

## WOMEN SCIENCE PROFESSIONALS IN INDIA

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### Abstract

*In India, women constitute over one-third of the total Science under graduate and graduate degree holders but comprise only between 15-20 percent of the tenured faculty across research institutions and universities in India (INSA Report, 2004) pointing to the fact that the leak in the pipeline is after graduate and doctoral levels. Most policies and reports till date have focused on providing provisions for women scientists based on the premise that family and societal factors are responsible for women dropping out of Science. The views of men scientists who constitute the majority of the formal space in Science reflect these popularly held notions. However, the findings of the IAS-NIAS study( 2010) point towards systemic biases that operate at the organizational level as a significant contributing factor. More importantly the study sample represents the diversity among women scientists and includes men scientists, emphasizing the need for policies to take into consideration the differences across these groups.*

Despite the increasing number of women in higher education in Science, women's participation at higher levels of Science in tenured research positions has shown little increase<sup>1</sup>. Further, the relatively higher representation of women is seen in the low status jobs (e.g. junior/ ad-hoc faculty, temporary research associates, post-doctoral fellows, etc.) in Science that have been vacated by men due to their lower profitability.

However, as Bal (2004) has pointed out, a permanent position with the ability to undertake research projects with appropriate institutional facilities, advise doctoral students, and publish is important for a stable career in Science. Since competition to remain and advance in Science careers begins at the earliest stage soon after PhD, it is important for women to establish themselves during their early 30s, a period that coincides for most Indian women with marriage and family commitments. Breaks or temporary research positions of 3-5 years during this period do not offer the advantage of moving up the ladder at a later stage when family commitments take less time. Thus, as a compromise, a large number of qualified

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<sup>1</sup> Refer Bal, 2002; 'Science Career for Women', published by INSA (2004)

women scientists opt for under-graduate or school level teaching, while others completely drop out of Science.

Even though there is recognition of this ‘winding career path’<sup>2</sup> for women, Science policy makers often ignore the willingness and need for women to stay active in research despite their other responsibilities. Absence from active research through breaks cannot be compensated for at a later stage in the highly competitive environment of Science. Therefore, policies designed to provide extended maternity breaks or temporary research projects may actually not address the central problem and may instead work against the interests of women.

Most of these studies have revealed useful information particularly with regard to the proportion of women at senior and management s as well as in the Academies. In addition, the studies highlight gender insensitive organisational practices, work place gender- related discrimination, nepotism and even sexual harassment. However, the nature of discrimination was more indicative than illustrative and nuanced.( The low representation of women at senior and decision making levels has figured as an area of concern ( Poonacha and Gopal 2004, Bal 2004). Despite the growing numbers of women in biology, prevalent patriarchal practices hamper the career prospects of these women. This is despite these women having a relative advantage of education and class when compared to women in the unorganised sectors (Bal 2004). A few others who carried out case studies with reference to specific universities and institutions referred to tacit factors – organisational and professional rigidities, reflective of social attitudes, hindering the progress of women in a science career(Gupta and Sharma 2002, Kumar 2008, Subramanyam 1998). A joint study( Kurup, Maithreyi, Kantharaju and Godbole (2010) of the Indian Academy of Science (IAS) and the National Institute of Advanced Studies (NIAS), Bangalore, explored the reasons why women after completing a PhD in science drop out from scientific research. Absence of job opportunities, institutional factors and the opaque selection process were among the several reasons. The proverbial glass ceiling that cuts short a woman’s career in science is not the family but the systemic biases in S&T institutions. Particularly in the Indian context, the prevalent structures and practices of these institutions that have historically been a

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<sup>2</sup> Refer Elgquist-Saltzman, (1992) for an explanation of ‘winding career paths for women’.

male domain pose a serious challenge to women's balancing career and home. Despite this, several women scientists have found their own approach to balance career and family in interesting ways. These experiences have not been studied and analysed so far (ibid.) .

The NIAS-IAS study aimed at developing a set of recommendations from the actual experiences of and data obtained from women scientists. Acknowledging the diversity among women scientists (Anitha et.al, 2007), efforts were made to include women who have continued in Science as well as those who have dropped out. It is important to note that while several recommendations of this study may have appeared in earlier reports, our attempt has been to qualify these recommendations with nuanced field data so as to overcome major hurdles during their implementation.

