

Women in Science & Technology:

a vision document



(Inter-Academy Panel on 'Women In Science' in India, 2016)

**A Road Map
for
Women in
Science & Technology
–A Vision Document**

INTER-ACADEMY PANEL ON 'WOMEN IN SCIENCE' IN INDIA



**Indian Academy of Sciences
Bangalore**



**The National Academy of Sciences, India
Allahabad**

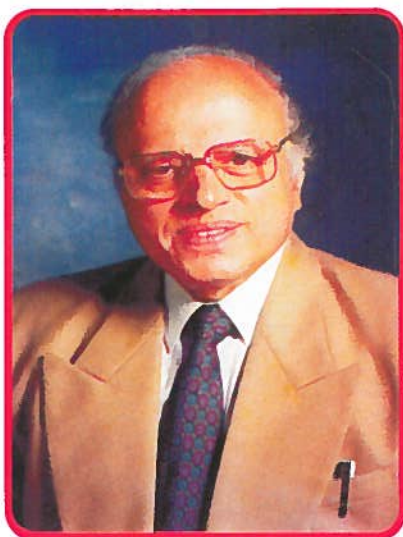


**Indian National Science Academy
Delhi**



"Life is not easy for any of us. But, what of that? We must have perseverance and above all confidence in ourselves. We must believe that we are gifted for something and that this thing must be attained" - Marie Curie

FOREWORD



The 6th Five Year Plan, for the first time included a chapter on women and development. The aim of the chapter was to ensure that all the development programmes are engendered. A section on women in science and science for women was also included. Later a comprehensive report was prepared on this topic on behalf of the Science Advisory Committee to the Cabinet. For women in science, several important recommendations were made including providing them with one year sabbatical opportunity whenever they have to go on leave for a few years for the care of children. Since then the Department of Science and Technology has been in charge of implementing programmes for women in science.

We need more women scientists both in the scientific leadership and academic levels and we also need application of science for the welfare of rural women. Hence, science for women as for example in the field of energy, water, healthcare, sanitation and nutrition need specific attention. Fortunately, in the Union Budget for 2016-17 funds have been provided for *Panchayats* to take up location-specific fields. At least 50% of this fund should be made available to women members of *Panchayats* for addressing gender specific issues.

I am happy that the Presidents of the INSA, NASI and IASc took the leadership in constituting an Inter-Academy Panel under the leadership of Dr. (Mrs.) Manju Sharma, former Secretary, Department of Biotechnology. Dr. Manju Sharma has more than anybody else promoted the cause of the technological empowerment of women and at the same time involved more women in science.

As a result, today women scientists are playing a leading role in strategic research in the fields of biotechnology, space technology and information technology, but they are also involved in developing technologies for rural women. The public policy support needed for involving women in science and promoting science for women are well defined in this report with great clarity and a sense of priority. I am confident that this report will further strengthen the steps already taken by different scientific departments, both at the Centre and State for ensuring that 50% of our population is enabled to make their contributions to science and also derive benefit from advances in science and technology in relation to quality of life improvement. We are indebted to Dr. (Mrs.) Manju Sharma and other members of the Panel for this excellent report.

Prof. M. S. Swaminathan
Past President, NASI

PREFACE

Our former Prime Minister Shri Atal Behari Vajpai had said in the context of declaring 2001 as the year of empowerment of women:

“Developing countries that have made remarkable social progress, have done so primarily through the empowerment of women, which has had enormous impact in terms of literacy, health and economic well being of families.”

Fifty percent of our precious human resource that is women are an integral part of the overall socio-economic development of the country, and in rapid progress of Science and Technology. Their education is crucial not only for the society, but for building the strength of the country, particularly, when women pursue Science as their career. Since 1980 so many reports, conferences, seminars etc. have been organised nationally as well as internationally. It is very clear that there has been serious concern about the inclusiveness of women and gender parity.

The purpose of the present **Vision Document-A Road Map for Women in Science and Technology** is once again to reiterate the unique challenges, obstacles, procedural issues, cultural paradigms, finances, sensitisation of women etc.; many of these issues have been discussed threadbare. The present report brings out two aspects of S&T for women; first is much greater involvement of women in science and technology i.e. inclusiveness in all developmental activities and scientific programs; the second is application of science and technology for women particularly the technological empowerment of women in rural areas to reduce their drudgery. The report has tried to bring out the genesis, some statistics on education, employment, fellowships of the academies etc. gap areas, role of academies, implementation strategy, need for human resource development and some other important recommendations.

NASI brought out compendium on the women Nobel Laureates; to illustrate, Madam Curie got the Nobel Prize in 1903 in physics and 1911 in chemistry; Dorothy Hodgkin on the structure of important biological crystals in 1964; Barbara McClintock on genetics in 1983 and many others. I would like to strongly advocate that women who do scientific research must have such role models in their minds. After all, why an Indian women Scientist cannot get a Nobel Prize? All my fellow women scientists must take this as their motto –

“Life is not easy for any of us. But what of that? We must have perseverance and above all confidence in ourselves. We must believe that we are gifted for something and that this thing must be attained.” Marie Curie

The technological empowerment of rural women is most critical; the educated and privileged class of women scientists will have to own the responsibility. As far as possible, awareness building, training programmes and entrepreneurship development with technological interventions, all these must be focused almost in a mission mode.

I take this opportunity to profusely thank our President, Prof. Akhilesh Tyagi for his continued, sustained support in NASI for all the Women in Science programmes. At this juncture I will be failing in my duty if I don't pay our most sincere thanks and gratitude to Prof. M S Swaminathan without whose guidance and encouragement, we would not have been where we are today. On behalf of all the women scientists of this country, we place our gratefulness and profound regards to Prof. M S Swaminathan. I also place on record our sincere thanks to the Presidents of the three academies (INSA, NASI, IASc) who gave us the responsibility of working on the theme of Women in Science.

This report would not have been possible without the full cooperation of all the Inter Academy Panel members. I thank them all. Dr. Paramjit Khurana and Ms. Archana Pant have played a crucial role in finally coordinating and presenting this document.

I request all the concerned Ministries and Departments to help us move forward!!!

Manju Sharma

*Prof. (Mrs.) Manju Sharma
NASI-DST Distinguished Woman Scientist Chair;
and Past President, NASI*

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1. Introduction

1.1 Genesis:

Women constitute 50% of the human resource, thus, contributing a major strength in the socio-economic development of the country. Gender inequality, parity, inclusiveness of women in major developmental activities and getting more women in Science and Technology (S&T) are the issues discussed since 1970 all over the world under the auspices of UN Conferences and other national and international events. Government Departments, Academies and NGO's have played a major role in the sensitization of the population especially, authorities regarding the involvement of women in S&T. The three Science Academies in India, in particular, as well as some professional bodies taking up the subject of **Women in Science (WiS)**, made several recommendations and documented many facts and constraints. Recently, the Presidents of three National Science Academies of India, viz., The Indian Academy of Sciences (IASc), Bangalore, The Indian National Science Academy (INSA), Delhi, and The National Academy of Sciences, India (NASI), Allahabad, also took note of this in their joint meeting to discuss **Women in Science** and realized the need of further advancement of this programme. Consequently, an **Inter-Academy Panel** was constituted with the motive to ensure inclusion of women in S&T related issues in all possible and pragmatic ways and strengthen the application of S&T to reduce the drudgery of women in rural areas. The panel with many distinguished women scientists as its members under the Chairmanship of Prof. Manju Sharma, NASI-DST Distinguished Woman Scientist Chair, former Secretary to the Govt. of India, and Past President of NASI, was entrusted with the responsibility to coordinate the **Women in Science** Programme in India. (**Annex- 1**)

The main objectives of the panel are:

- To prepare a road map for implementation to encourage women in science and application of science for the welfare of women.
- To include more women in science and accelerate contributions of women in science.
- To ensure access to information about various opportunities.

The first meeting of the panel was held on 23rd June, 2015 (**Annex-2**). After detailed discussion on various aspects relating to **Women in Science**, it was agreed that a **Vision Document** outlining a roadmap will be prepared. A sub-committee with Prof. Paramjit Khurana as the convener was set up to prepare the first draft. The present document has taken note of many of the existing programs and has highlighted the implementation strategy. The Road Map would outline the implementation strategy under two categories, viz. (i). **Women in Science**—For those women who want to pursue Science as a career (ii). **Application of Science and Technology**— For the welfare of women; especially, in rural

areas with a view to reduce their drudgery. The intention is not to repeat statistics and other information already documented, but, to give concise recommendations and implementation strategy.

The three Science Academies, viz., IASc, INSA and NASI have played a pivotal role in bringing out specific issues pertaining to women scientists. Recognizing the substantial role of women scientists and teachers in providing support and solution, and most importantly, in pursuit of its mandate of *Science & Society*, the National Academy of Sciences, India (NASI) launched a nationwide programme on **Technological Empowerment of Women** during the year 2012-13 (also declared as 'Year of Science' by the then Prime Minister of our country) under overall supervision and convenership of Prof. (Mrs.) Manju Sharma along with other distinguished scientists as Prof. Krishna Misra, Prof. Paramjit Khurana, Prof. Kasturi Datta, Prof. Veena Tandon, Prof. Madhulika Agrawal, Dr. Shashi Bala Singh, Dr. Shelly Praveen, Prof. Rama Bhargava, Dr. Rama Datta, Dr. Asha Juwarkar, Dr. Mehtab Bamji, Dr. Jyoti Sharma, Ms. Archana Pant and many others with the approval of the Council of the Academy (NASI) for organizing a series of workshops in different regions of the country. Several important issues / areas (viz. health & nutrition, agriculture, horticulture, aquaculture, animal husbandry, value addition, writing scientific proposals, enhancing skills and S&T education) related to urban as well as rural women were discussed during the workshops attended by a large number of enthusiastic women research scholars, faculty members, scientists from educational and scientific/research organisations from all over the country. After this vigorous exercise and incredible response/ feedback from the women scientists/teachers/scholars from all across the country, the recommendations of these workshops were displayed on NASI's website. These were subsequently published and discussed on various platforms; some were pursued with government departments/agencies for implementation.

The Indian Academy of Sciences, Bangalore, formed a Panel for *Women in Science* in 2005. The webpage of the panel summarises its activities¹. It has three major initiatives, viz.,

1. To mentor and provide role models to young students to attract them to careers in science,
2. To help the women who are already in the profession to achieve their full potential; and
3. To sensitize different sections of society to the gender issue in science.

Women are universally under-represented in science and technology. There are few role models to motivate the young women scientists and students. The Indian Academy of Sciences (IASc), Bangalore, made a laudable effort of bringing out '**Lilavati's Daughters: The Women Scientists of India**', an eye-opening collection of essays of about nearly 100 Indian women scientists from the Victorian era to present-day India, giving an inspiring account of what brought them to science and what kept them going despite the exorbitant

social and personal problems along the way. The idea was to put together a collection of biographical sketches of influential Indian women scientists of earlier generations, to underline the fact that it is possible to find role models within the country and most importantly to find women scientists of substance. Covering a range of disciplines in this compilation, the Indian women scientists talk of what brought them to science, what kept their interest alive and what has helped them achieve some measure of distinction in their careers. To communicate with the women scientists of coming generations and give them an inspiring message, what makes a successful career in science possible, the above book has highlighted these aspects. It is important, especially, for budding women scientists and research scholars with a strong desire of pursuing science to know of women who achieved their goals in the Indian social and academic environment, even though sometimes it was not favourable.

The WiS Panel created a data base of women scientists to conduct a survey, along with National Institute of Advanced Studies, called 'Trained Scientific Woman Power: what fractions are we losing and why?'². The panel also conducts workshop programs called 'Women in Science: Career in Science' in schools and colleges for an audience consisting of both men and women. Women scientists talk about their science and also conduct career guidance/gender sensitization sessions depending on the audience.

The Indian National Science Academy (INSA) in fact took the first step in the context of statistical information by bringing out a report. This led to a set of recommendations and formation of a DST Task Force which brought out a report analyzing the situation. Many of the recommendations given herein were implemented by DST and the DBT, leading to the formation of a Standing Committee of the government of India for **Women in Science**.^{3,4}

INSA formed a panel for **Women in Science** and also organized a one-day discussion meeting on 'Women in Science Education and Research' during the second summit of the South Asian Science Academies held at INSA and the INSA team participated in the formulation of 'Women in Science and Technology in Asia: an AASAA report'.

