of anomalous dispersion effects b' and b'' (the scattering length $b = b_o + b' + ib''$) are much greater than f' and f'' for X-ray scattering. For example, for ^{113}Cd, $b'' \sim 10\, b_o$ and $b' \sim 5\, b_o$ on the shorter wavelength side. SR showed that if the crystal contains a ^{113}Cd atom per asymmetric unit and if it scatters anomalously, a structure containing as many as 10,000 atoms could be determined via the anomalous neutron scattering method. With ^{147}Sm or ^{157}Gd in the crystal, the number of light atoms could increase three or four fold. Thus the method should, in principle, allow the determination of the structures with a very large number of light atoms. Unfortunately, the practical application of the method is beset with experimental problems, mainly arising from the nonavailability of very powerful neutron radiation sources.

The research group led by SR during the period 1953–1960 consisted of six research scholars—M. A. Viswamitra N. V. Mani, S. Swaminathan, H. Manohar, Jelica Musovic (from Yugoslavia) and myself. Investigations on different aspects of X-ray crystallography—the anomalous dispersion technique, organic and inorganic crystal structures and high temperature crystallography were undertaken. He provided the right kind of intellectual environment by encouraging a lot of informal discussions on each other's crystallographic problems. The simplicity and directness of his physical intuition were striking; gifts which one can experience even now at the age of 80 when he is not in the best of health.

Let me go back to the beginning of this note where I expressed my shock during my first encounter with SR. How stupid I was became obvious to me very soon and indeed I began to wonder as my scientific training progressed, 'how such a small head could carry all he knows'. I am very fortunate to be associated with such a brilliant scientist and a wonderful human being for five decades. I wish him good health on his 80th birthday.

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Sivaraj

It was in 1959 that I returned from Berkeley to take up a faculty position in the Department of Inorganic and Physical Chemistry at the Indian Institute of Science (IISc), Bangalore. I was 25 years old at that time and was greatly looking forward to initiating research in spectroscopy, molecular structure and solid state chemistry. The facilities at IISc were far from satisfactory, but the pleasure of working with young students seemed to compensate for many of the problems which I faced at that time. It was during those formative months of my career that I got to know Sivaraj Ramaseshan, who was in the physics department. We became close friends in a short time, and not a day passed during that period, without our meeting each other. On many days, I used to meet him and his delightful wife Kausalya during lunch hours. When I got married in 1960, the Ramaseshans were among the few family friends we had. Sivaraj was clearly one of the most engaging and scholarly colleagues I had at IISc at that time. He had a wonderful sense of humour and we spent many a day talking about a variety of matters, personal to universal. We had common ideas and goals in life, and shared our excitement and disappointment in research. I still remember with fondness, the long journey we took to Shillong in 1961 for a chemistry conference, and the varied encounters during that trip. We both left IISc around the same period, he to IIT Madras, and I to IIT Kanpur, in the early 1960s. We, however, kept our friendship and met always at the meetings of the Indian Academy of Sciences.

From left, S. Ramaseshan, Dorothy Hodgkin, Kausalya Ramaseshan and Prema Pancharatnam at Crab Hill, Ilmington, UK (circa 1980).

*Dedicated to Prof. S. Ramaseshan on his 80th birthday.

S. Dhawan (left) and S. Ramaseshan in the late 1990s.

When C. V. Raman passed away, Sivaraj took on considerable responsibility to ensure that the Academy fulfilled the dreams of its founder, by enhancing and strengthening its activities, specially its publications. I had the opportunity to work closely with him during that period. I still remember the meetings to start *Pramana*, and the varied discussions on starting new journals, and widening the membership of the Academy. I believe that the Academy has been eminently successful in these and other endeavours. It was enjoyable working with Sivaraj closely, specially when I became one of the first secretaries of the Academy. Sivaraj served the Academy in various capacities and we all owe him much for all that he has done for the Academy.

No account of Sivaraj is complete without the mention of Satish Dhawan. My friendship with Satish also goes back to 1959. He was the moral conscience of the academic community. Satish and Sivaraj were always close friends, and I claim that I belonged to the same cluster. I have no doubt that Sivaraj and Satish were jointly responsible to bring me back to Bangalore from Kanpur in 1976. Sivaraj was then at the National Aeronautical Laboratory, Bangalore where he successfully set-up the first proper materials research laboratory in the country.

Sivaraj is a scholar and an idealist. He is a scientist inspired by two great souls, Raman and Dorothy Hodgkin. His sharp wit and eye for the essence are remarkable. He is a fine human being and is truly humane. He has been a source of encouragement to many a scientist in the country, and is one of the treasures of Bangalore and its scientific traditions. He has been blessed with a charming companion whom we all dearly love. Due to various preoccupations, I have not met Sivaraj and talked to him as frequently as I should have in the last few years, but I have always considered him to be one of my dearest friends and well-wishers. I know that he is there, and I feel reassured with that knowledge.

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Ramaseshan's Chitra connection*

I met Ramaseshan for the first time in 1972 in the old CSIR guest house in Delhi. I had then returned to India from the US after many years and made an uncertain start in the Safdarjung Hospital as a cardiac surgeon. I was asked to meet him by Nayudamma who took note of my plea for developing biomaterials and medical devices technology in India. Rigid compartmentalization is the bane of science and I had long recognized, not two, but many cultures among scientists and intellectuals. The meeting with Ramaseshan came as a breath of fresh air because here was a master physicist who not only understood the problems of introducing materials into a living system but even shared the excitement of developing an artificial valve which had to open and close 100,000 times a day for a minimum period of 10 years before getting approval for implantation! We hit it off immediately and our contacts grew even though I could achieve little during my year's stay in Safdarjung Hospital. My next stop was the IIT, Chennai where Arcot Ramachandran offered me a Visiting Professorship in the Division of Biomedical Engineering with permission to operate in the Railway Hospital, Perambur thrice a week. My assignment in the IIT included teaching a course in physiology, contributing to seminars and interacting with M.S. students whose projects covered almost everything in medical sciences. I was however disappointed that R&D received low priority in the IIT scheme of things; a student could spend three or four years, for example, on the modelling of a valve for his Ph.D. without getting any closer to making a prototype. As the students were bright and enthusiastic there was no reason why each project could not have been chosen and planned with technology transfer in view. I remember discussing these issues more than once with Ramaseshan who did not dismiss my concerns as scientists generally tend to do. Needless to say, the valve project made no progress during my IIT interlude.

Like in the affairs of men, there is a tide in the life of ideas and the upswing for the valve project coincided with my move to the Chitra Institute, Trivandrum in 1974. Side by side with the commissioning of a speciality hospital, a project proposal for the development of PVC and titanium for medical applications was approved, among the first few, by the SERC for funding. My co-investigators were Ramaseshan in the NAL and Gowarikar in the VSSC. The project gave me an opportunity to bring two biomedical engineers including Bhuvaneshwar who had been a keen student in the IIT, as Research Fellows to Chitra and create a rudimentary facility for R&D. Looking back, it is remarkable that our tiny group could develop a pulse dup-

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