**Sample and Methodology:** A survey was conducted with 568 women scientists, of whom 312 were engaged in Science research (WIR); 182 were not engaged in positions other than long-term Science research (WNR)<sup>3</sup>; and 74 were not working (WNW). In addition to representing the diversity among women, another unique aspect of the study was the inclusion of men scientists (161) as a comparative group.

## **SUMMARY AND RECOMMENDATIONS**

### **Women Scientists: Women in Research(WIR), Women not in Research (WNR), and Women not Working ( WNW)**

The complexity of developing interventions to retain women in science stems from the diversity in the characteristics of women scientists across different groups of science. The differences also perhaps stem from the different priorities the groups have because even with several commonalities among demographic profiles of the women, differences on important aspects such as professional prospects vs. childcare or family responsibilities are seen.

- An analysis of sample details reveals that while majority of all three groups of women were married, the highest percentage of WIR were 'never married' (14.1 percent).

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<sup>3</sup> WNR included those in undergraduate or school level teaching, temporary research positions such as DST women scientists schemes and consultancy or administrative posts. The defining feature of the category was working on jobs that may not require training at the PhD level.

Women who were 'never married' are distributed across all age cohorts. Majority of the three groups also reported children. Majority of them had children over 15 years. However more WNW across all age groups had younger children (between 0-5 years) compared to the other two groups.

- Majority of the women also reported living in nuclear families. A significantly higher percentage of women not working reported having received no help with childcare. Thus for WNW, the absence of support either by choice or compulsion could perhaps be an important reasons for their drop out. WIR and WNR reported receiving help from varied agencies like their family, husband's family and professional help.
- A significantly higher proportion of the scientists classified as women not working also had spouses in the same field or organization as themselves, and this could have been another major factor contributing to their drop out.
- With respect to organizational details, professional advantages and opportunities and getting jobs have been the main factors influencing job selection. , Majority of the responses from all groups indicated **not getting jobs as reason for not taking it up posts applied to**, While more WIR and WNR have indicated **better professional prospects** for not taking the posts no responses from WNW have indicated better professional prospects.
- With respect to leaving previous jobs, **better professional prospects have been the most important consideration for WIR and WNR, while the temporary nature of the post has been the reason most often stated by the WNW**. Family reasons have also been the second most important factor for leaving jobs for WNW.
- There is also a significant difference between WIR and WNR with respect to reasons for accepting present post. **A greater proportion of WIR have reported professional advantages as reason for taking up the post, while a greater proportion of WNR have reported other reasons such as lack of other suitable options, freedom and autonomy in work, permanency of position, etc**
- **In terms of working hours, both WIR and WNR have reported working between 40-60 hours on an average**. However a higher percent of women in research have reported working for 60 hours or more a week compared to WNR, while a greater percent of women not in research have reported working between 20-40 hours per week compared to WIR.

- With respect to breaks in career also, there is a significant difference between the groups with respect to reasons for the breaks. While childcare and elder care have been important reasons for all three groups, **more women in research have reported other family factors such as marriage, husband's or father's transfer as significant reasons; more WNR have reported other reasons such as further studies, health reasons or non-availability of fellowship due to age limits, while women not working have reported difficulties in finding jobs and institutions as a significant factor.**
- Having noted that there are differences between the three groups of women with respect to reasons for not taking up jobs, or leaving jobs, as well as reasons for breaks, it is hardly surprising to note the significant differences between the groups with respect to the provisions considered important by them to retain women in science careers. **While all three groups have considered flexibility in timings to be the most important provision, they differ with respect to other useful provisions. For WIR, who continue to juggle between scientific research and teaching careers, and family responsibilities, provisions for transportation and accommodation are important. For WNR, better HR policies have been considered important. For the third group of WNW, mainly due to reasons of childcare, childcare facilities at the workplace are important.**

#### **Summary of Women in Research(WIR) and Men in Research (MIR) :**

The analysis of the educational, work and research profiles of women and men in research is important to identify what factors that women and men differ on contribute to their advancement or drop out from science.