1.2 Inclusion of Women in S&T and the Application of Science and Technology for Women Welfare:

● Women in S & T

Women, the vital human resource, are the pillars of the world economy. Women have contributed in almost every sphere of life, be it social, political, educational, economic & business. They are even leading the country and are source of inspiration to many. But, the social norms, societal structure, relationship between family and work and the

organizational processes of scientific institutions have created a series of interrelated problems for women in science. To address these problems, attitudinal changes in the society at large are, thus, absolutely essential.

Science and society are closely linked and there is a need for changes within the social structure and scientific institutions. Women in science comprise only a small percentage of the total number of working women in India. The scarcity of women whether it comes to science fellowships, awards or positions of science administration is the reality in India today. The under representation of women in science, particularly at senior levels of teaching and research in India, has become a serious concern. Hence, there is a need to make women aware of careers in science as a possible option and then to retain them in the profession and give them the necessary recognitions.

It is essential to bring about a radical change in the mindset of the authorities and managerial structures where participation of women is not restricted to science education and should be increased and expanded considerably. This is feasible by facilitating ways and creating a conducive environment to empower them. It is essential that from the very beginning, girls are attracted towards science for which several strategies need to be adopted. This report will discuss later the importance of mentoring and nurturing. Utilisation of the talents of women should not be viewed only from the perspective of gender equity. It must be understood that full involvement of women in scientific and technological efforts is essential today for rapid societal and national development, and sustainable happiness of the people.

● **Application of S &T for women in rural areas:**

Women in rural areas need to be valued as precious human resource and assets; not liabilities. Science education, vocational training and skill improvements would not only increase the capacity of women for gainful socio-economic participation, but, also enhance their awareness to thinking critically, analysing the problems and act accordingly for better opportunities and more importantly, bring about a qualitative change in the approach with S&T intervention relating to societal programmes. They can become instrumental in removing the socio-economic barriers and psycho-stigmas.

The condition of women in rural areas is demanding more infusion of scientific and technological endeavours. Women are not only concerned with doing all the household work, e.g. getting water, fuel, wood, fodder, food, etc., but play a significant role in preserving culture, grooming the children and shaping the future of the family. There are areas like agriculture and related activities such as animal husbandry, post harvest operations, fisheries etc. where women do more than 60% of the work to earn their

livelihood, but when it comes to training or making available other facilities for women to reduce their daily drudgery, there are several hurdles. For example, the agricultural implements are suitable for use by men; these need to be modified/ improved and if necessary, new ones could be developed so that their physical drudgery is reduced. In this regard, the Indian Council of Agricultural Research (ICAR) has initiated many programmes in collaboration with the National Academy of Sciences, India (NASI). An award has been instituted to recognise the scientists and technologists who would develop suitable implements to reduce the drudgery of women in the agricultural sector.

2. Some Statistics:

Gender issues have figured in important ways in shaping the career of women scientists for centuries. Ideologies of gender, culture and traditions have developed over different eras have resulted in the exclusion of women from science for a long time all over the world. Women, in fact, were barred initially from education itself. Later on, they were allowed education, but, were barred entry to universities. The idea prevailed that education would distract women from their natural roles and family responsibilities including care providers. A striking observation is the paucity of women at the senior most administrative and policy level and in scientific institutions. Women in science comprise only a small percentage of the total number of working women in India. Despite the overall quantitative improvement in numbers of women in science, the under representation, particularly at senior levels of teaching and research in India is still very significant.

Building scientific capacity is a shared responsibility. Women's contributions and efforts, therefore, can not be ignored any longer. **They must be represented in all delegations, committees and programmes, not because of gender parity, but because of their merit.** The statistics in education and employment, fellowship etc. are given below:

2.1 Education:

Education is a major milestone of women's empowerment because it enables them to respond to the daily challenges, confront their traditional role and change their lives. India is poised to becoming a superpower, a developed country by 2020. Educating women is the best way to improve health, nutrition and economic status of a household that constitutes a micro unit of a national economy. In this context, it can be argued that lack of women's education can be an impediment to the country's economic development. In India, women achieve far less education than that of men's.⁵

The 2011 census, however, indicated a 2001–2011 decadal literacy growth of 9.2%, which is slower than the growth seen during the previous decade. ***The literacy rate of females is lower than that of males in Indian population. Gender inequality is reinforced in education which is proved by the fact that the literacy rate for women is 65.46% as against 82.14% in men, as per 2011 Census.**

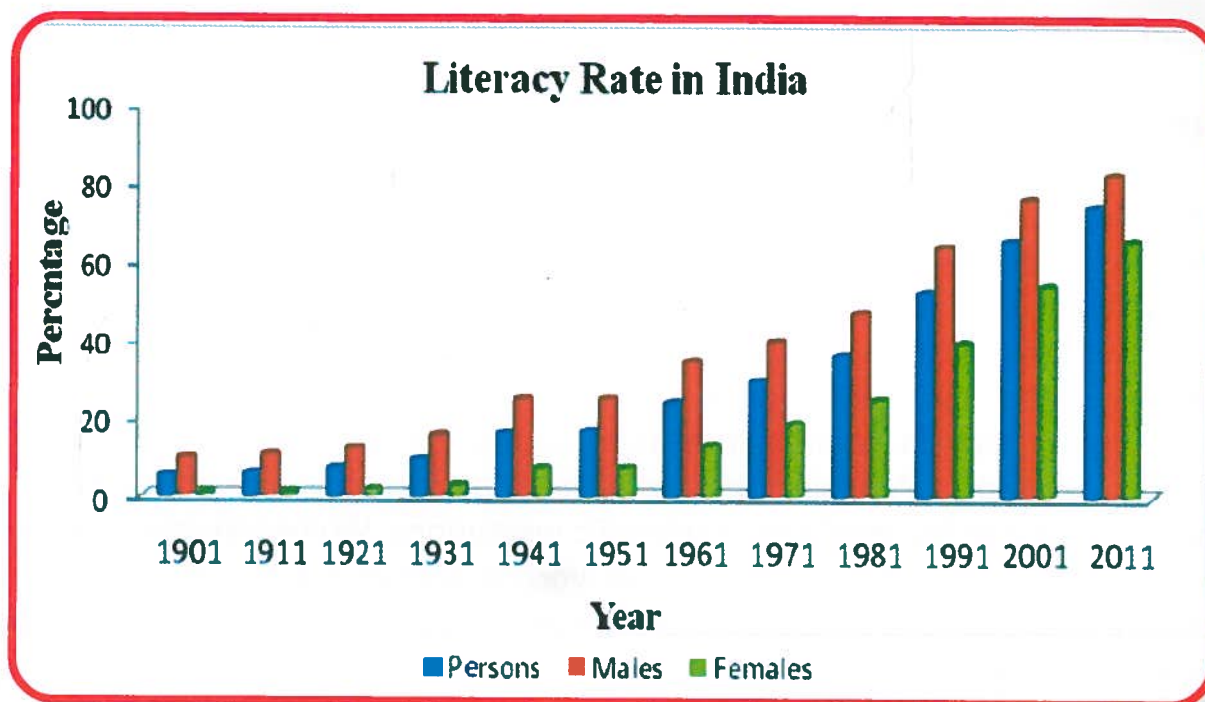


Fig. 1: Status of Literacy in the Country as Per 2011 Census

Source: Census of India, 2011

*The ratio of females to males in different level of School education has steadily gone up since 1991-92 (Fig. 2). The percentage of female students to total number of students at Primary, Middle and Upper Primary Level has gone up; **but, there has been a decrease in the ratio from one level to another which indicates the female drop out at each level (Fig 3).

Some basic facts are given below:

- As per Census 2011, 74.0% of the population is literate comprising 65.5% females and 82.1% males. The incremental increase over Census 2001 of 11.8% for females is higher than 6.8% for males.
- Among the States/UTs, the female literacy rate is highest in Kerala at 92.0% followed by Mizoram at 89.4%.
- As per NSS, 64th Round, 2007-08, of the currently attending students aged 5-29 years, 69.2% females in primary schools, 65.6% females in the middle schools and 56.8% females in secondary and higher secondary schools were attending Government schools which is a positive indication.
- Share of females getting free education/ exemption from tuition fee and receiving different types of incentives is higher than that for males in all the three levels of school education. However, the average annual expenditure for females is lower than that of males.
- The main reasons of females never attending school are expensive cost of education, not interested in studies, education is not considered necessary and required for household work.
- The Gross Enrolment Ratio (GER) for females at the primary level stood at 115.39 compared with 115.55 for males in 2009-10 indicating parity in GER. At the middle classes level, the GER for females was 78.30 while that for males was 84.53.
- The Gross Attendance Ratio for females in the classes I-V in rural areas was 103 as compared with 106 for males in 2007-08 (NSS 64th Round). The Net Attendance Ratio was observed to be 83 and 86, for females and males respectively, in the rural areas in the classes I-V.
This indicates that the gender difference is an aspiration in rural areas which is diminishing.
It is to be noted here that there is not much difference in the attendance ratio of girls and boys in rural schools; this indicates that the educational aspiration of girls is growing and demonstrates the family's interest in sending girls to school.
- The Drop-out Rates were observed to be 27.25% and 30.25%, for females and males respectively, in the classes I-V in 2009-10. These were 44.39% and 40.59% in classes I-VIII and 51.97% and 53.38% in classes I-X for females and males respectively.

***Statistics revealing women's literacy rate, access of women to higher education, careers in S&T:**

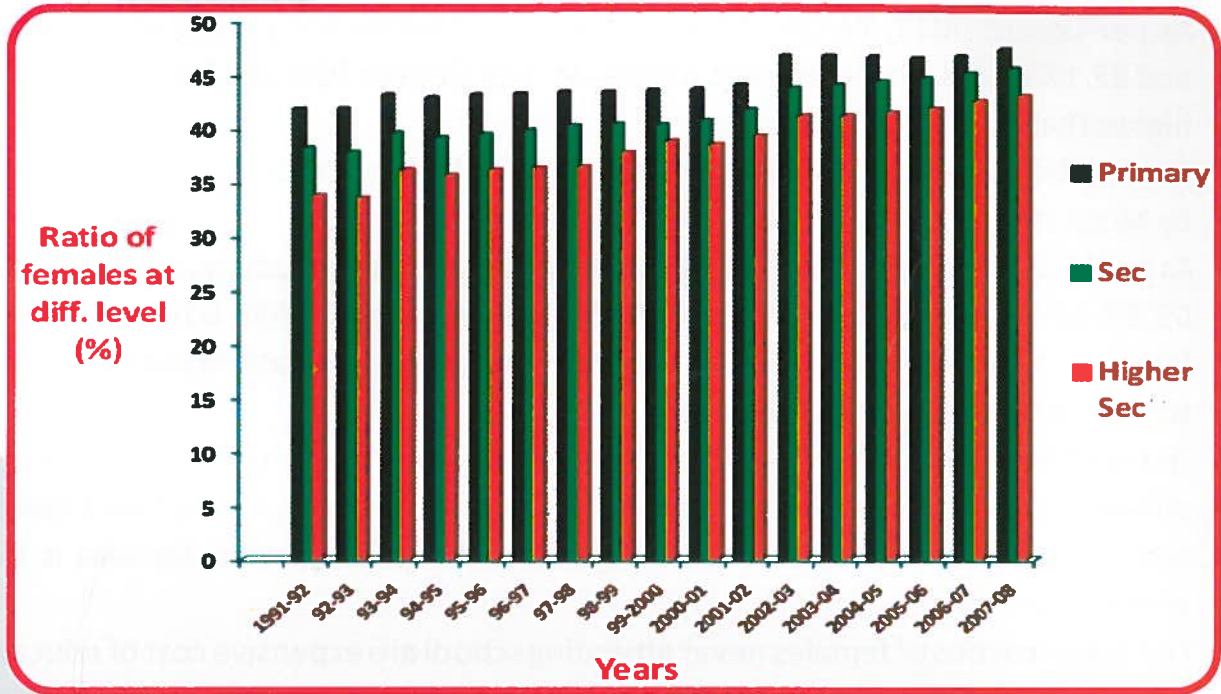


Fig. 2: Ratio of female students to total no of students at different levels of education
 Source: Department of Education, Ministry of HRD

