

## INSA examines Indian women's access to and retention in science

Gender disparity at all levels and its adverse impact on women has become a fact of life. This is partly due to biological role and responsibilities of women as mothers, but mostly due to traditional mindsets, which visualize women as being child-bearers and homemakers, and men as breadwinners. Yet, in many invisible, un-rewarded ways, women contribute significantly to the economic well-being of the family, and take on the double or triple burden of home-making, work outside the home and fight male chauvinism. Among various professional spheres, women seem to miss out more in science and technology, particularly physical sciences, agriculture and engineering fields. Those who do study science, often end up in what are considered as less challenging teaching jobs.

There is a growing realization that by not allowing the creative talent of women to be expressed through their involvement in research and development, society will be at a loss, and something needs to be done to make scientific research more gender-friendly.

The Indian National Science Academy (INSA) constituted a committee to investigate the issue of science career for Indian women and suggest measures to increase their participation in the study and practice of science. The INSA report<sup>1</sup> has attempted to do that. Secondary sources of data were used to get a picture of the status of Indian women in science. To make an objective analysis of the factors that influence science career for women, a study was contracted to the Research Centre for Women's Studies (RCWS), SNDT Women's University, Mumbai. This is a unique study, which has relied on feedback from women scientists and postgraduate students from many parts of India. Efforts were also made to examine the science policy in the context of women. This report summarizes only salient observations. A detailed discussion of this aspect is available in the RCWS original report<sup>2</sup>.

### Study and practice of science by Indian women – recent status

Unlike in the West, in India, the educational pipeline leaks most heavily at the school level. There is higher drop-out of girls compared to boys from the primary to secondary stage<sup>3</sup>. Though there is an overall drop

in the number of students enrolling for higher education, the proportion of females at the high-school level compares well with that at the university enrolment stage, suggesting that improvement in the numbers of girls entering university may be achieved by preventing the secondary school drop-out rate. Interestingly, the proportion of women persisting with science education increases as one moves from graduation to post-graduation (Table 1)<sup>4</sup>. Women studying subjects like agriculture and veterinary science, besides technology and engineering are few. Regional differences in college enrolment exist.

There is evidence of the 'glass ceiling' for women in terms of opportunities for academic advancement. Thus employment opportunities and career growth for women in national laboratories and good universities are limited (Table 2). No woman has become the director of a CSIR laboratory, and even in laboratories where there are over 30% women scientists, women are seldom seen in decision-making committees<sup>5</sup>. A few women receive recognition through awards and academy fellowships. Thus the percentage of women fellows in prestigious science academies is only 3–4. Only 2 (out of 24) national bioscience awards have gone to women. Out of 387 Bhatnagar awards given since 1958, only eight women have received them and none in the past few years<sup>5</sup>. Bias against women leading to the much talked about 'glass ceiling' does operate and needs to be addressed in practical ways.

### Factors influencing science career for women

The RCWS–SNDT study examined the sociological/behavioural aspects using stru-

ctured questionnaires, focused group discussions and in-depth interviews with women scientists, and postgraduate science students from universities as well as government institutions. The regional spread covered Mumbai, Pune, Nagpur, Akola, Shillong, Guwahati, Delhi, Aligarh, Bangalore and Hyderabad. Though the sample size was only about 300 (maximum responses being from Mumbai and Pune), the combination of methods used makes the findings valid.