#### **The data analysis reveals:**

- Sample details have shown that while 14 percent of WIR were 'never married', only 2.5 percent MIR report being 'never married'. In comparison to 39 percent women who reported that their spouses were doctorates and 40 percent who reported that their spouses were in science, only 16 percent men reported that their spouses were doctorates and 19 percent reported that their spouses were in science.

- 86 percent men compared to 74 percent women reported having children. **A higher proportion of WIR spent between 40-60 hours per week at work compared to men, while a higher percentage of MIR reported spending less than 40 hours per week at work compared to women when their children were growing up.**

With respect to employment and organizational factors, it was observed that a significantly higher proportion of women (46.8 percent) compared to men (33.5 percent) reported working between 40-60 hours per week. More men reported working less than 40 hours per week compared to women.

- For both women and men, getting jobs and professional advantages and opportunities have been important reasons in determining present and previous jobs. More men compared to women have reported leaving previous posts for better prospects. For men and women approximately equal proportion of responses were reported indicating family factors as an important factor in taking up present posts. However, the proportion of responses reported by women indicating organizational factors such as flexible timings, day care facilities, transportation and accommodation, etc for taking present posts is higher compared to the responses reported by men. The importance of organizational provisions to help women balance careers and domestic responsibilities have been importantly highlighted by this data.
- Men and women differ significantly with respect to breaks in career also. A significantly lower proportion of men have reported breaks compared to women. While personal factors such as health, further studies and voluntary retirement have led to breaks for men, for women, domestic responsibilities of childcare and eldercare have been responsible for the breaks.
- Perceptions regarding why women drop out of science also differs between the groups. While higher responses from men have indicated family and socio-cultural factors, women have also perceived organizational factors such as lack of flexibility in timings, lack of role models and mentors, discouraging and uncongenial atmosphere, etc to be responsible for women's drop out from science.
- Men and women differ with respect to the provisions that have been considered important to retain women in science as well as regarding reasons for why women and men drop out of science. **While majority of the women's and men's groups have reported flexibility in timings, a larger percentage of responses by men indicate need for refresher courses, fellowships, awareness and sensitization campaigns to**

**retain women in science. In contrast, women perceive provisions such as accommodation and transportation that would help women balance their career and family to be important.** Since most scientific organizations have a greater proportion of men compared to women, especially on decision-making posts, the differences in understanding of the problem between men and women could have important implications. Provisions that are designed without consultation of both the experience of women and men who are part of this work space will not yield the desired results. **Thus, it may be important to consider the view points of gender sensitive men scientists along with gender sensitive women scientists who have a nuanced understanding of the complex functioning of S&T organizations.** It must be emphasized that the S&T organizations in our country are varied and hence experiences of one organization cannot represent the other organizations. **Sociological studies of S&T organizations with a democratic multi disciplinary team will go along way to provide useful insights that will help the country frame policies that can retain the talent pool both women and men.** Excluding the experiences of women in science can lead to inadequate provisions. Thus, it is important that **more women are represented on committees and decision making posts to influence the policies that can be conducive to women.**

## **RECOMMENDATIONS**

The primary purpose of the study was to develop a set of comprehensive set of recommendations and policy directions that is evidence-based that will be relevant to motivate and retain women in science. In drawing out the data that has importantly informed the formulation of our recommendations, a wide range of women and men scientists were covered from different parts of the country. While the purview of the survey covered only those with a PhD in Science, Engineering or Medicine, adequate care was taken to represent members from a range of scientific organizational settings like autonomous institutions, research organizations, universities and colleges, industries that are government owned and private sectors. For the first time, this study has covered women scientists who may not be currently employed as well as men scientists. The data too convincingly revealed that the group was not a homogenous one and the diverse experiences of women in science research, men in science research, women and men not in science research and women and men who were currently not employed has vitally informed our recommendations. **The myth of ‘One**

**size fits all' accepted by science policy makers has been interrogated through this study.** The study attempted to represent the many different voices and needs that science policy makers need to respond to if there is a serious engagement with the central question of attracting and retaining women in science..