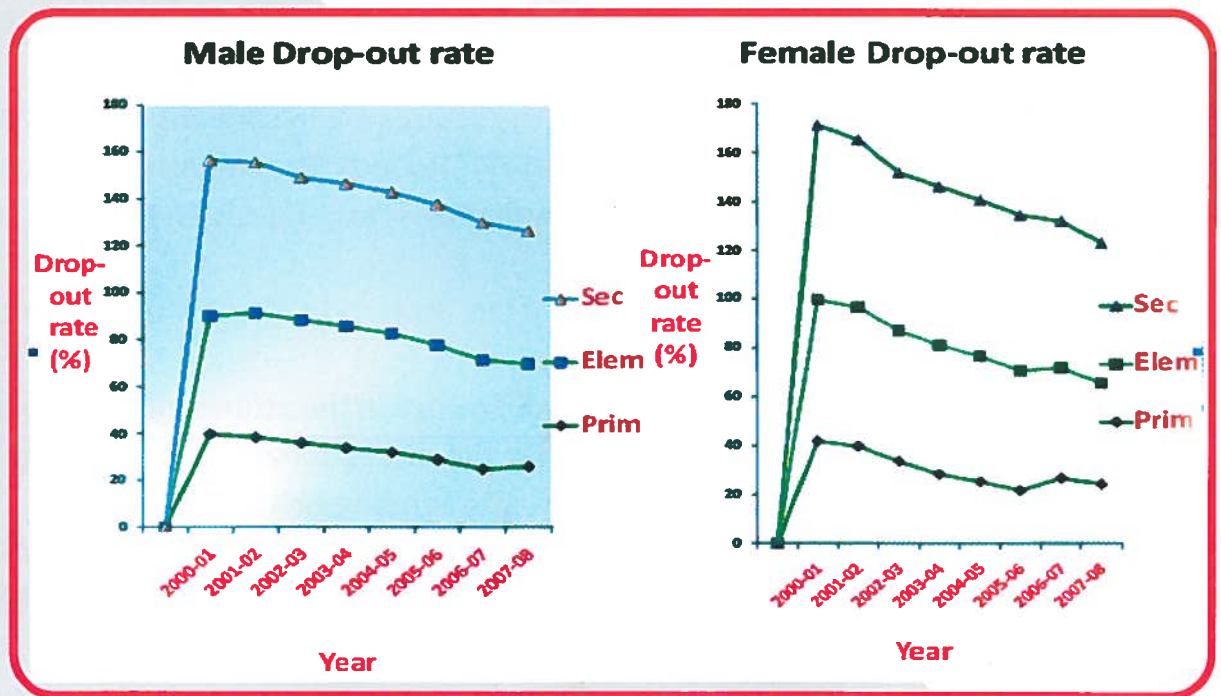


Fig. 3: Gross drop-out rates at different levels of school education
 Source: Department of Education, Ministry of HRD

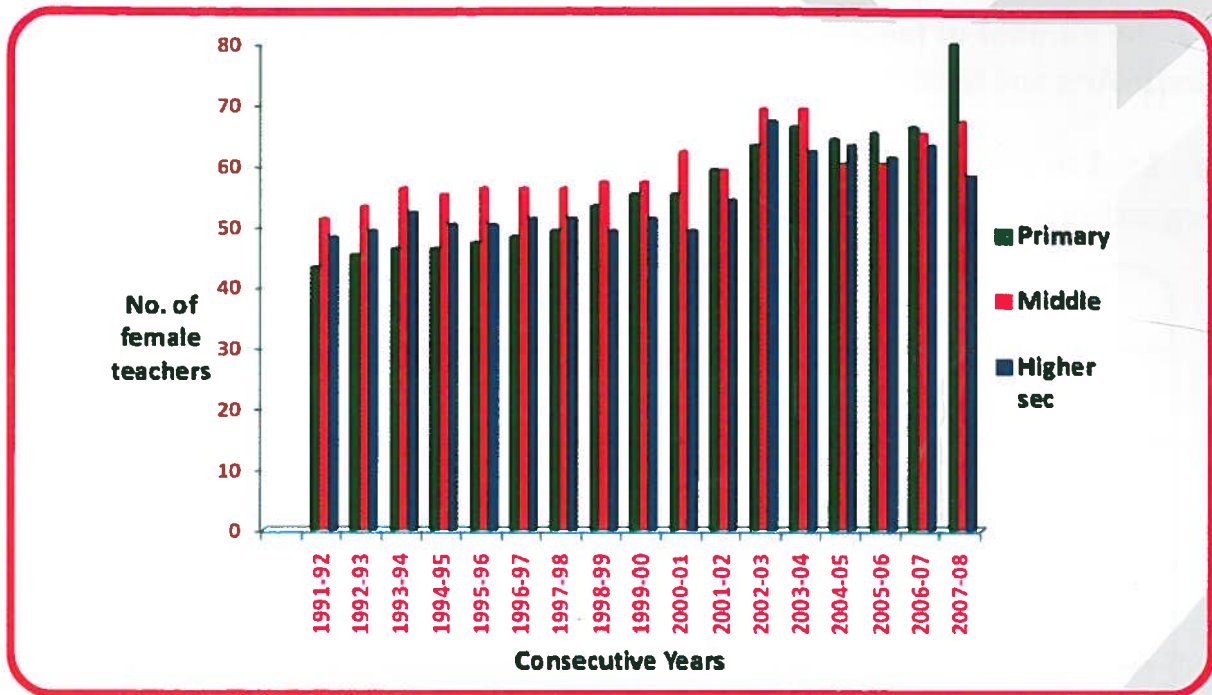


Fig. 4: No of female teachers per hundred male teachers at different levels of education
 Source: Department of Education, Ministry of HRD

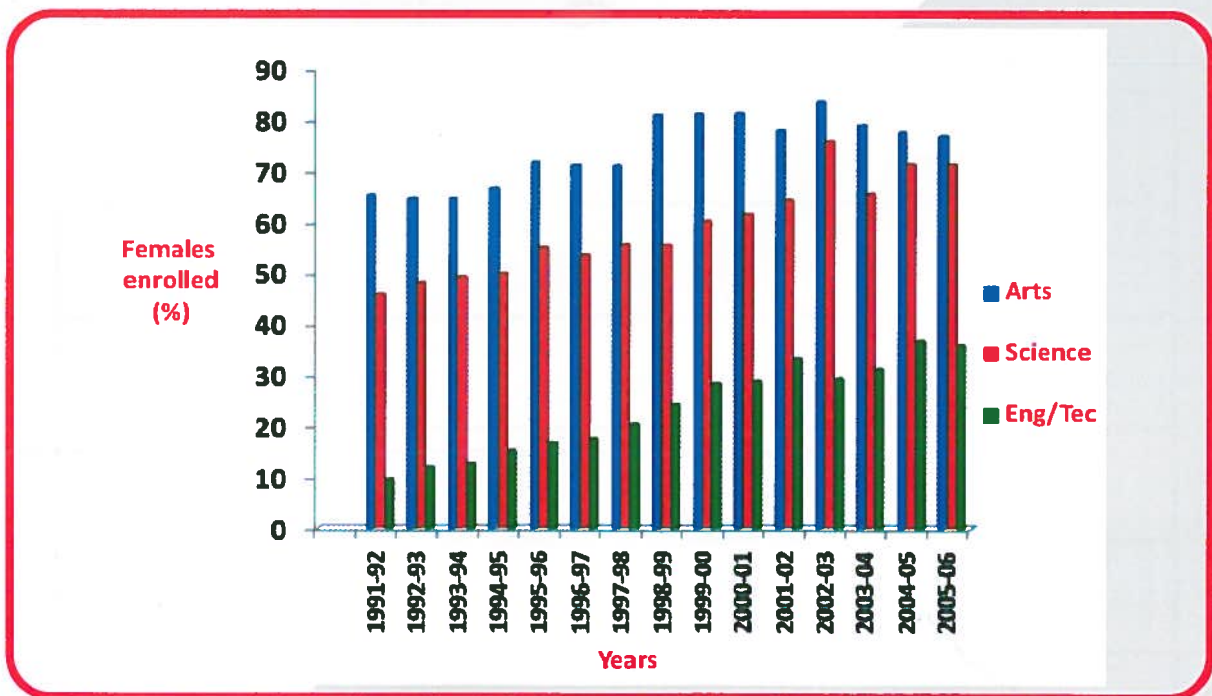


Fig. 5: Enrolment of females per hundred males by university education in major disciplines
 Source: Department of Education, Ministry of HRD

Overall, the number of female students enrolled in Science is less as compared to those enrolled in Arts and lesser in Engineering and Technology.

Table 1: Enrolment percentage in different disciplines / subjects at undergraduate level in higher education (2012-13)

Subjects	% Enrolment
Arts/ Humanities/ Social Sciences	40.69
Engineering & Technology	16.34
Commerce	14.53
Science	12.60
IT & Computers	4.11
Medical Science	2.87
Management	2.19
Law	0.95
Education	3.10
Orientation Learning	0.46
Agriculture	0.55
Other	1.60

Data source: AISHE Portal (www.aishe.gov.in)

Table 2: Enrolment percentage in different programmes in higher education**Bachelor's level**

Programme	Male	Female
Arts	28.22	37.84
Commerce	11.51	11.30
Science	10.41	12.09
Technology	9.10	4.46
Engineering	8.07	4.06
Education	1.34	2.84
Law	0.86	0.48

Master's level

Programme	Male	Female
Arts	3.45	5.42
Science	1.59	2.31
Business	2.25	1.44
Commerce	0.77	1.16
Computer	0.92	0.75
Technology	0.61	0.39
Engineering	0.25	0.22
Other	20.20	14.72

Data source: AISHE Portal (www.aishe.gov.in)

Status of Women in Science and Engineering

Higher education

The decline in female enrolment between primary and secondary education and between secondary and tertiary education is steep for mainly societal reasons; and the tertiary education at the undergraduate and graduate levels is more focussed. Access to these for the Indian population as a whole has increased since 1947. Fig.6, taken from R&D statistics of the DST for 2007-2008, shows the year-wise university enrolment of women in different disciplines. Enrolment in engineering has been lower as compared to the sciences.

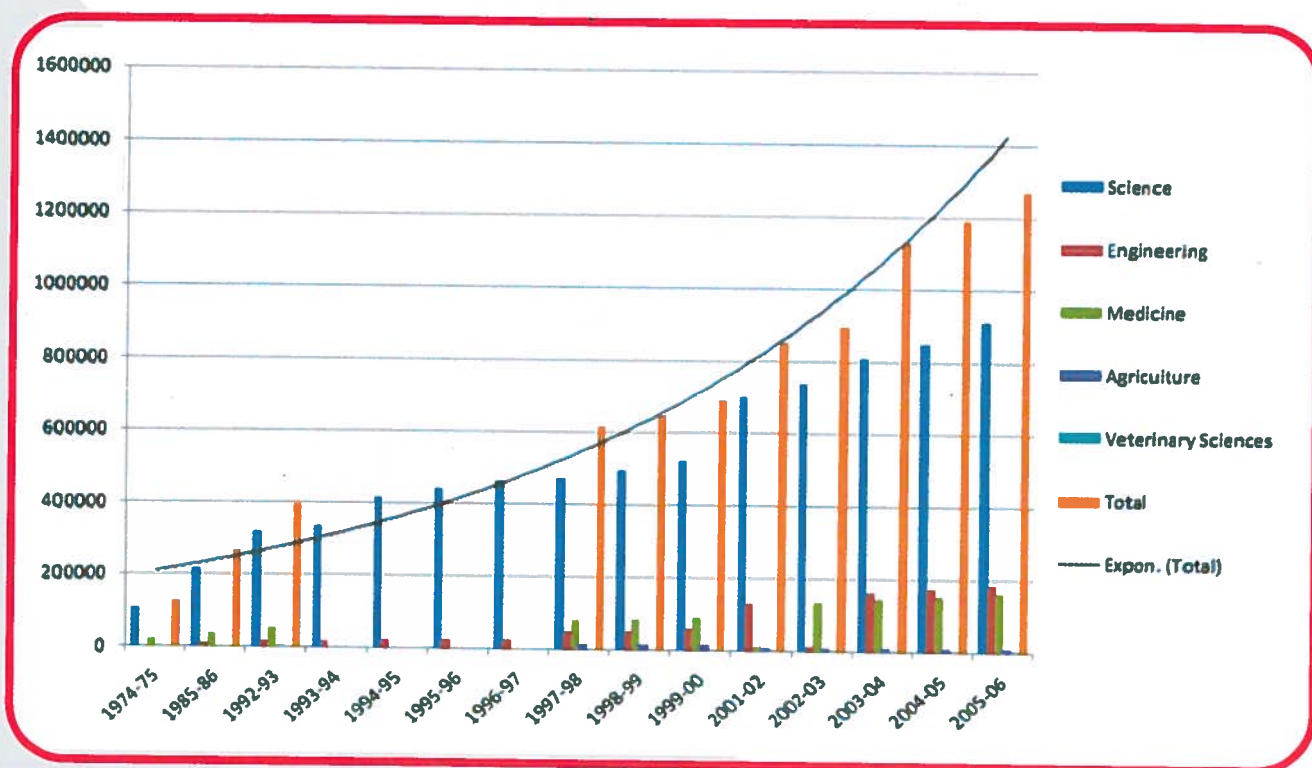


Fig. 6: Growth in the absolute numbers of women with access to University education in STEM subjects from 1974-1975 to 2005-2006

Source: "DISHA: Initiatives for Gender Parity in S&T", presented at the INSA-AASSA joint meeting on Women in Science, New Delhi, September 2013. (<http://tinyurl.com/pmrmcpt> and <http://tinyurl.com/npu5dq7>)

Women's share in the total enrolment has also increased. Tables 3 and 4 show that both the number of colleges and universities and also the fraction of women in science education have increased in the decades from 1950 to 2000. The enrolment has not been uniform across disciplines as already seen in Fig. 6. The growth in the fraction of women in S&T through the decades is shown in Fig. 7. As one can see sciences account for nearly all the enrolment while engineering accounts for a much smaller fraction, even till recently.

