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A journey of discovery

Chanda Jog

For as long as I can remember, I have been fascinated by nature and puzzled about its various features – from mountains, to rains, to the regularity with which the stars appeared to complete their revolution around us. I had the good fortune of living at the foot of the Sahyadri hills in a small town called Kalwe in Maharashtra for four years, from the age of twelve to sixteen. I was surrounded by nature in all its glory, from the morning dew on the grass, the cascading waterfalls in the monsoon, to fantastic animals like chameleons, salamanders and even an occasional snake trooping through our house. To me all these were interesting phenomena to puzzle over. I have been extremely fortunate in having parents who instilled and encouraged in me a sense of independence and curiosity about all things around. They taught me that knowledge does not come only from books or in a ready-to-swallow form.

The two subjects which most interested me at that time were geometry and physics. I remember spending long hours engrossed in the geometry riders assigned to me by my mother. The thrill of finally figuring out the construction and solving a problem by pure logic was my first experience in research. It also taught me, as I later realized, the value of persistence as well as the

confidence and deep pleasure that solving a problem can give you.

At an earlier age, I remember accompanying my father who was then an electrical engineer with the Ahmedabad Electricity Company, and being shown various kinds of lights and their different properties. Science and engineering were a part of life, to be approached with a sense of fun. Concepts which I now recognize as “sample selection” and “trying a different approach if the first fails”, were lessons I learnt at home from my father. Later, when I was in the eleventh standard, my sister, who had just joined the Bhabha Atomic Research Centre (BARC). training school as a scientist, introduced me to books by George Gamow, including his stimulating book *Mr. Tomkins in Wonderland*, and I got hooked on physics and astrophysics in particular. With such a strong home background it never occurred to me to doubt if I could pursue science despite being a girl. Even later, being mostly self-driven has helped me treat any obstacle in my career as a temporary problem.

Doing a Ph.D. in the United States, brought new opportunities and encouraged an openness to things, and most importantly the necessity of steady, dedicated, hard work for a scientist. There, I also met Alope Jain, who is now my husband, and who was a student at Stony Brook at the same time. Alope has been a pillar of strength during all these years, urging me to give my very best to research, standing by me at all stages of my career, and acting as a sounding board for my many research ideas. Now research in astrophysics has become a way of life, almost an obsession. I consider myself lucky to be a professional scientist – thoroughly enjoying what I do, and getting paid to do it.

In school, I had a very strong interest in literature, especially poetry related to nature, and in classical music. Music remains essential for my day-to-day life. Had our home atmosphere been stronger in literature or music, it is possible I might have chosen to pursue them.

The home atmosphere is extremely important in shaping a child's thinking. We have tried to encourage our twin daughters, Abha and Deepa, to pursue whatever subject they like with joy and dedication, and devote their full energies to it. Alope's practi-

cal, no-nonsense approach has made them strong and determined with a can-do attitude, which is very important. It has been a real privilege to have this class of two young enthusiasts right at home! Guiding research students is also a highly educative process – both about the science we do together and also the psychological insights one gets from it.

The main problem I faced after returning to India was that when I was younger and it mattered the most, no one took any notice of me or gave me active encouragement by showing me the ropes, or making me a part of the science network. This benign neglect meant delay for me personally, and seen from a larger perspective, was also a loss of research opportunity for the community. This is a common problem for any budding scientist and especially for a woman scientist. Surprisingly, the same is true of women in the US and in Europe, as seen repeatedly in the discussions in a forum like the “Women in Physics”. An even bigger problem has been working in India in a field like astrophysics that is highly dynamic and interactive and literally exploding in many subfields worldwide.

It has often been a lonely struggle and it need not be. For my part, I have tried to help younger people – my own students and post-doctoral fellows, as well as others here and in Europe, by showing them the ropes and the possibilities, mentoring them whenever I can. Apart from helping an individual, I think this also will help stop the waste of trained, scientific talent and ensure a more robust scientific community.

I am happy I have made some impact in the areas of galactic dynamics and interstellar molecular clouds on the world scene. I have explored and initiated work in areas of coupled star-gas instabilities and vertical-disk dynamics in galaxies, triggering of starbursts by shock compression of gas, lopsided galaxies, and the dynamics of interacting galaxies. Keeping in touch with observations has been crucial in the way I have phrased problems.

In retrospect, if I had to do it all over again – I am at the same time wistful and relieved at not having to go through it all again – I would do some things differently. I would ask for help more readily. I would try to travel more to international scientific

meetings, and establish contact with others in the field at an early stage so that many interesting collaborative projects could be done. The latter has become easier not just financially but also because of the ease of channels such as email. The way science is done has changed dramatically over the last decade, and yet there is no alternative to personal meetings with other scientists in order to really trigger new ideas.

The one thing which has kept me going is the overriding curiosity to know what makes things work – whether galaxies, their dynamics, or star formation. I enjoy the challenge and thrill of looking at new problems. The sense of mystery as I think about these problems is the deepest pleasure of doing science. After this mulling period when the ideas are mostly a picture in the mind, comes the phase of formulating the problem – which is the hard part – then solving it, most often numerically before comparing the results with the observations.

I can also see how exciting other fields in science are, for example the biological field at the level of how a cell functions, or at the other end, the cognitive aspects. It is spooky to think of the mind thinking about the mind and so on without closure. The complexity of the biological sciences, and the different logic used in these compared to the physical systems, are fascinating.

Time and capability limits scope to dabble in or even obtain enough information to truly appreciate technical questions and advances in other fields of science. Being at a broad-based institution like Indian Institute of Science (IISc) has been a boon in this respect. Over the years, I have been able to learn about other fields and also build warm friendships.

I am extremely fortunate to be able to live a life of research in science, and to be able to work on challenging, new research problems, so that each day is a journey of discovery!