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The making of a woman scientist: A personal experience

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I am a Professor in the Department of Molecular Biophysics, Indian Institute of Science, Bangalore working in the area of computational biology. The focus of my research is to elucidate the structure-function relationships in biological systems. The work involves the use of computational- mathematical techniques to understand the functioning of macromolecules such as proteins. The challenges in this field are two-fold: one is to gain insights into biological systems through established methods and the other is to develop methods to probe biological systems. This is truly an interdisciplinary area, which requires the knowledge of biological systems, the chemistry of molecules, and the principles of physics and mathematics. I have thoroughly enjoyed working in this area, which provided me a glimpse of how marvelously the biological systems work. In this article, I focus on the factors which led me to choose this area of research and what factors played a role in shaping up my career as a professor in this field.

The making of a scientist can happen in many ways. Success

in this process is the culmination of several factors, such as upbringing, motivation, and environment. There is also society at large, whose attitude plays a predominant role in the case of a woman scientist.

I was born and brought up in a small town in Karnataka. Ours was a typical middle-class joint family with a large number of siblings. This was soon after India won its independence. There was an all-pervading sense of nationalism; my mother was proud of the fact that her brothers had participated in the national movement, although in a mild form. As my grandfather was a teacher, there was great respect for education in the family. My father's main aim in life was to give children as much education as possible, irrespective of whether the child was a boy or a girl. As a result, we girls enjoyed all the privileges our brothers had, along with the warm affection showered especially on girls, as is common in a traditional family. Thus, we had the best of both worlds: the healthy values of a traditional family as well as the liberal encouragement to acquire knowledge and education without gender bias.

All this could well apply to any serious scientist, irrespective of gender. On the other hand, certain specific questions arise in the case of a woman scientist. For instance, was the path to a scientific career a smooth one without hurdles? Or were there challenges that had to be faced as a woman, particularly as an Indian woman? My own experience is that women do not need any undue special push to achieve what they want. However, specific deterrent factors, such as gender bias, should not come in the way either. Furthermore, it would help if simple privileges such as flexible hours and extension of age limit in starting one's career are made available to compensate for the time spent in raising a family. Once these basic needs are fulfilled, a woman can perform in science as well as a man, as is true in any sphere of activity. All said and done, the most important factor in science is one's attitude towards the pursuit of knowledge and creative activity, which has to be inculcated and nurtured from a young age.

I obtained both my B.Sc. and M.Sc. degrees from Bangalore University. Although my specialization in M.Sc. was in biochemistry, I was exposed to other branches of basic science to a

reasonable extent. Consequently, I had no problem in shifting to quantum chemistry for my Ph.D., which I did at the City University of New York, under the guidance of David Beveridge. Later, I worked as a postdoctoral fellow with well-known quantum chemist John Pople, Nobel Laureate, at the Carnegie Mellon University, Pittsburgh. I returned to India and started working as a postdoctoral fellow at the Molecular Biophysics Unit where I eventually became a faculty member.

Currently, I am fortunate enough to have a good scientific environment and the freedom to shape and pursue my own line of research. The most rewarding experience is to interact with youngsters, who spend several years in the laboratory, working towards their doctoral degrees. It is highly gratifying to motivate bright young students and guide them in their research. The most important aspect of this scientific endeavour is the continuous learning process. Quite often, students become part of our lives by keeping in touch with us even after leaving the institute and sharing with us not only their academic achievements but also their personal lives.

I was fortunate enough to have had full support from my husband and his family to pursue my career as a scientist. It does require understanding and adjustments from all people concerned. Ultimately, this can be a happy and rewarding experience.

On the job market, despite all talk of equality, women are definitely at a disadvantage for various reasons. One is the attitude, in general, of doubt harboured by decision makers regarding women's efficacy of performance in view of their family responsibilities. Under these circumstances, patience and perseverance help. Of course, opportunity must knock on the door as well. My case was no exception in this regard. I too had to go through these difficult phases before reaching the stable equilibrium that I now enjoy. Nevertheless, it is always a pleasure to have children around and participate in their development and activities. It is up to us to teach them to adjust to our working habits and schedules as working mothers. A happy and vibrant family environment can result from such a mother-child interaction. In my own case, this has indeed happened, leading to our two daughters pursuing sci-

entific careers by their own choice. Having a husband who is himself a scientist has helped a great deal in this regard.

Was process of becoming a scientist a nurtured dream? No doubt, it is always good to have long-term dreams, but it is also necessary to have more focussed short-term goals in sight. At each step, we have to concentrate on the immediate aim and strive to achieve it. Many such steps taken would add up to a path that will hopefully lead to the ultimate destination, which may not even be known beforehand and may not correspond to your original dream. The most creative and exhilarating experience is to follow a course that has not been traversed earlier, a course that is perhaps a meandering one with surprises at many turns. I can only describe this journey by quoting the Spanish poet Antonio Machado:

*Traveller, there is no path.
Paths are made by walking*

By and large, it is not difficult to achieve what one wants, if the aims are within the limits of one's own environment. If the goals are beyond these limits, one has to be much more adventurous and be ready to take chances. Of course, there is also the radical alternative to change the society itself. I have chosen the first path, where I devote maximum effort to my profession, yet remain in harmony with the environment. A large number of women scientists can achieve this. In fact, the present generation of young women have more opportunities and better social acceptance. Pursuing cherished dreams can be a richly rewarding experience for those young women in science who make use of these opportunities.