From 1950-51, when the number of universities was 32 and colleges was 695, the number of universities in 2011 has grown many folds being 634 while the number of colleges is 33,023, averaging 55 colleges per university; thus, putting huge pressure on the university administration in managing these institutions. It is also to be mentioned that out of these 634 universities, 100 are private ⁶. The percentage of women's enrolment has steadily increased as shown in the table below:

Table 3: Growth in percentage of women enrolment in universities:

Year	Total enrolment	% Women
1950-51	396745	10.9
1960-61	1049864	16.2
1970-71	1953700	22.0
1980-81	2752437	27.2
1990-91	4924868	29.2
2000-01	8399443	39.4

Source: *Science Careers for Indian Women: an examination of Indian Women's access to and retention in Scientific Careers*, October 2004, Eds. M. Bamji et al. (<http://tinyurl.com/oanqvno>)

The situation in engineering has changed somewhat in the last 15 years as a result of globalization. It is also interesting to compare the total fraction of women enrolment in different disciplines in more recent times.

Weaknesses:

Women comprise about 40% of the undergraduate students in Science. In engineering, about 30% are women, but, the fraction at the more prestigious technical institutes such as the IITs (Indian Institutes of Technology) is low. **The reason attributed is because the parents, on average, tend not to spend this for a girl child. Similarly, while the fraction of women medical students is about 45% in total at the more prestigious institutes such as AIIMS (All Indian Institute of Medical Sciences), this percentage also tends to be somewhat lower.**

The data in Fig. 7 indicate that women in India have fair access to University education and higher studies.

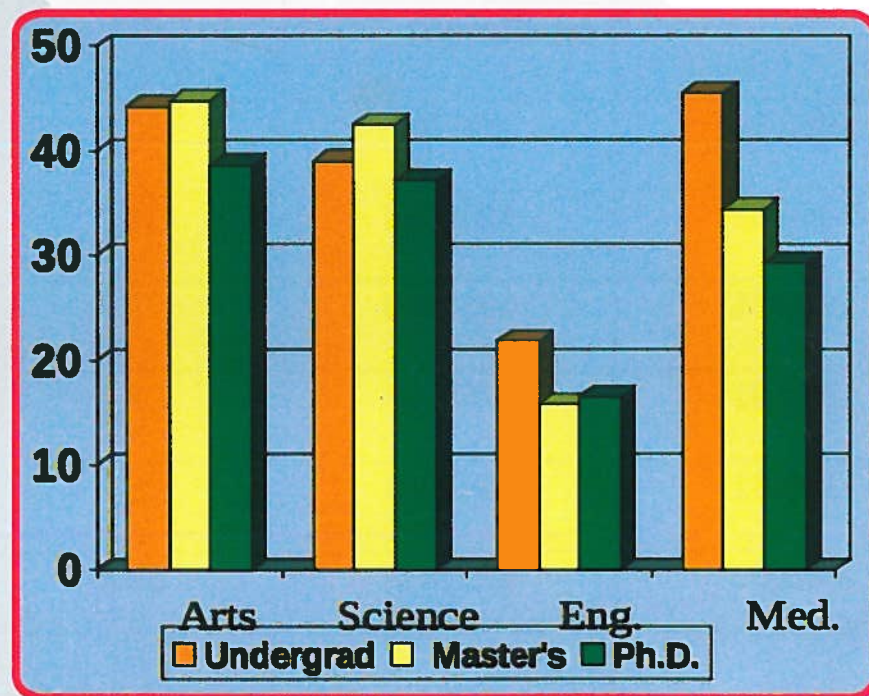


Fig. 7: Change in the fraction of women with increasing level of education in different faculties. Here the data for medicine is shown separately

Ref: *Science Careers for Indian Women: an examination of Indian Women's access to and retention in Scientific Careers*, October 2004, Eds. M. Bamji et al., (<http://tinyurl.com/oanqvno>)

The cultural diversity of India implies that there are large fluctuations. In states such as Rajasthan, Arunachal Pradesh, Bihar or Orissa, the proportion of women in higher education is well below 35% while in others such as West Bengal, Kerala, Tamil Nadu or Maharashtra, the numbers are much higher with the national average being 40%. This speaks for the social and developmental norms in these states and also provide some data where programs to encourage women are more essential. A major concern, however, remains drop-out of the girl students.

2.2 Employment:

The number of women on the faculty of academic and research institutions is not commensurate with the fractions at the Ph. D's. In India there has been somewhat a separation of research from undergraduate Science teaching. **Women participate in a major way in teaching Science and Mathematics in schools as well as in colleges; but, the percentage of women on the faculty of the high profile institutes like TIFR (Tata Institute of Fundamental Research), the IITs or IISc is about 10-12%.** Tables 4 and 5 display these numbers for a variety of government laboratories as well as the high profile teaching and research institutes.

Table 4: Women scientists in various organizations

Organization	% Women	
	2004	2008
CSIR	13.0	16.05
DST	-	20.8
DAE	16.5	15.0
DBT	31.8	27.4
ICMR	27.3	29.0
DRDO	-	14.0
DOD	8.7	-
ICAR	8.5	14.3

Ref: Report of the DST Task Force for Women in Science, Ed: M. S. Bamji, 2009-2010.
(<http://tinyurl.com/oanqvno>)

Table 5: Women faculty in select universities

University	2004		2008	
	Total scientists	% Women	Total scientists	% Women
IISc Bangalore	Academic: 316	6.6	Total: 330	7.7
	Scientific: 113	9.7	Asst. Prof.: 91	9.9
			Assoc. Prof.: 92	5.5
			Professor: 147	8.3
University of Hyderabad	Total: 101	15.8	Total: 135	20
			Asst. Prof.: 41	31.7
			Assoc. Prof.: 32	40.6
			Professor: 62	8
Jawaharlal Nehru University	82	16	120	20
Delhi University			Sciences	
			Asst. Prof.: 184	37
			Assoc. Prof.: 22	6
			Professor: 85	10
			Mathematics: 38	34.2
			Asst. Prof.: 8	25.0
			Assoc. Prof.: 9	47.4
		Professor: 11	18.2	

Ref: Report of the DST Task Force for Women in Science, Ed: M.S.Bamji, 2009-2010.
(<http://tinyurl.com/oanqvno>)

It is evident from above figures that apart from the Department of Biotechnology (DBT) and the Indian Council of Medical Research (ICMR), the percentage of women faculty is rather low. The picture is better at the entry level (Assistant Professors or Lecturers). The situation is stark when one considers leadership positions such as Directors/Deans of these Institutes and/or membership of Advisory bodies of these Institutes⁷.

2.3 Fellowships of the Academies:

The three Academies of Science in India, namely, the Indian National Science Academy (INSA), the Indian Academy of Sciences (IASc) and the National Academy of Sciences, India (NASI), do not have adequate number of women fellows. The percentage of women in the fellowship for the IASc is 7%, for INSA it is 5%, for NASI it is 8%. In TWAS as well, the percentage of women Fellows is around 7%. Paradoxically, there were two women among the women Fellows of the Indian Academy of Sciences, Bangalore in 1934; but, only

once has been a woman President of any of the Academies. Dr. Manju Sharma was the President of NASI for a two-year period, 1995-96. The Councils have had women members and vice presidents, but the numbers have been limited in absolute and relative terms.

In recent past, major efforts have been made by the three National Science Academies (INSA, NASI & IASc) to nominate women scientists for the fellowship. The other professional bodies/academies such as NAAS, TWAS are not making enough progress except probably the National Academy of Medical Sciences (NAMS). The numbers given below are indicative of the subject-wise distribution of fellowships of women scientists.

Table 6: Fellowship summary- 2015

I. Fellowship of Indian Academy of Sciences

Subject Area	No. of Men	No. of Women	Total No.	% of Men	% of Women
Mathematics	82	7	89	92.13	7.86
Physics	197	9	206	95.63	4.36
Chemistry	181	2	183	98.9	1.09
Engineering & Technology	145	1	146	99.3	0.68
Earth & Planetary Sciences	83	2	85	97.64	2.35
Medicine	61	24	85	71.76	28.23
Animal Science	38	14	52	73.07	26.92
Plant Science	55	2	57	96.49	3.5
General Biology	115	18	133	86.46	13.53
Total	957	79	1036	90.15	9.83

II. Fellowship of Indian National Science Academy

Subject Area	No. of Men	No. of Women	Total No.	% of Men	% of Women
Mathematics	67	6	73	91.78	8.95
Physics	127	5	132	96.21	3.78
Chemical Science	121	2	123	98.37	1.62
Earth & Planetary Sciences	67	3	70	95.71	4.28
Engineering & Technology	108	0	108	100	0
Plant Science	118	6	124	95.16	4.83
Animal Science	57	10	67	85.07	14.92
General Biology	100	9	109	91.74	8.25
Medicine	61	16	77	79.22	20.77
Multidisciplinary Committees	8	1	9	88.88	11.11
Total	834	58	892	92.21	7.85

III. Fellowship of The National Academy of Sciences, India

Subject Area	No. of Men	No. of Women	Total No.	% of Men	% of Women
Mathematics	150	16	166	90.36	9.63
Physics	220	11	231	94.82	5.17
Chemical Sciences	188	5	193	98.94	1.05
Engineering & Technology	159	3	162	98.14	1.85
Medicine	140	32	172	80	20
Earth & Planetary Sciences	84	1	85	96.51	3.44
Animal Science	122	16	138	88.4	11.59
Plant Science	253	19	272	93.01	6.98
General Biology	173	34	207	86.5	13.5
Total	1489	137	1626	91.8	8.19

IV. Fellowship of TWAS

Section Name	Men	Women	Total	% of Men	% of Women	Women from India	Men from India
Agricultural Sciences	84	12	96	87.5	12.5	0	12
General Biology	177	25	202	87.62	12.37	3	45
Medical & Health Sciences incl. Neuroscience	120	25	145	82.75	17.24	7	20
Chemical Sciences	137	14	151	90.72	9.27	0	33
Engineering Sciences	103	4	107	96.26	3.73	0	32
Astronomy, Space & Earth Sciences	111	11	122	90.98	9.01	0	25
Mathematical Science	99	5	104	95.19	4.80	1	12
Physics	163	11	174	93.67	6.32	2	39
Social & Eco. Sciences	27	10	37	72.97	27.02	2	4
Total	1021	117	1138	89.71	10.28	15	222

It is not only the fellowships of the Academies where enough number of women are not represented, even in awards and other recognitions women scientists need to be better represented as shown in the table below:

V. Shanti Swarup Bhatnagar Awardees (1958-2014)

Subject Area	No. of Men	No. of Women	Total No.	% of Men	% of Women
Biological Sciences	78	3	81	96.29	3.7
Chemical Sciences	77	3	80	96.25	3.75
Earth Sciences	40	1	41	97.5	2.43
Engineering Sciences	66	2	68	97.05	2.94
Mathematical Science	55	2	57	96.49	3.5
Medical Sciences	50	4	54	92.59	7.4
Physical Sciences	81	0	81	100	0
Total	447	15	462	96.59	3.38

The statistics presented above reveal that the number of female fellows in all the areas of S&T is significantly less as compared to male fellows, which is a matter of great concern.