Important headway can be made by **addressing organizational and infrastructural facilities as well as undertaking policy changes that maybe critical to attract and retain women in science. Such changes are important to move beyond the traditional framework that locate societal and family responsibilities as singular factors responsible for women dropping out of science.**

As the data has importantly revealed **close to 85 percent of the women who are pursuing active careers in research have competently and in very different ways balanced families and careers. Among those in scientific research approximately 15% percent have reported being 'never married' and are distributed across all disciplines. Among the largest majority of those married, never married, with or without children, family and societal pressures have been a small/miniscule but significant proportion (13 %) of the hurdles reported for not taking up the job they applied for. Even among those who are currently not working, the corresponding figure is 3.3%. indicating that family and societal pressures cannot explain completely why women drop out of science.**

**These facts are an important indicator of women's commitment to pursue scientific research. Institutional support through 'gender-neutral' facilities and policies could be vital/critical in attracting and retaining women in science. These policies in turn will in turn have a spin off effect in redefining 'gender roles' at home, that could maximize the productivity of women and men scientists. In essence, this will lead to maximizing the productivity of the organization on the whole.**

**Gender neutral facilities and policies are also important to prevent one, the stereotyping of gender roles and two, the stigmatization of women for being privileged for special treatment. A caution in this regard is very useful. Periodic reviews of the new policies are essential to make sure that they do not work against the interest of women in particular and science practice in general. In the West there has already been a recognition of the**



importance of having such gender-neutral facilities and interestingly many men have availed its benefits.

## **ORGANIZATIONAL / INFRASTRUCTURAL PROVISIONS**

### **A. Provisions to manage career and home/family/multiple responsibilities:**

Provisions of on campus housing, transportation<sup>2</sup>, state of the art child care and elder care facilities as well as professionalized domestic help for both women and men faculty at all S&T organizations including universities, research organizations and autonomous organizations can be of importance for scientists in the management of their family responsibilities. This will release their time and energy that can be utilized for their scientific research activities. Priority accommodation and childcare and eldercare facilities for those with young children and elders would be important.

**B. Flexibility in Timings:** Evolve a gender neutral policy of flexible timings in all S&T organizations that allows one to manage multiple responsibilities. It is important that this is not construed to mean that scientists would want to work from home and not spend time in the laboratories. Rather, it is an indication that organizations are willing to introduce policies that will allow a greater participation of scientists to engage with research. The policy will have an extended office hours which will give a margin of three hours for starting and closing work officially. This will mean that scientists will start their office hours between 7 and 10 am and close it respectively between 4-7 pm.in the evening. Work can be organized by the scientists so as to use the official timings to interface with the administration if necessary and to hold official meetings at a time when convenient for all team members. The quorum required for departmental meetings should have a gender break up. The extra time margin provided could be used productively on research.

**C. Opportunities for networking and collaboration:** Increasing opportunities for networking and collaboration through increased number of travel grants; organizing workshops and conferences dedicated to facilitate collaborations; integrating sessions in conferences and workshops for honing networking skills is important and measures

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<sup>2</sup> In the view of security reasons, it is not just enough for organizations to compensate for travel but provide assured transportation facilities for late working hours for both women and men. This provision has already been adopted by the private sector, particularly IT and ITES services which has enabled more women also to work in these sectors

to enhance it among women scientists needs attention. In considering applications for conferences and workshops, it is important to ensure that there are adequate number of applications from both women and men through active pursuit<sup>3</sup>, and selection must take care of representing members of both groups, even while specifying the merit criteria. It would be important to have a transparent, publicly displayed checklist indicating the requirements for merit based selection, both to encourage more women to apply through a knowledge of these criteria as well to ensure transparency in the selection procedure. **Mentoring:** Mentoring mechanisms and integrating sessions during workshops and conferences to enhance capabilities of women scientists are important factors in attracting and retaining women in science. Mentoring needs to be encouraged through provisions of additional incentives for it in individual's performance appraisal. As adopted by some corporates, mentoring can also be encouraged by instituting official policies that pair senior and junior colleagues to provide for guidance.

