how it rubs off on them. I fell

into resonance with the book, for I have been an apprentice to a genius, in every sense of the term.

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