

Women in Physics in India

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Despite the perception that women in India do not face any barriers in studying subjects like physics and mathematics, unlike women in many Western countries, a recent survey of 8 premier research institutes [1] in the country found that only 20 of the 245 researchers of the physics faculty were women, while the 7 Indian Institutes of Technology [2] had 16 women physicists as part of physics departments which had 201 faculty members. Universities fared little better, as 11 university physics departments [3] surveyed had only 30 women faculty members out of 258. Moreover, in many departments, this fraction has remained roughly constant over more than a decade. Even more telling, the Bhatnagar award (the premier scientific national award in the country) has never gone to a women physicist, and representation in decision making bodies, including influential academies of sciences is so low, as to be almost negligible. So while it is true, that there is no general perception that women lack the intellectual skills required for a career in physics, and both the percentage and the number of women enrolled in universities has increased steadily in the last few decades, in all subjects, including physics, (roughly 30% at the Master's level and 20% at the PhD level [4]), there is definite under-representation of women in higher levels.

The reasons for under-representation at lower levels in India are easy to understand. Many girl children are simply not sent to schools because of poverty. But even among the economically privileged section, girls do face systematic discrimination. There are of course the standard problems of subject material in science subjects including examples and problems being gender-biased, and role models and images of women presented as subordinate - for instance, as nurses instead of doctors or as assistants or subjects with males as the scientists or observers. In many co-educational schools, teachers often talk more to the boys in the class, expecting them to be smarter. Since achievement so often depends on expectations, the fact that society and even teachers expect the girls to be less capable affects their

achievement, which in turn affects their self-esteem. These are similar to the problems faced by girls in other Western countries. But in India, girls, much more than boys, are subject to an enormous social pressure to conform. Even in middle class families, boys are allowed much more freedom to be different and to question elders and teachers. whereas the girl-child is ‘allowed’ to study, but only on condition that she otherwise conforms socially. This hampers the creation of an inquisitive and questioning mind, which is one of the essential prerequisites for doing science, right from the very beginning. Not only is it just that conforming to the rules set by parents and society is much easier than rebelling and getting punished, for girls in particular, the punishments for rebellion are always far more severe. Besides, even in purely theoretical pursuits, the questioning mind questions everything including religion, traditions and social mores. If limits are placed on some forms of questioning by a patriarchal society, how is the mind free to create? As the child grows up, more and more restrictions are placed on her movements, and actions. Marriage looms large on the horizon. If she chooses to dedicate herself to studies, she runs the risk of remaining single and foregoing the standard pleasures of marriage and family. This is not a sacrifice that has to be made by her male counterpart. If she does get married, she (and her husband) have to deal with the problem of finding jobs in nearby places, or deal with a commuting marriage, again exacerbated by the social mores in India, which frowns on couples living apart. If she has children, her divided responsibility during the early years of her children may drive her out of the competitive job market altogether [5].

The 2002 IUPAP women in physics conference in Paris, where a team of women physicists from India participated, brought about an explicit recognition of the problem in the Indian context, where family responsibilities are so overwhelmingly important. This was seen to be the major factor in the selective dropping out of women at higher levels. After the conference, networking among Indian women physicists has increased. This has also led to a more open acknowledgment of the problem of sexual and/or gender-based harassment, which had earlier been a taboo subject. In order to raise awareness, there have been articles and talks by individual women scientists, including several of the team members who went to Paris [6, 7]. Officially mandated policies in India are frequently supportive of women, e.g., it is mandated that all institutions have daycare facilities, and that they set up women’s grievance cells to deal with complaints of sexual harassment, etc. However,

the problem is that these recommendations have rarely been implemented in practice. Several of the team members have now managed to set up these women's grievance cells at their home institutes, and other institutes have followed suit.

A panel on women in science was arranged at the annual meeting of the Indian Academy of Sciences, held in Guwahati in November 2003. There was also an International Conference on 'Women in Science: Is the glass ceiling disappearing?' in March 2004 in New Delhi, where there were discussions about barriers to women's progress in the science and engineering disciplines. This conference brought together working scientists, and social scientists who studied gender issues. The international conference 'Statphys', held in Bangalore in 2004, had a special session on women in physics. An important point which came up was that while individual scientists might have faced no discrimination, the statistics indicated that there was cause for concern. A team from India also participated in the second IUPAP conference on women in physics in Rio de Janeiro, and presented the follow-up of the Paris conference [8]. The IUPAP conference on Physics Education which was held in New Delhi in August 2005 also scheduled a session on 'Nurturing women in physics' which concentrated on ways in which physics can be taught which encourage more women.