## **POLICY CHANGES**

- D. Policy on transparency in selection and evaluation procedures:** All institutions must make available the criteria for selection and promotion of all faculty. According to literature the availability of actual selection criteria helps increase the pool of women applicants and builds confidence among those who contemplate whether to apply or not because of the low success rate for women. Studies on the hiring practices of institutions can provide clues to the evaluation procedure and qualities perceived as desirable for a good candidate. Such a study would also help institutions develop a ready checklist to be made available to all candidates during selection.
- E. Policy on Time Bound Target Recruiting System (TRS):** For institutions that do not have adequate representation of women at all levels from students to faculty (including Assistant Professors, Associate Professors, Professors, Deans, etc), develop a time bound recruitment target system(TRS) based on the current representation of women in the institution, age and the size of the institution. **Make it mandatory for institutions to review TRS based on outcomes<sup>4</sup> rather than restricting it to providing opportunities or process based.**

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<sup>3</sup> Subject specific databases developed by IAS and NIAS as well as the data base of DST can be used to send out mails calling for papers/abstracts. Information by and large is restricted to premier and well know institutions.

<sup>4</sup> Outcomes refer to the actual increased number of women employee across all levels and departments.

- F. Increase in recruitment of women to premier research institutions:** Government must proactively increase number of women scientists in premier institutions to break the stereotype that women scientists are best as college or university teachers . Increasing the number of women in premier institutions that gets greater visibility, have comparatively higher resources and better infrastructural facilities will have a far reaching impact on women wanting to choose a scientific career.
- G. Mandatory disclosure of gender break-up of faculty and students across departments:** It must be mandatory that every S&T organizations within a time frame puts up a gender disaggregated data of their employees at every level starting from student to the professors and deans. The data must be presented department wise.
- H. Mandatory composition of one-third women members to committees:** It must be mandatory that all decision making committees, like the search/ selection/hiring committees, committees that decide on promotions at all levels as well as other decisions making committees or the organization must have at least one third women representation (or work towards it within a specific time frame). Efforts to get women representative from outside the institution, city, state must be explored. It would also be important to make mandatory a rotational system of selection of women representatives to different institutional as well as national committees based on merit, to give opportunities to all women to be a part of the decision making process. This will broad base the participation of women scientists and hence become more representative.
- I. Introduction of Long-term schemes for re-entry:** Modification of existing re-entry schemes to cater to long term working opportunities for women and men who return to a scientific career after a break. Provisions for short term schemes, temporary positions and post doc positions limit the potential of attracting scientists to a research career. It would be important to ensure complete autonomy for these scientists by making it mandatory for all government supported institutions or labs in institutions to take them on independent projects. To optimize the use of lab facilities supported by the government, incentives can be given to these institutions for having taken more independent researchers on government schemes. These scientists can be subjected to the review processes once in five years as done in the case of scientists who are in tenured track positions. Facilities for these scientists like travel grants, PF, transport facilities, and child care/elder care must be extended to them. It should be important to ensure that these women (or men) scientists are not awarded projects based on their

identification of a faculty member at a particular institute, to ensure their independence. However, a local advisory committee that can guide and review their work can be set up to ensure that the targets of research are met.

**J. Policy on Employment of Spouses in the same Organization:** The study has revealed that the largest proportion of women who were unemployed had spouses who worked in the same field or organization as themselves. A higher proportion of this group also reported that they had difficulty finding jobs or institutions as reasons for breaks. Together, this data highlights the importance of ensuring the continuation or accommodation of spouses in the same organization or at least within different organizations in the same city or town to prevent the loss of trained scientific women power. It should be made mandatory for all S&T organizations to state it upfront and bring it into practice that the organization will encourage and employ couples when found qualified. This is particularly relevant with respect to small cities and towns where opportunities for science research are limited to one or two institutions. The government agencies must play a proactive role to facilitate the employment of the spouse when the other is transferred to prevent the loss of trained scientific human power.

**K. All recommendations need to be reviewed periodically do make sure that steps taken to attract and retain scientific human power (including men) do not work detrimental to the interest of promoting equality and preventing the loss of trained scientific human power.**

The recommendations developed here are the first step towards understanding and addressing the issues of the diverse groups of women in science. Further study is required to understand the choices that women have made and to what extent the choices were informed.

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