Given the fact that the fraction of women among practicing scientists is rather small, it is clear that women will be scarce in top positions in institutional and governance structures. Nonetheless, there have been outstanding women scientists who have made important contributions to science; but, by and large, they have not been seen as leaders in scientific research. This situation is only slowly changing.

2.4 Leadership Positions:

In the current national scenario, only a small number of women scientists and technologists have reached the pinnacle of hierarchy in occupying leadership positions. Although, there is improvement in the situation which prevailed ten years ago, yet there is need for concerted efforts.

Team leaders and administrators in academia and research institutes

There are four major government agencies, which fund basic research in various areas: the Department of Science & Technology (DST), Department of Biotechnology (DBT), Department of Earth Sciences (DES) and Council for Scientific and Industrial Research (CSIR). In addition, the Department of Space and Department of Atomic Energy (DOS and DAE) invest heavily in basic as well as mission oriented research. None of the secretaries of these departments so far (with one exception) have been women. Even the Program Advisory Committees of these departments have few women members.

There have similarly been a few women directors of major research establishments. The All Indian Institute of Medical Sciences (AIIMS) has had only one woman director in its 60-year history given the large number of women in medicine and this is also true for the Indian Council for Medical Research (ICMR) where only two women scientists have become DG. The Indian Statistical Institute now has its first woman director in an eighty-year history. The first woman director of the Indian Institute of Geo-magnetism was appointed in 2005, after its establishment as an autonomous institute in 1971. Other institutions that have been headed by women at some time include the National Institute of Immunology, the National Brain Research Centre and the Institute of Advanced Study in Science and Technology.

Of the 46 Central Universities in the country (Central Universities Act, 2009), no more than 4 are headed by women and many of the universities have never had a woman Vice Chancellor or pro VCs. The situation is marginally different at State Universities. The IIT Council (the Council which oversees the running of the Indian Institutes of Technology) has had its first woman member this year. Of 300 government run universities in India, roughly 6% have women as their Vice Chancellors; these are essentially women universities.

The data shows that women directors of science institutes, whether in areas of Biological/Medical Sciences or in Physical Sciences are rare, and as heads of departments in universities and research institutes, they are not uncommon, but, the fraction rarely exceeds 15% overall. **In all, therefore, women's participation in governance structures is fairly limited. It is expected that if women head an organisation, they will bring a fresh outlook.**

Principal investigators

The small fraction of women in faculty at institutions of higher education and research is reflected in grant applications to various funding agencies such as the Department of

Science and Technology (DST), Department of Biotechnology (DBT) as well as to international funding programs. A large fraction of women scientists work in institutes that come under Department of Space (DOS), Department of Atomic Energy (DAE), Defence Research and Development Organization (DRDO) or the Indian Space Research Organization (ISRO) where they do not need to make grant applications. The fraction of women as division and project heads in the above (DRDO, ISRO and DOS) is substantial, about 30%, and in fact the current head of the Integrated Guided Missile Development Program (Agni-IV) is a woman and also DIPAS (Defence Institute of Physiology and Allied Sciences) is headed by a woman scientist.

Outside the system of these special institutions, DST and DBT have made special efforts and introduced schemes to increase the number of Principal Investigators. In Fig. 8 the relative number of Principal Investigators of different genders is shown. The fraction of women principal investigators in the early years was about 11% reflecting their population in the faculties at research institutions and universities. There has been a steady increase in the absolute number of women PIs, and by 2010 the number was close to 23%. **This steady increase in the ten-year period also coincides with the inception of the special funding schemes (launched by DST, DBT etc.) for women.**

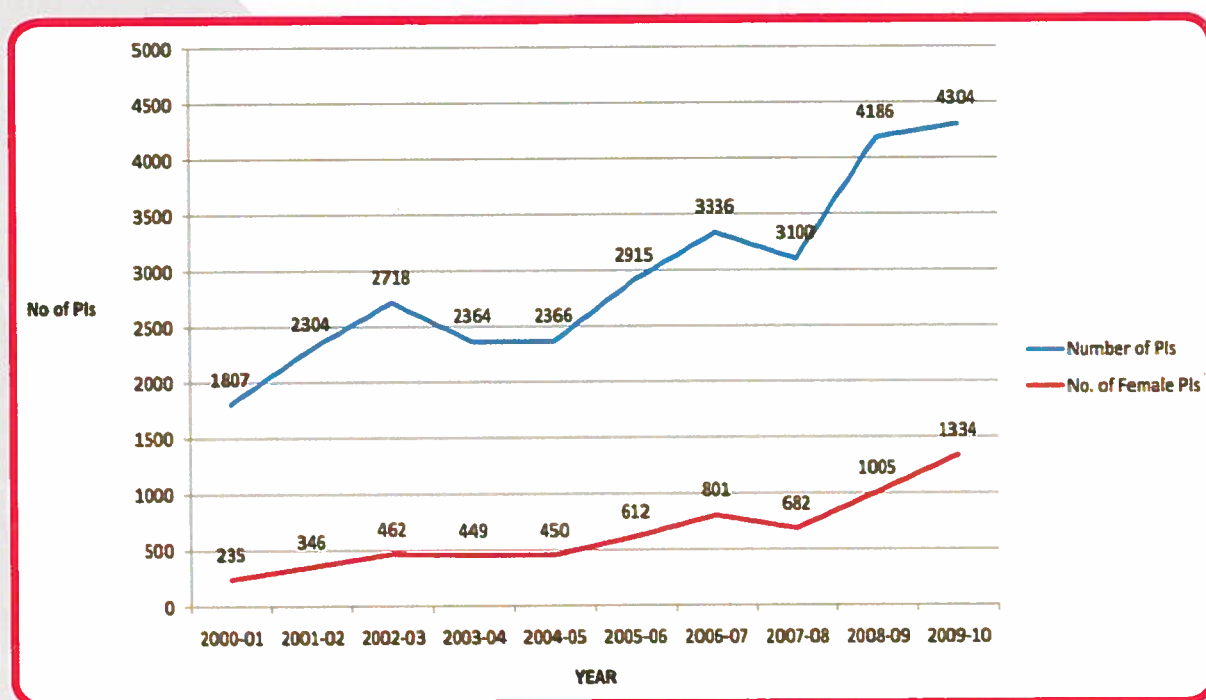


Fig. 8: Gender participation in R&D projects supported by central S&T agencies

Source: DST Annual Report 2011-2012 (V. Sharma, "DISHA: Initiatives for Gender Parity in S&T", presented at the INSA-AASSA joint meeting on Women in Science, New Delhi, September 2013. (<http://tinyurl.com/pmrmcpt> and <http://tinyurl.com/npu5dq7>))

3. Existing Programs

3.1 Science Ministry and other concerned Departments:

The Government departments especially from sixth five-year plan (1980 onwards) have been supporting many scientific programmes for women. First time during the sixth plan a separate chapter on Women and Development was introduced in the plan document. In this, a section was dedicated to science and technology. It was reiterated in the policy document in 2013 and in previous policy statements. The majority of governmental programs as well as by the private sector have been to provide a re-entry for those who have had to take a mid career break to resume life as working scientists and/or special rewards/awards to women scientists to encourage participation in science and technology.

The Department of Science and Technology (DST) has presently a division called '*Knowledge Involvement in Research Advancement through Nurturing*' (KIRAN). Various programs for women scientists through KIRAN have been introduced with a view to provide an enabling and supportive framework for gender mainstreaming of women in science, technology and innovation. *KIRAN* has following components: (a) Science and Technology for Women (S&T for Women) (b) Women Scientist Scheme (WoS) (c) Capacity/Orientation Building (d) Institutional Support/Development and (e) Mobility.

'Science and Technology for Women' Scheme is aimed to improve the living conditions of women by reducing their drudgery, improving health and environment and by providing opportunities for income generation through application of science & technology.

The Women Scientist Scheme has three components (earlier known as WoS-A, WoS-B & WoS-C) such as: (i) Basic Research Fellowship (for pursuing research in basic sciences in frontier areas of science and engineering) (ii) Societal Research Fellowship –SoRF (scholarship for research in S&T - based Societal Programs) and (iii) Intellectual Property Rights (to train women having qualifications in science/engineering/medicine or allied subjects in the area of Intellectual Property Rights (IPR) and their management for a period of one year).

There are about 2500 projects that have been awarded under the basic research fellowship component, approximately 570 projects under Societal Research Fellowship in diverse areas of S&T and 405 to train women scientists in the area of patent and Intellectual Property Rights (IPR).

A special one-year 'Internship Programme' has been introduced in 2013 under WOS-B/SoRF in order to train women scientists having no prior experience of writing and implementing projects. Total 106 fellowships have been recommended in Internship Mode during 2013. DST has joined hands with NASI to help in administering a newer version of SoRF.

In 2009, a special programme '**Consolidation of University Research for Innovation & Excellence in Women Universities (CURIE)**' under the institutional support was initiated for Women Universities to strengthen their R & D infrastructure. In the Phase-I, **6 Women Universities** have been supported for **3 years** on the basis of overall performance. Phase-II of CURIE has also been started in order to maintain the pace of progress in R&D.

An interesting part of the scheme that was recently introduced is 'KIRAN-Mobility'. Through this scheme, women can continue involvement in science even if the family requires them to relocate within the country. Although, not the most optimal from a woman scientist's perspective, this offers the possibility of continuing involvement in science in spite of family responsibilities. Indian administrative and banking services as well as mission oriented services like the Indian Space Research Organization (ISRO) and Defence Research and Development Organization (DRDO) follow the rule of transferring spouses together when both are employed in the same service. This certainly has helped women working in various organizations.

NASI and the DST now jointly administer **KIRAN**, which includes WoS-B and other programmes. NASI also held a series of workshops around the country in the Year of Science 2012-2013 and has recently formulated a report after interaction with about 5000 women scientists and students⁸. Through the years, the DST programmes have been running vigorously and have led to an increase number of proposals from women PIs. This has turned to some women getting high-level faculty positions after a career break. About 15 % of the women recipients of the fellowships have been able to return to a meaningful career in science.

Apart from above mentioned programs, the training programs for working women scientists covering multifarious themes in partnership with premier national and international level institutes have provided an opportunity to over 1000 women scientists to upgrade their knowledge base and skills.

The Department of Biotechnology (DBT) has many useful and successful programs to provide ways and means to encourage and empower women on the career path. Biotechnology-based programmes for women had widespread impact and a number of women scientists were benefitted, including women in rural areas. Other schemes are:

- **Biotechnology Career Advancement and Re-orientation Programme for Women Scientists (Bio-CARe):**

In an attempt to enhance the participation of women scientists in Biotechnology Research, the Department of Biotechnology launched a Biotechnology Career Advancement and Reorientation Programme (Bio-CARe) for women scientists. The programme is mainly for career development of employed/ unemployed women scientists up to 55 years of age for whom it is the first extramural research grant. The scheme is open for all areas of life science/ biology (including agriculture, veterinary science and medicine).

DBT has instituted a number of awards and grants for women working in biological sciences, specifically with a focus on biotechnology. About 200 grants have been given so far and about 50% of these went to women returning to a career after a break. Of these, 10% found gainful employment in scientific research. Furthermore, since 1999, the DBT has given special awards to junior women scientists, with substantial funding for research. DBT also offers lifetime awards to senior women bio-scientists; in all they have offered over 50 such awards since 1999.

- **Golden Jubilee Biotech Park for Women:**

The Women's Biotech Park in Chennai was set up by the Department of Biotechnology in the year 2000, in order to provide opportunities for professionally qualified women to take to a career of remunerative self-employment through the organization of environment-friendly biotechnological enterprises. To promote viable commercial projects based on the bio sources available within the state, they have classified technologies into four broad segments: Agriculture, Food, Medical and Environmental biotechnology. A good number of entrepreneurs have been supported so far.

The University Grants Commission (UGC) has also instituted five-year fellowships for women to provide a pathway to re-entry to programs in basic research. The UGC holds workshops (up to 10 each year) for women, not just for women in science; but, also more generally for empowerment of women in academics.