Majority of the respondents were from urban Hindu forward-caste families and from English-medium schools. Over 90% respondents opted for science as a conscious choice. Besides being self-initiative, maximum encouragement came from parents followed by teachers. In the cohort examined, only 13% scientists and 10% students said they faced difficulty in finding the first job/placement. However, problems started after that. Many complained of gender-insensitive organizational practices and work-place discrimination, which came in the way of their career growth. There was a strong expression, particularly in the focused group discussions, of gender-related discrimination, nepotism and sexual harassment. Many scientists (35.7%) said they had denied themselves career advancements and some (22.7%) said that such denial had adversely affected their careers. It may be pointed out that these are the relatively fortunate women, who had managed to combine a career in science along with managing their homes. Many others would have fallen by the wayside, being unable to cope with the triple burden of home, work and societal prejudices, including gender-related nepotism. Indeed, attempts were made to interview women scientists who had to give up their career for a variety of reasons, but these women

**Table 1.** Percentage enrolment of women at various levels in different faculties during 2000–01

Year	Percentage of women		
	Graduation	Postgraduation	Ph D
Arts	44.2	44.7	38.6
Science	39.0	42.5	37.2
Engineering/technology	21.8	15.8	16.5
Medicine	45.5	34.4	29.3
Agriculture	17.2	18.8	14.6
Veterinary science	21.6	18.6	14.5

**Table 2.** Relative presence of women as scientific and technical staff in government R&D institutions and universities

Organization	Grade of scientist	Scientists – total	Percentage women	Technical – total	Percentage women
CSIR	–	5030	13.0	3250	14.0
DBT	–	179	31.8	277	23.1
ICMR	–	615	27.3	1939	20.1
DAE*	–	436	16.5	–	–
DOD	–	127	8.7	–	–
ICAR	Assistant professor	12750	10.4	–	–
ICAR	Associate professor	4750	6.2	–	–
ICAR	Professor	2500	3.5	–	–
IISc	Academic	316	6.6	34	14.7
IISc	Scientific	113	9.7	–	–
Hyderabad University (science departments)		101	15.8		
Jawaharlal Nehru University (science schools)		82	16	20	0

\*Includes aided institutions only: TIFR, IISc, IPR, IOP, TMC and HRI.

**Table 3.** Special programmes to encourage study and practice of science by women

Recommendation	Implementing agency
Special merit scholarship for girls studying in government schools to take up science. Science education is becoming increasingly expensive due to privatization, and the axe will fall on girls.	NCERT
Travel support to girls from poor families and one escort when they come to the city to write competitive exams.	NCERT
Opportunities for placement for girls, especially from small towns and government schools to do summer projects in good laboratories.	DST, CSIR, ICMR, DBT, etc. and science academies
Opportunities for science teachers from colleges to do short-term research projects. Special leave with pay, if they want to do Ph D	UGC, DST, etc.
Role model programme. Fellowships to eminent women scientists to visit, give lectures, and interact with students and teachers in universities.	UGC, DST, etc. and science academies
Website and directory of women scientists, giving their professional profile. This can be used to identify speakers for conferences, appointment to committees, etc.	DST, science academies
Opportunity for women who have suffered a break in career to return to a science career. More programmes like the one DST has started.	Science agencies, academies
Articles on achievements of women scientists.	Journals like <i>Current Science</i> , etc.
Life histories of successful past and present women scientists to be chronicled.	Project for a suitable organization like RCWS–SNDT
Gender sensitization programmes in all institutions, including schools.	

did not want to talk about it, the experience being painful. In some troubled areas like the northeast, mobility of women is curtailed due to reasons of safety, which has an adverse impact on their productivity.

While the women did not ask for any special personal privileges, they did want better supportive facilities like crèches, day-care centres for elderly, flexible working hours, part-time jobs, campus housing, etc. Some organizations do not allow married couples to work in the same place. This has affected the career of many women. Representation of women in policy-making, as well as selection committees was also suggested. Currently, a few women are considered suitable for being on committees.

In the present study, school students were not included. But in another detailed study in India conducted by Mukhopadhyay<sup>6</sup>, reasons for girls not opting for science, particularly physical sciences, mathematics and engineering were examined. Interestingly, no gender differences in aptitude, or natural inclination for these subjects was observed. Societal mindsets and pressures, particularly in patrifocal families, determined the ultimate preference and educational path of women.