At the Government level, the Department of Science and Technology has initiated special fellowships to enable women to get back into science after a break in their career. This scheme provides funding for up to three years. In the three years since this scheme was begun, about 600 women have benefited from it. The Department of Science and Technology also relaxes the age limit for various schemes by 5 years for women, to allow for the fact that they may have had a break in their career. The scientific advisory committee to the Prime Minister is also looking at concrete measures to increase the number of women in science. The University Grants Commission (the supervisory board for universities) has announced 50 postdoctoral fellowships per year for women with a break in career. The L'Oreal foundation has started in Mumbai, a special fellowship for girls to pursue science, based on merit and need. A committee on "Women in Science" has been formed by one of the academies of science and has recommended several measures such as getting a larger database of statistics and information about women in science. The committee has also suggested starting a role model programme, which will involve mentoring, and holding special lectures and workshops for

girl students in science, etc. The committee has also formulated plans for books, etc., which give biographical sketches of eminent women scientists. But all these initiatives are for women in science and not specific to women in physics, where the under-representation of scientists at higher levels is far more serious than in other subjects like biology.

Unfortunately, all the measures mentioned above may not solve the problems faced by women in getting the past the barrier of the first faculty position, nor is it sufficient to ensure their career advancement. Besides social mores and conditioning regarding family responsibilities that will take time to change, attitudes and perceptions of working scientists (mostly male), particularly those in powerful positions (all male), also need to change. Whether or not there are explicit biases in hiring, suitable women candidates get bypassed simply because women are still excluded from informal networks of professionals, and fail to get noticed. Young women who want take up careers are still routinely discouraged by ‘friendly and kind’ senior people, who advise them to look for ‘soft jobs’ near their husband’s workplace. The two-body problem of working couples has not yet been addressed and archaic anti-nepotism rules, written or unwritten, are still the norm. Day-care is by no means available in most places and society still holds the ‘mother’ solely responsible for the children. Talks in conferences, fellowships, grants, awards, etc, are controlled by a few powerful people in the country to whom women are still ‘invisible’. Thus, the discouragement faced by the average woman physicist still needs to be countered by support groups and mentors, which do not now exist to any great extent. This is one place where the women can help themselves, and in the next few years, we hope to set up a network of women physicists who are ‘visible’ and can stand up and expect to be counted.

References

- [1] Institutions surveyed: Tata Institute of Fundamental Research, Mumbai, The Institute of Mathematical Sciences, Chennai, S.N. Bose Center for Basic Sciences, Kolkata; Harish Chandra Research Institute, Allahabad; Institute of Physics, Bhubaneshwar; Raman Research Institute, Bangalore; Indian Institute of Science, Bangalore; Jawaharlal Nehru Center for Advanced Scientific Research, Bangalore.

- [2] All the seven IIT-s located at Mumbai, Delhi, Chennai, Kanpur, Kharagpur, Guwahati and Roorkee are included.
- [3] Universities surveyed: Delhi University, University of Hyderabad, Jawaharlal Nehru University, Pune University, Mumbai University, Madras University, Calcutta University, Madurai Kamaraj University, Panjab University, Chandigarh, M.S. University, Baroda, Banaras Hindu University.
- [4] University Grants Commission, University development in India-basic facts and figures on institutions of higher education, students enrolment, teaching staff. Report, University Grants Commission (Information and Statistics Bureau, New Delhi), 1995-96 to 2000-2001.
- [5] Women Scientists : A Contradiction in Terms?, Current Science, **76**, 24 (1999).
- [6] N. Gupte, J. Gyanchandani, S. Nair and S. Rao in ‘Women in Physics’, Proceedings of the Women in Physics Conference, March 8th-10th, Paris, 2002 (AIP, 2003).
- [7] R. Godbole, N. Gupte and S. Rao, Women in Physics, Meeting reports, Current Science, **83**,359(2002).
- [8] R. M. Godbole, N. Gupte, P. Jolly, S. Narasimhan and S. Rao, ‘ Women in Physics in India, 2005’ Proceedings of the Second IUPAP conference on women in Physics, Rio de Janeiro, May 23-35, 2005.