Apart from the programs by the DST and other science departments, there have been a series of measures taken by the Academies of Science separately and jointly. The INSA report as well as the series of workshops held by the NASI and the resultant report was funded by the DST. INSA also held a joint workshop with AASSA in September 2013 on the subject of **Women in Science**. The Indian Academy of Science (IASc), Bangalore, has a Panel on *Women in Science* (WiS) with a number of activities. Workshops are held all over the country in women's colleges to encourage young women and to educate them and their families about the various options that are available today.

Other academic institutions like the Department of Atomic Energy (DAE) have effective Women Cell and Day-care facilities. They also arrange programmes for improving

the awareness about the rules and provisions for a healthy working environment. Merit-based nominations are encouraged and recruitment committees have women representatives. Similarly, ISRO has instituted several performance-based awards irrespective of gender and a large fraction has gone to women. The Astronautical Society of India has several merit awards and a special 'ISRO-ASI Best woman scientist award' for recognizing the outstanding contributions made by women in the discipline. Not just the Government organisations, industries and NGOs also take up this topic and are making efforts to focus on women in S&T.

Under the TWAS umbrella, OWSD (Organization for Women in Science for the Developing World) is the first international forum to unite eminent women scientists from the developing and developed worlds with the objective of strengthening their role in the development process and promoting their representation in scientific and technological leadership. OWSD provides a series of opportunities for women scientists from the developing world, including networking for OWSD members as Ph.D. fellowships for successful applicants and an awards scheme for established researchers.

There are a large number of very active Women Studies departments in universities in India. However, only a few of them focus on issues of *Women in Science*, notably those at Jawaharlal Nehru University (JNU), New Delhi, the University of Hyderabad, and S.N.D.T. Women's University (Srimati Nathibai Damodar Thakersey Women's University) etc. In addition, organizations like the National Institute of Advanced Studies (NIAS), also engages on research on *Women in Science*. It is interesting that two very useful projects came out of joint initiatives between the Academies of Science and these groups. For example, the INSA report was a result of the cooperation between the INSA and S.N.D.T Women's University (incidentally one of the oldest universities exclusively for women in India which has celebrated its centenary), whereas the survey: "What fraction of Trained Scientific Women Power are we losing and why?"⁹ involved cooperation between IASc and NIAS. Almost all research organizations and universities celebrate *International Women's Day* on 8th March; and in research institutes, there are discussions on *Women in Science*. Other than these celebrations, all institutions have a special cell to address grievances of women (students and faculty) on sexual harassment. By and large the general feeling is that this is the only subject that needs concern about women in science. In fact it can be fairly said that all the research institutions and universities in India require greater awareness on gender parity and specific actions needed to achieve it. Such groups have been effective in a few Institutes with an active gender sensitivity cell.

4. Gap Areas and Constraints:

Despite some progress, women scientists are still paid less, promoted less frequently, win fewer grants and are more likely to leave research than qualified men with similar qualifications. Issues relating to education and some other aspects are briefly given below:

Science Education

Throughout the 19th century women in Europe and the United States were actively campaigning for the right to the same education as men, and some notable pioneers succeeded, despite the social obstacles in their way. In 1849 Elizabeth Blackwell, became the first woman to obtain a medical degree. In the 19th and early 20th centuries, in both the United States and the United Kingdom, the founding of women's colleges provided for the first time a clear career path for women scientists. Beginning in the 1960s, when the women's movement in the 20th century was nearing its peak, women campaigned for, and finally won, equal rights in education and employment. In the early 21st century the situation started to change and in the United Kingdom and the United States, nearly 50 percent of medical degrees and doctorate degrees in the Biomedical Sciences were awarded to women (Encyclopaedia Britannica).

In India, campaign for Women's Education and their rights began around 1845-1850 and one of the earliest schools for women was started in Maharashtra in 1848. The first Indian woman to receive a medical degree was Mrs. Anandibai Joshee who travelled to US for studies and was awarded the degree in 1886. Participation of women in education and later in medical profession was the first to grow. The share of women in University Education increased from a mere 10.9% in 1950-51 to 39.4% in 2000-2001 (INSA report, INSA-AASSA report). This can also be seen in Fig.2 and Fig. 5 in Section 2.

Historically, only a small fraction of science degrees were awarded to women, but in recent decades, women's overall participation in Science, Technology, Engineering and Mathematics (STEM) fields has steadily increased. Women's involvement in advanced study and careers in science and technology continues to grow. However, women are still underrepresented in many fields and face significant challenges at the highest levels of these professions.

Although there have been great strides made in the education of women and girls worldwide, many countries in both the developed and developing worlds have a dearth of women in STEM fields and a few women represented in leadership or at policy-making levels. Even in countries where large numbers of women are educated, this often does not translate into equal numbers of women in the workforce; reasons for this **leaky pipeline** are generally regional and culturally specific.

In this narrative there is an important difference in the western world and India. In India, young girls and women are not perceived as being incapable of learning or teaching science.

The numbers in both these have increased steadily in Modern India (as seen from the numbers presented in section 2), however, 'doing science' or 'having a career in science' is still perceived as a male bastion. In India, it is more an instance of a major leak at the post Ph.D. level, rather than the leaky pipe line till we reach the post Ph.D. level, mentioned before. In India, participation of women up to Ph.D. level is about 20-25%, but finally in positions of professors or heads of departments/ divisions it falls to 10-12%. Of course, when we look at participation of women in science careers and particularly, at the top level, the narrative is similar across cultures and countries. Presence of women in higher positions or positions of power is still, by and large, an exception and their share in fellowships, awards is still rather small to discuss meaningfully of percentages, as can be seen from the numbers presented in section 2.

Reaching the top tiers of scientific recognition has remained difficult for women across the board.

The exponential benefit of educating a girl reaches far beyond the classroom; an educated woman will re-invest a major chunk of her income back into family and community. The better educated a girl, the more choices become available to her. The education of girls can have the greatest single impact in a community.

"If you educate a woman, you educate a family".....Mahatma Gandhi.

Reasons for Women being left-out of Careers in Science:

Science is best done by diverse and inclusive groups of people, when they recognise each other as individuals who are not just scientists, but also people with profession and career beyond science. Why women are lagging in scientific careers, is a complex topic with varied reasons.

Some of these are highlighted below:

- **Social Conditioning:** It is the most acute problem throughout one's childhood and adolescence. Manifestations of social conditioning are vast. Parenting is the major institution that conditions children. The dangerous spin-off brought about by social conditioning of children is when they develop cognitive biases as adults. One such example is of '*gender-bias*'. Although one cannot escape social conditioning, yet, not everything we learn through socialization is accurate. This is no surprise. A quick look at how women have been treated throughout history and how they are treated today is an explicit example. There is, thus, a need to get reconditioned and take charge. **Existence of 'Role Models' also can go a long way in changing this social conditioning.**

- **Caregivers:** For centuries it has been assumed that women will stay home and take care of the children and the family. Laws and institutional policies concerning time off for infant and childcare often reinforce these roles, providing more flexible leave policies for new mothers than for new fathers. This sets many women back in the early stages of their careers. It is, therefore, important to assess the value of various caregivers and care-giving policies, because, these are what truly make a society functional and often their contribution goes unnoticed.
- **Marginalization:** Women in Science and technology fields face a constant bias against them. Women are in general marginalized even at faculty positions. This marginalization is likely to be the result of an inherent bias. A number of different factors, such as systemic gender discrimination and biases in career review processes have contributed to this discrepancy, suggesting that there is not one easy solution, but that a combination of cultural and institutional reforms will be necessary to effect a change.
- **Work Environment:** As already mentioned, in India, the major leak from the scientifically trained women work force happens at the post doctoral level. This outflux at the post doctoral level is caused by a variety of reasons. Apart from the commonly perceived reasons such as dual responsibilities, lack of gender sensitivity and support for gender diversity in the work environment seem to be an important reason in India for this out flux. This was revealed in the IASc-NIAS survey. These issues deter a lot of women from pursuing a career in science at the highest levels. This attrition in numbers in permanent scientific workforce at the entry level, then contributes logically, among other factors, to their small numbers in higher level positions and also as members of scientific academies or in leadership roles. It has been noted that for the same position and recognition, women have to work harder and perform their best at every level.
We need Women in Science at every level, and it's our collective responsibility as a scientific community to ensure that this happens effectively, in a planned, strategic, and sustainable manner.

5. New programs/ Initiatives:

Women who do pursue careers in Science and Technology face unique challenges. In many cultures, raising children and tending the home are commonly regarded as women's responsibilities, forcing women to divide their time between work and domestic obligations. For professional development of women in science and technology, a life-long training mechanism should exist to help them achieve their full potential. These include

affirmative action policies, initiatives and constant nurturing through workshops, seminars and training programs.

- **Mentoring:** To mentor and be mentored is not only to pass on knowledge gained over a lifetime, but to also share wisdom from past mistakes and provide guidance for future decisions. In Science, the benefits of mentoring are becoming more widely recognised and valued especially for women. Strengthening of mentoring relationships that enable the exchange of knowledge and the psycho-social support relevant to work, career or professional development need to be put in place.

Mentoring and nurturing is essential for the girl students interested in science from the early stage. Choice of mentors will depend upon the target groups which need to be identified for mentoring. Mentoring has to be for

- Confidence building
- Choosing and sustaining a career
- Employment opportunities-livelihood
- Administrative and social responsibilities

In fact the **Women in Science** Panel on the Indian Academy of Sciences has been running such workshops for college students and Department of Science and Technology for women professionals working in science. The scale at which they take place needs to increase.

- **Work-Life Balance:** When work and personal life are out of balance, one's stress level is likely to soar. Some of the consequences of a poor work-life balance are time lost with friends and loved ones, fatigue, poor health and increased expectations. Therefore, it is important to promote a healthy work-life balance that enable scientists to effectively navigate competing and conflicting demands at the professional and personal level.
- **Flexi-timing:** Women are skilled at multitasking, and they tend to take a larger share of responsibility wherever they are. Exploring suitable opportunities with flexi hours will tap in the enormous potential of women professionals. In a global economy where geographical barriers have shrunk and people are spending most of their time in the online space, introduction of flexi timing can be a big boost and incentive for working mothers. Terming household responsibilities as one of the major reasons for attrition among women employees is not adequate. Parliamentary Committee had recommended introducing "flexible timings" in 2013, however, there are still major constraints regarding its implementation in both the public and private sectors.
- **Leadership and Career Advancement:** Leadership positions have been generally held by men and therefore, they were stereotyped as more effective leaders. However, for women to be as successful leaders and have career advancement, they need to be high on both femininity and masculinity. These

gender differences are more apparent at the higher levels. The representation of women decreases with advancing management layer and women experience career plateaus more than their male counterparts. It is, thus, imperative that suitable Leadership Programs remove these psychological barriers and help women advance in their careers.

- **Achieving Recognition:** It is important that women be recognized for their contributions to the nation's scientific and engineering enterprise through nominations for awards and leadership positions. This also involves development of individual and organizational strategies resulting in a more equitable distribution of opportunities, awards and recognition for the contributions of women to science.
- **Recognition through Science Awards:** Any recognition of work done is always welcome and highly motivational, more so, for the women in Science and Technology. Despite the availability of several trailblazers in our society, there are not enough avenues and methods for recognition of their talent. Recognizing the need for this, some initiatives have been undertaken both at the International and the National levels. There are many national awards instituted in the country by Science Departments and Academies.

6. Role of Academies

The initiative of the Indian Academy of Sciences, Bangalore, is very commendable. The Academy has a panel on **Women in Science**. As part of its Role Model Program, one publication titled "Lilavati's Daughters: The Women Scientists of India" has been brought out in 2007 and another one titled "A Girl's Guide to Life in Science" was brought out in 2012, to inspire and enthuse young girls especially interested in research. The former has been translated into some languages. The panel also conducts workshops on 'Women in Science: A Career in Science' for students of schools and colleges. The National Academy of Sciences, India has as per its mandate, focused on many activities to benefit women doing science. A compendium on 'Nobel Laureate Women Scientists' was published in 2008 by the Academy and widely circulated throughout the educational, research and academic institutions in the country. Role models are important to attract women in science and to ensure their excellent performance. The NASI has instituted a Chair for a distinguished woman scientist and several awards exclusively for women. The Indian National Science Academy (INSA) also published a very valuable report on **Women in Science**, in 2004. It continues to promote the strengthening of women in S&T. Several of its recommendations have been implemented by the Science Departments, specially, the Department of Science and Technology (DST).