Socio-economic pressures also play a major role in the college education of girls vs boys. With increasing privatization of education, this kind of pressure will increase with greater marginalization of girls from science education. An interesting

study from Mumbai brings out sexual stereotyping in terms of gender roles depicted in the illustrations in science textbook published by NCERT<sup>7</sup>.

Based on the data collected under the guidance of this committee and taking into account reports from other similar committees, including the one constituted by the Indian Academy of Sciences, a list of recommendations has been put together. If implemented sincerely, the committee feels that these recommendations would have significant impact on improving the status of women in science in India. These have been grouped as (1) facilitating programmes that would attract more girls/women, particularly from the under-privileged classes into science, and help their

**Table 4.** Steps to reduce stress on women scientists and students, and to facilitate study and practice of science by women

Flexible working hours and part-time jobs.	UGC, institutions
Facilities like crèche, day-care centre for the elderly, campus housing, transport, proper toilets, ladies rooms, etc.	As above
Age relaxation in recruitment, and two mid-career breaks	As above
Paternity leave for the father, only if there are small children to care for.	As above
Freedom for husband and wife to work in the same institution.	As above
Transfer to enable the wife and husband to work in the same city.	Science agencies
'Grievance cell' for gender-related and sexual offences at the level of the institution as well as at a higher level.	UGC, science agencies
Inclusion of women in selection and other policy-making committees	As above
Transparency in the process of selections. Reasons for rejection should be included.	As above
Performance assessment for a woman should be done on the basis of years spent in professional life, rather than biological age.	
More rigorous efforts to identify meritorious women, and objectivity in selection for fellowships and awards, as well as invitations to speak in conferences.	Academies, awarding agencies
Ensure gender neutrality in illustrations in science textbooks. Stereotype roles of women doing domestic work and men engaged in scientific work should not be portrayed.	NCERT

retention in science career, and (2) support systems to reduce the stress on women scientists and students (Tables 3 and 4).

Women's presence in science is advantageous for the society at large. In addition to women bringing in a more humane perspective to scientific research, necessary for sustainable development, loss of womanpower from science is a major loss of trained resource, which can be difficult to compensate even in financial terms – a point that the society and the polity should note.

Implementation of the recommendations can be made only with collective determination and efforts of several agencies like UGC, NCERT, science funding agencies, and academies. INSA can facilitate the process by initiating a dialogue between these agencies and organizations.

The INSA report was released on 11 October 2004. On 20 December, a brainstorming meeting of putative stakeholders who can help implement the suggestions and recommendations was organized. The

participants urged INSA to form an inter-academy standing committee with inclusion of other science funding agencies and UGC, NCERT, etc. to chalk out a plan of action. The Indian Academy of Sciences has also constituted a committee and the two academies could work in tandem. An earlier report provides information on status of women engineers<sup>8</sup>.

The Inter-Academy Council (IAC), a world body of science academies, has initiated a study/project on Women for Science that is designed to produce an action agenda for science academies to strengthen the contribution of women to science and engineering. Manju Sharma, co-chairs this IAC WfS Panel. Consultations between academies have been initiated. Let us hope, that with all these initiatives, women scientists and engineers will have a brighter future.

1. Indian National Science Academy, Report, New Delhi, 2004; see <http://www.insaindia.org/sciencesservice/science.htm>

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## Serving farmers and saving farming

'Serving Farmers and Saving Farming' is the title of the First Report submitted by the National Commission on Farmers (NCF) to the Government of India in late December 2004. Commissioned to recommend a comprehensive medium-strategy for food and nutrition security, and examine

and recommend methods of enhancing productivity, profitability and sustainability of major farming systems of the country while looking at technology and public policy and the neglected area of needs of farm women especially in the context of increasing feminization of agriculture,

the NCF has in this report, proposed a three-pronged strategy: improving productivity of land, water, livestock and labour in asset-based livelihoods; enabling unskilled agricultural labourers convert to skilled entrepreneurs managing non-farm micro-enterprises supported by micro-credit;