Internationally also **the Academics are now taking lead roles in promoting and encouraging women scientists to take up and pursue science as a career.** An International Symposium on Science, Technology and Human Values was organized in 2007, in Athens. Several women scientists discussed issues related to women and S&T (*Science & Technology for Women, 2007*). The international example of the work through UNESCO Chair for Women, Science and Development in Africa has created programs on 'Health' with University Professors and students interacting with women. The report recommends a cadre of women scientists and engineers to be created by the academies and governments for helping the empowerment of village women.

The Inter Academy Council (IAC) constituted an *Advisory Panel* in 2004 with Dr. Manju Sharma from India and Johanna Levelt Sengers from the US National Institute of Standards and Technology as Co-Chairs. The panel members included academicians from government and private sectors with the expertise in research, teaching and management of Science. The report entitled **Women for Science** was finalized in June, 2006¹⁰. This report drew the attention of the academies world over to take a leading role for promoting the involvement of *Women in Science*. Some highlights are:

- **Including women in Science and Technology and advancing them into a senior and leadership positions.**
- **Engaging the public, specifically women and girls in the Science and Technology enterprise.**
- **Empowering not only professional women, but also women at the grass root levels in the rural and urban areas of the developing countries.**

This report addressed many important issues such as measures for access to information, participation and progression, technological empowerment of women at the grass roots, academies to lead the way and finally a summary of recommendations highlighting the action points for the academies in the world. The report very strongly emphasizes the critical role of women in harnessing the power of science and technology for the welfare of humankind and calls for the academies' major role to ensure the contributions of women scientists towards this goal. The emphasis for inclusion of women in this report has been on the good management practices. **It has been strongly recommended that academies and other institutions follow the good management practices for evoking a culture for equal opportunities for women so that their full potential can be utilized.** Given below as quoted from the report are elements of **good management practices**:

- **Commitment from top levels of the organization**
- **Establish infrastructure such as a diversity committee**
- **Transparency in communication, recruitment, promotion and award**
- **Wider inner circle where decisions are made, i.e. inclusive leadership, training and**

mentoring

- **Regular collection of sex disaggregated data and monitoring of the progress**

Technological empowerment of women is extremely important as highlighted in the Inter Academy Council (IAC) report on Women for Science (2006). The report has given emphasis on:

- **Engagement of women at the grassroots is essential to worldwide Science and Technology capacity building**

- **Creation of Infrastructure facilities, financial organization, knowledge centers networking etc.**

In fact the academies all over the world being the global professional bodies provide the platform to lead the way. They should, therefore, include gender issues on their agenda, widen the nomination pool, increase women's participation and visibility as well as sponsor and evaluate research.

Academies can give a major thrust world over to create knowledge-based society with full involvement of women scientists and technologists; create a strong sustainable science & technology base which will affect all the social levels. This intellectual capital of half of the human resource on the planet earth should be an integral part of the accelerated S&T drive towards progress, peace, happiness and humanity.

It is recognized world over that academies being the highest intellectual bodies, can play a major role in attracting, involving and recognizing women scientists in their scientific endeavors. **They can clearly demonstrate the policy of inclusiveness.**

7. Women in Rural Areas

Rural women make significant contributions to household production, economy and food security. While working in the fields and in post harvest activities, they are constantly engaged in monotonous repetitive tasks that involve harmful postures, wet conditions and handling toxic materials. There is immense drudgery in sowing, transplantation, irrigation, fertilizer application, weeding, plant protection and harvesting. Even in post harvest work, women carry out the operations manually in an arduous manner when technologies are now available for threshing, winnowing and milling as also for shelling of maize and groundnuts. They also face problems related to health and energy efficiency with use of traditional technologies (*cooking stoves* and *chulhas*) at the household level.

Women have different ergonomic characteristics compared to men. It is necessary to develop technologies to suit them and reduce the burden and drudgery, especially for small holders and marginal women farmers, since, women do more than 80% of farm work. The working conditions and environment coupled with sustained long hours of work in standing

posture pose a great deal of physical and physiological stress on women workers.

There are hand/pedal-operated cleaners, solar dryers, metallic storage structures and power operated mills, etc. which can reduce the drudgery in these operations. The transplanter requires only about 16-20 person days/harvest for transplanting as against 25-person days/harvest. Most of the improved agricultural tools available have been mostly tested with male workers only. Improved tools and equipment need better skills and training. Since, women are usually preoccupied with home management activities such as procuring fuel, water, fodder etc., they are hardly able to spare the time to improve their skills. **They need to be provided the opportunity to receive training so that they too can use these technologies.**

One of the constraints of making technology available to women lies in the lack of women extension workers who can help them obtain and learn to use these innovations and modern implements. Further, in order to allow women to be trained in the new technologies, support services for women workers in terms of transport, accommodation and childcare services need to be provided.

Need of the Hour:

There is an urgent need for including/mainstreaming gender issues in Agriculture curricula, because major operations in agriculture are carried out by farm-women. In order to reduce their drudgery and bring them into the mainstream, it is essential to have a sensitised concern regarding their role in biodiversity conservation, ecology, medicinal plants, seed production, sustainability, food production and kitchen gardens etc. The course curricula must also be periodically reviewed and assessed to ensure that the gender concerns of farm-women are adequately taken care of and updated as a long term sustainable measure to ensure gender equity in agriculture. **Accordingly, a continuous change in the curricula is needed and a strong teacher training component and suitable development of appropriate training modules to sensitise both teachers and learners should be developed to address and articulate on issues of technological empowerment of women.**

The consequences of new technologies on women-specific occupations and the constraints responsible for their transfer have to be separately studied in details so that technological packages can be gender-friendly, socially sound and coupled with appropriate packages of services and government policies. **Non-governmental women's organizations can help in ensuring the flow of benefits from these technological packages. Women-friendly implements / tools can reduce drudgery, save time and enhance output.**

Encouraging entrepreneurship for women in the era of increasing feminization of agriculture in the country is important. Enterprises focusing to bring linkages between farm and non-farm activities would be useful for rural development. This was also one of the key strategies for poverty alleviation in rural India, since the Tenth Five-Year Plan. Development of agriculture and other non-farm enterprises in rural areas that involve large number of women can be a key factor in reducing poverty¹¹.

This has been illustrated by highlighting the efforts of M. S. Swaminathan Research Foundation which has been in particular engaged in several activities for empowering the farmer women. The Pondicherry centre has been making concerted efforts to train the resource poor farm women¹².

Based on the needs, the drudgery reduction measures introduced for women should include:

- Safe drinking water sources closer to their houses
- Maternal and child health care
- Strengthening of traditional health care practices
- Awareness on health, hygiene and sanitation
- Training of local youth as health guides for first-aid
- Establishment of community grain banks and promotion of nutrition gardens
- Promotion of energy conservation devices as improved woodstoves, biogas, solar devices and energy plantations
- Establishment of *Anganwadis* and awareness of girl's education
- Reorientation of Course Curricula
- S&T innovation for modifying the available equipment to suit the ergonomic needs of women.

For rural development, technological empowerment of women at the grass root is essential which requires:

- Training of the trainers
- Setting up Knowledge Centres □
- Institutional framework
- Empowering women at the grass-roots
- Community-based projects

In this current year *Mera Gaon Mera Gaurav Programme* has been initiated and 20 villages have been adopted by the scientists under the programme. CISR-CIWA (Central Institute for women in Agriculture), striving to ease the work of farm women by promoting different women-friendly technologies methodologies/models, provides a gender sensitive working environment to the women employees.

Table: 7 Drudgery Index (%) of women in different farm activities

Activites	Paddy	Wheat	Maize	Soybean	Vegetable	Cotton	Sugarcane	Chilly
Removing Stalks	–	33.44	27.61	37.00	33.14	55.55	36.05	33.00
Seed treatment	21.25	30.00	–	–	–	–	–	–
Sowing	–	–	–	35.2	–	63.00	–	–
Cutting/ uprooting	41.53	33.0	–	–	36.9	–	–	–
Transplant	42.57	--	--	–	37.9	–	45.75	25.00
Weeding (Plant to plant)	56.5	30.15	31.16	39.00	40.37	55.66	40.06	45.00
Harvesting/ Picking	43.07	25.9	–	41.00	–	54.00	–	27.00
Top dressing	–	–	29.63	–	–	–	–	–
Cob removing	–	–	26.7	–	–	–	–	–
Gathering/ Heaping	37.57	39.29	–	40.00	42.30	53.00	44.73	–
Winnowing	45.44	--	–	–	–	–	–	–
Drying	35.64	--	–	–	–	–	–	–
Dehusing	38.13	--	--	--	--	--	--	--

Source: Biennial Report AICRP on Home Science 2013 & 2014

8. Implementation Strategies

Since 1975, when the first conference for *Women in Science* was held in Mexico on the International Women's Day, followed by the one in Beijing, there have been several recommendations made by various committees and reports. These are all documented and many of them have also been formally submitted to the Government and the Academies. The purpose of this Vision document is **to present a Road Map outlining the implementation strategy**. The present strategy as outlined here is in two categories namely:-

- I. **Women in Science – Those who want to pursue Science as a career.**
- II. **Application of Science and Technology– For the welfare of women, especially in rural areas with a view to reducing their drudgery.**

I. Women in Science

1. There are many government funded programs which provide opportunities to young women interested to do science. This information is not readily available to many of them especially in colleges and schools and in semi urban areas. All the academies in the country can play a vital role in **disseminating this information** about government programs. Orientation programs for career development, electronic print and oral media could be used for the purpose. It should become a main charter of the academies.
2. **Career Orientation: Sensitisation and awareness creating workshops**, interactive meetings and seminars etc. should be organised regularly in different regions of the country. The responsibility can be given to academies, NGOs and of course, whenever possible, to government departments. Orientation Programme for career development should be compulsory.
3. **Implementation of various government schemes for women especially R&D funding, provision of scholarships and training programs etc. should be given high priority with expeditious disposal and processing. Many times because of the delays, young women lose interest.**
4. **Conscious decision** has to be taken by the scientific community in **nominating more and more women** for fellowships of the academies, various positions in the government, research organisations etc.
5. Government departments, PSUs, private sectors etc. have to ensure that they try to get more applications of women scientists for key positions in the organisations.
6. **A conducive environment** with proper infrastructure is important. **Crèches** must be

- established in the work places.
7. **A grievance cell** or a committee is essential to ensure that there are no atrocities on women.
 8. Adequate and **ear marked funding** is essential in the budget of all the implementing agencies.
 9. Special care has to be taken of women staff from view point of their security and keeping in view their dual role in the society. Transport, special leave provision, part time job opportunity etc. need to be an integral part of hiring a woman in the organisation.
 10. **Institutional Gender Audit** is essential. The format developed may vary from Institute to Institutes and discipline.

ATHENA program run in Great Britain may serve as a guideline.

II. **Application of Science and Technology**

1. To provide healthy life-style to women of all ages (free of disease and malnutrition) several measures need to be strengthened and implemented on war footing.
2. **S&T interventions** are necessary along with the government programs of health, education, nutrition, employment etc. Interventions which will do value addition and speed up their progress can be taken up by both male and female scientists.
3. Keeping in view the ergonomics of women, special efforts **to develop farm implements**, which will reduce their drudgery and improve the efficiency, should be developed by engineering and agricultural research institutions.
4. The existing *Krishi Vigyan Kendras* and any other polytechnics, village level institutions **should be strengthened with professional work force for training of village women.**
5. **Special drive for entrepreneurship based on S&T** is critical for employment generation and livelihood security of women. Small scale industries particularly should be encouraged to organise such programs with the help of S&T institutions.
6. Each one of the national laboratories according to their expertise should compulsorily be asked to have a program to help the women in rural areas.
7. Special R&D projects taking note of the societal benefits be funded to various scientists. This must be publicised as well.
8. Health, hygiene, sanitation and nutrition are critical for a good and healthy living style of a woman in rural areas.
Education, of course, is a must. In each one of these areas **good research projects, demonstrations and training programs** should be given high priority by the funding agencies.

9. **Environmental protection and conservation** is yet another critical issue affecting the lives of the poor people. These also should be taken up by the scientists and for this, adequate publicity by the funding agencies is important.

10. It may be useful **to train a cadre of research scientists / teachers / extension workers** who could teach and create awareness in rural areas. Efforts by the government in this direction will go a long way, instead, leaving this only to NGOs and village level organisations. Use of local languages will be vital for the success of such programs. **Further, the implementation strategy would involve the following steps:**

8.1 Human Resource Development:

- Training of young women scientists within India and abroad with travel expenses, scholarships and other facilities. This should be for both employees and employed women.
- Training of teachers, establishing a cadre of women scientists and technologists.
- Training of special extension workers for rural areas and rural women.

The ongoing governmental schemes and programmes should be adequately funded; in fact, the funds should be increased to implement the recommendations of this report. Academies should also be given "earmarked" funds so that they play a pivotal role in the implementation of this report.

9. Specific Recommendations

Areas in which women can contribute significantly and which are relevant to them for their career progression are highlighted below:

1. **Inclusiveness of women in all S&T related activities; education, innovations, research, technology development, application, management, decision-making etc. :** It has to be noted that involvement of women in the S&T endeavours is not just for gender parity. It brings freshness, new outlook, diversity, different governance and over all a better output from the whole program. A woman can be an outstanding team leader and also a very friendly and desirable team member.
2. **Data Collection and Analysis:** There is lack of gender-based data regarding the involvement of women in science. This may also be regional and state specific. **Projects can be developed for this and supported by DST.**
3. **Gender Audit:** All institutions be mandated to provide web-based open access to the number of women at different levels.
4. **Information Accessibility:** Mechanism to access all types of information

(scholarships, research funding, positions, R&D programs, training programs, grievance redressal mechanisms, rules and regulations etc.) should be developed and decentralised.

5. **Increase the number of women scientists and technologists in key and decision-making positions** and promote leadership roles.
6. **Programs for rural women** to be launched especially in the remote places on health and hygiene, nutrition, employment and training. *Krishi Vigyan Kendras* can be used with more emphasis for S&T development and application and training **in rural areas**.
7. **Special curriculum to be developed for inclusiveness of women in rural areas** in agricultural training and teaching programme. It will be necessary to establish and strengthen infrastructure for S&T intervention.
8. **Training of trainers**, especially science teachers in colleges and schools with efforts for exposure as well as up gradation of skills of women towards S&T, higher education and research. Schemes can be formulated by science departments to take up such training programs. Academies can play a pivotal role.
9. **A conducive environment**, transport, security and similar facilities are essential. It should be made compulsory to **set up crèches** in all the organisations where women are employed.
Meetings should be conducted in every institution at least once a year, wherein all members are sensitised to the issue of gender discrimination and the importance of a conducive environment for women to work in. Such gender-sensitisation meetings may be conducted separately for different categories of members i.e. for faculty, staff and students and their planning should be a part of the mandate of the Women Cell of the institute.
10. **Flexi timings** realising the dual role of women scientists, would result in greater participation of women in S&T endeavours.
11. **Anti-Harassment Committees** should be activated to organise awareness workshops and sensitization programmes for women scientists. This should be done periodically.
12. **Women representatives should be nominated in Board of Governors** at Institutional levels.
13. **All round celebrations of one day in a year for S&T for Women, i.e. on 8th March.**
14. **Corporate sectors** may be directed to earmark **specific funds** for women in S&T Programmes. More scholarships and programs which women can join at any time of their career should be initiated.

15. **Academies should continue and support their existing programmes for women in science** and may also expand their activities. Each Academy to designate one position/**a focal point, as a nodal officer** to deal with Women in Science programme.
16. **A Standing Committee on *Women in Science*** may be revived and set up by DST, Gol including the eminent women scientists at various levels. This committee will be expected to work at all levels for recommendations coming from various sources and give the directives for implementation of these.
17. **Surveys and studies** on women in science and technology have to be commissioned at various levels. There is a dire need for disaggregated data on women's career in different science and technology disciplines, women's upward mobility in various kinds of S&T organizations, such as mission oriented agencies and academic and research institutions, women S&T professionals in regional institutions and data on the career choices of SC and ST women who enter technical education. Qualitative data on women's career history and the hurdles in the process, collected through interviews with women and men professionals in S&T is likely to enrich our understanding of the specific problems of women professionals in various situations.
18. There is a need to create a **data base** of women practicing Science. There are two existing data bases, one in the Indian Academy of Science (IASc), Bangalore and the other in the Department of Science and Technology (DST), Gol. These two may be merged and one focal point can be identified and supported, **preferably, in an academy.**
19. **A cell may be set up in any of the national academies to be the focal point and to look at all projects and programmes relevant for women in science. This in no way will be a hurdle for the ongoing programmes. It will act as the facilitator.**
20. **As DST and DBT have special schemes for women in S&T, similar programmes may be started and financially supported by the government in other science departments also.**

Acknowledgements

The *Inter-Academy Panel* is grateful to the Presidents of the three Academies, viz. INSA, IASc and NASI for constituting the Panel on this very important subject. **Prof. Paramjit Khurana** and **Ms. Archana Pant** have done outstanding job by coordinating the work for the Vision Document. Thanks to them. We are grateful to President, NASI for giving us the facilities for holding the meetings. Special thanks to **Dr. Rohini Godbole** and to all the other members for their valuable suggestions.

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Annexure-1**Composition of the Inter-Academy Panel**

1. Prof. (Mrs.) Manju Sharma, Past President, NASI-In Chair
2. Prof. Rohini Godbole, IISC, Bangalore-Member
3. Prof. Sunil Mukhi, IISER, Pune- Member
4. Prof. Vijayalakshmi Ravindranath, IISc, Bangalore-Member
5. Prof. Somdatta Sinha, IISER, Mohali-Member
6. Prof. Kasturi Datta, JNU, New Delhi- Member
7. Prof. Paramjit Khurana, University of Delhi, South Campus-Member

Annexure-2**Minutes of the Inter-Academy Panel Meeting held on June 23, 2015
at NIPGR, New Delhi**

An **Inter-Academy Panel meeting** of the three National Science Academies on '**Women in Science (WiS)**' for suggesting ways/measures to be adopted for improving contributions of women to science; and application of Science and Technology for women was held in the Board Room of NIPGR, New Delhi on **June 23, 2015 at 12 noon**. The following were present:

1. Prof. (Mrs.) Manju Sharma, Past President, NASI -In Chair
2. Prof. Rohini Godbole, IISC, Bangalore -Member
3. Prof. Kasturi Datta, JNU, New Delhi- Member
4. Prof. Paramjit Khurana, Univ of Delhi, South Campus, New Delhi –Member

Other members viz. Prof. Sunil Mukhi, IISER, Pune, Prof. Vijayalakshmi Ravindranath, IISc, Bangalore, and Prof. Somdatta Sinha, IISER, Mohali could not attend the meeting due to their prior commitments.

Agenda Item 1 – Opening Remarks

The meeting commenced with the welcome address by the Chair person Prof. (Mrs.) Manju Sharma. At the outset, Prof. Sharma thanked the Presidents of all the three academies namely INSA, NASI and IASC for this initiative and constituting the Inter Academy Panel. Efforts to be made by the three Science Academies in this direction would lead to some concrete action and recommendations to be implemented by the concerned departments. She added that more statistics and data are required on 'women pursuing Science as a career'. The women don't have access to information about the opportunities and programs; therefore, steps are required to ensure that there is access to information.

Although, there are many programs and activities supported by government, these need to be strengthened and some new ones to be added.

Agenda Item 2 – Comments by the members

Dr. Rohini Godbole circulated a note which was discussed in a panel for women in science. All issues regarding the vision document, named lecturership, dialogue with women scientists outside India, mentoring workshops and Lilawati's Daughters book to be

put on Youtube were discussed and recommendations made accordingly in the meeting.

Prof. Khurana opined that mentoring for women is very important and leadership programme is also necessary adding that some mechanism to showcase the participation of women in science should be developed.

Prof. Kasturi Dutta supported the idea of preparing a Vision Document. She also suggested that more women scientists should be invited to different workshops and meetings of various academies. Efforts should be made to nominate more women for fellowships of the academies.

Prof. Sharma told that a roadmap needs to be prepared with implementation strategies and making use of the existing resources of different organisations; particularly for the women who are socio-economically deprived. A fresh survey report of WiS has to be prepared taking note of the one already prepared by Indian National Science Academy (INSA)/ Indian Academy of Science (IASC). The panel consider an independent consultant to do this work. Regarding the Vision Document, suggestions from all the members need to be invited and Prof. Paramjit Khurana along with Ms. Archana Pant can prepare the first draft. The roadmap should include the important recommendations of all three academies. Implementation strategy of the roadmap must include area-wise steps. The members also discussed about INSA /NASI/ IASC reports on WiS and survey conducted on 800 women by IASC, DST task force. Lack of opportunities for women due to family responsibilities and inaccessibility to information, need for some international collaborations for the women pursuing science, different types of training etc. are important issues to be considered.

After detailed discussion on several issues related to WiS, the following decisions were taken:

1. Letters be sent to various governmental agencies/ organizations viz. DST and DBT for permanent invitees. ICAR, DRDO, ISRO and DAE to nominate a *Special Invitee* to this panel who could be invited as and when required; or called for a discussion on a particular subject. The roadmap be prepared by inviting valuable suggestions from all the panel members for drafting a *Vision Document* for implementation which will include steps to be taken for encouraging women in science and application of science and technology for the welfare of women. Prof. Paramjit Khurana was requested to coordinate and prepare a draft in three months, for discussion by the panel in the next meeting.
2. Dr. Manju Sharma agreed to give a format to facilitate the preparation of the Vision Document.
3. A proposal will be submitted to DST with a request for some funds to be allocated for the activities of this panel. It was very strongly recommended that NASI may be given

at least two permanent scientific positions, one Senior Scientific Officer and one RA (Research Associate) to coordinate and deal with all the activities of the Inter-Academy panel. A budget of about 15 to 20 lakhs per year may be sanctioned. For this a proper proposal will be submitted to DST. The proposal would include items such as holding quarterly meetings every year, including the expenditure on preparation of reports, payments of TA/DA under various activities, consultancy and other miscellaneous expenses.

4. Science Education Panel of the three Science Academies be requested to include some lectures by women scientists during the lecture workshop and also a pane discussion. Efforts should be made to invite women scientists for sharing their expertise in lecture workshops and participating in the Panel discussion. The announcement/ activities must be put on NASI's website under the ongoing programme on 'Popularisation of Science' by NASI. A note will be prepared on this by Dr. Rohini Godbole to be sent to Dr. Mukunda.
5. National Lecturerships in the name of famous woman scientist(s) be instituted and 5-10 enthusiastic budding women scientists from Under Graduate (UG) Colleges, universities and research institutions be invited per year to give these lectures. Prof. Rohini Godbole was requested to draft a proposal for this for submitting to the DST, Gol on behalf of the Academy.
6. The mentorship and leadership programmes for the young women who have chosen to opt for Science as a career, be supported and strengthened.
7. 'Lilavati's Daughters: The Women Scientists of India,' an inspiring anthology published by the Indian Academy of Sciences be put on *You Tube* with the help of NASI; and considered under NASI's programme on 'Popularisation of Science'. Vigyan Parishad, Allahabad (Contact person: Dr. Sheo Gopal Mishra of Vigyan Parishad) may be requested for translation of the aforesaid compilation in Hindi for easy understanding by common women.
8. The report on '*Science for Women & Women in Science*' of the Inter- Academy Panel be put in the Council meeting to discuss and decide about the funds to be provided for the ongoing programme on 'Popularisation of Science' by NASI including WiS programme; the highlights of such programme be put on *You Tube* and connected to the UGC and other websites.
9. The Panel should become the *Point of Contact* for all activities / programmes / workshops and the related S&T functioning for WiS.
10. All the websites to be linked and further connected to IASC's website on *Women in Science & Technology* as well as other websites for women as WISE (**Women IN**

Science and Engineering) and STEM (Science, Technology, Engineering & Mathematics) etc., so that the information/resources could be shared.

11. Conducive environment is required for the women scientists working in the laboratories and desirous to work for late hours, keeping in mind the gender sensitivity and ethical issues.
12. It was proposed to have good quality crèches in the universities/ govt organisations for child care; hence, promoting gender-friendly environment.
13. The next meeting of the Panel was proposed on October 12, 2015 at 11:00 a.m. at NIPGR, New Delhi.

At the end Archna Pant of NASI made a very good presentation about the various activities, workshops and their recommendations as conducted by NASI. The work done by Archna and Sippy of NASI was greatly appreciated by all the members.

The meeting ended with a vote-of-thanks to the Chair and all the experts.



**The National Academy of Sciences, India (NASI)
5, Lajpatrai Road, Allahābad-211002, India**