Women Scientists - Status in India

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Women Scientists - India

- **2001- University enrolment – total 39%**

- **Science** **39%**
  - » **Graduation 39%**
  - » **Postgraduation 43%**
  - » **PhD 37%**
- **Medicine** **44%**
  - » **Graduation 46%**
  - » **Postgraduation 34%**
  - » **PhD 29%**

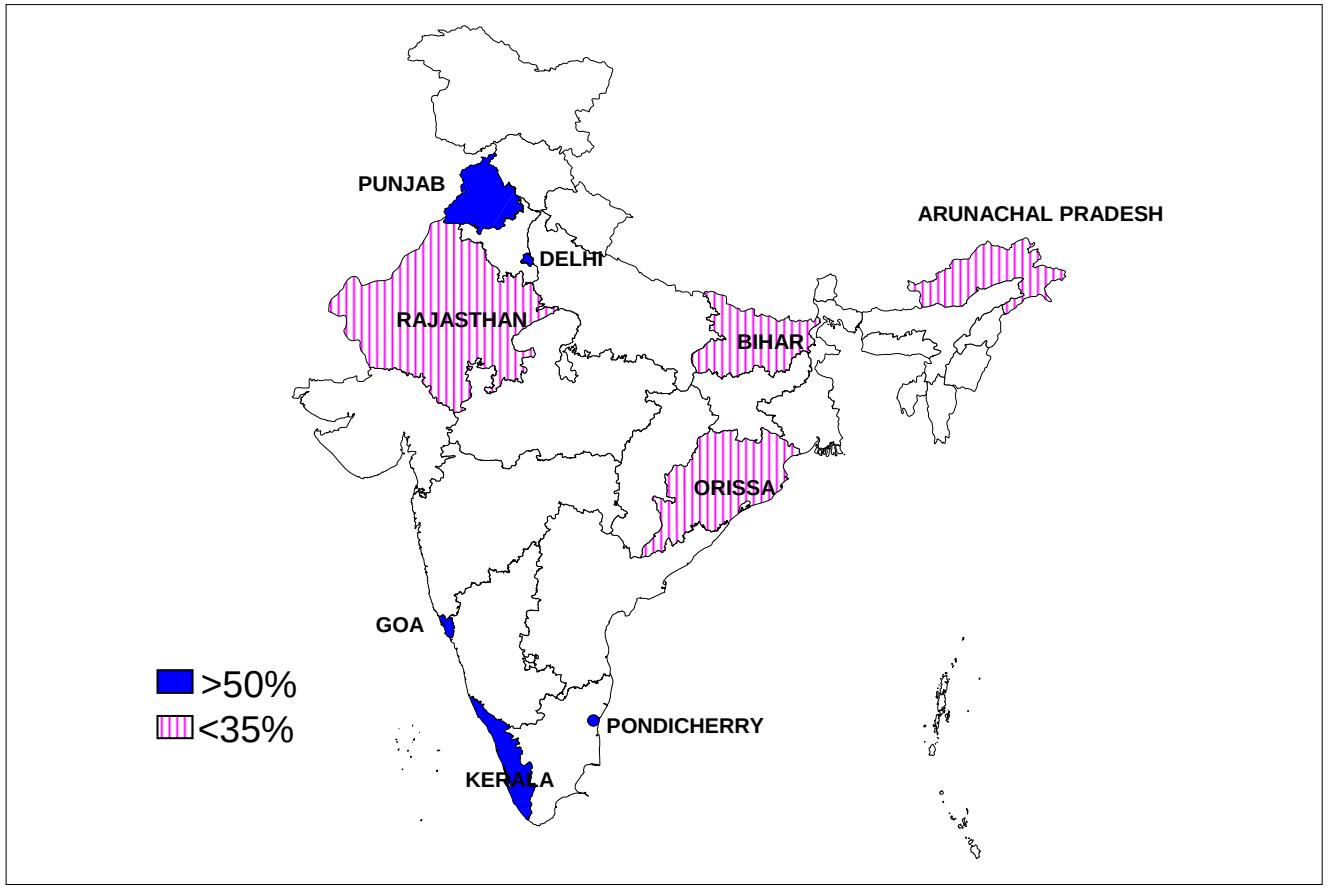
- **Agriculture 17%**
- **Arts 41%**
- **Education 47%**

- **Indian women good in Medicine and Medical Sciences**

- **Saudi Arabia: Women started University in 1973 43%**
- **Egypt: Women started University in 1920 35%**
- **Economics and general awareness an important factor ?**

% Women students in Universities

- **Some States are better than others!**



Women Scientists- India Achievements/Awards

- **Publications with Impact Factor > 5**
  - **Men:** **85.7 %**
  - **Women** **14.3%**

- **Awards**
  - **National Biosciences Award- 1 in 24** **4%**
  - **Bhatnager Award** **8 in 333** **2.4%**

  (highest award for <45yrs)

  (none given to a woman in last 5 years)

- **Fellowships of Academies**
  - **Indian National Science Academy** **3.2%**
  - **Indian Academy of Sciences** **4.6%**
  - **National Academy of Agricultural Sciences** **4%**

Women Scientists- India Achievements/Awards

Faculty positions	%	Men	Women
– Professor		18	3.6
– Associate professor		37.7	35.7
– Assistant professor		44.3	60.7

- Glass ceiling phenomenon for women: UK Greenfield report, Peters et al 2002
- Even though 50% got PhD only 10% of senior scientific positions in any country went to women
- European Commission: 40% PhDs vs 15%
- Korea: 3%

Women Scientists- India
School enrolment %

Country	Primary	Secondary
India	45	40
USA	49.7	50
Sri Lanka	49.5	52 (more boys drop out)

- India girls drop out in rural areas due to societal pressure, economic reasons, no value for giving education to girls, lack of toilets

Women Scientists- India/USA

- **Sciences**
  - **Graduation 39%**
  - **Postgraduation 43%**
  - **PhD 37%**

    No attrition in higher degrees in India

MIT(USA 1994)	Biology	Chemistry	Maths
Undergraduate	50.8	52.7	30.1
Graduate	46.1	29.3	15.2
Post docs	30.5	22	28.6
Faculty	14	6.2	2.1

Women Scientists- India/Others

Physics:

- **India 32%**
- **Netherlands 6%**
- **Poland 36%**

(Godbole et al. 2002)

- **Salvadore and Argentina**
  - **60% of S&T post graduates are women**

Women Scientists- India

Conclusions:

- **Girls drop out of school**
- **Those who continue show no attrition subsequently at graduation and post-graduation levels**
- **Glass ceiling for recognition, awards, senior positions**
- **Drop out again after PhD- during child bearing age**

Innovation

- Poor representation of women in higher levels and innovation due to biological drop out, lack of opportunities and timely recognition.
- India is trying to correct the drop out at post PhD level.
- Gender differences at productivity and efficiency level at the time of child bearing for women. With loss of 5 years or more, it becomes difficult to catch up in fast moving fields of science. There is an internal brain drain which is an economic loss!
- Some cultural differences play a part in countries where value for women is low.
- A good scientist needs to have both talent and long term dedication combined with a good work place environment and facilities.

Gender based “style”

- **Myth: Men prefer physical sciences and women prefer biological sciences and medicine.**
- **Reality: Societal bias influences the child, Parental decisions strong in India.**
- **Increase in Women engineers, pilots, astronauts, physics, mathematics**

Gender based “style”

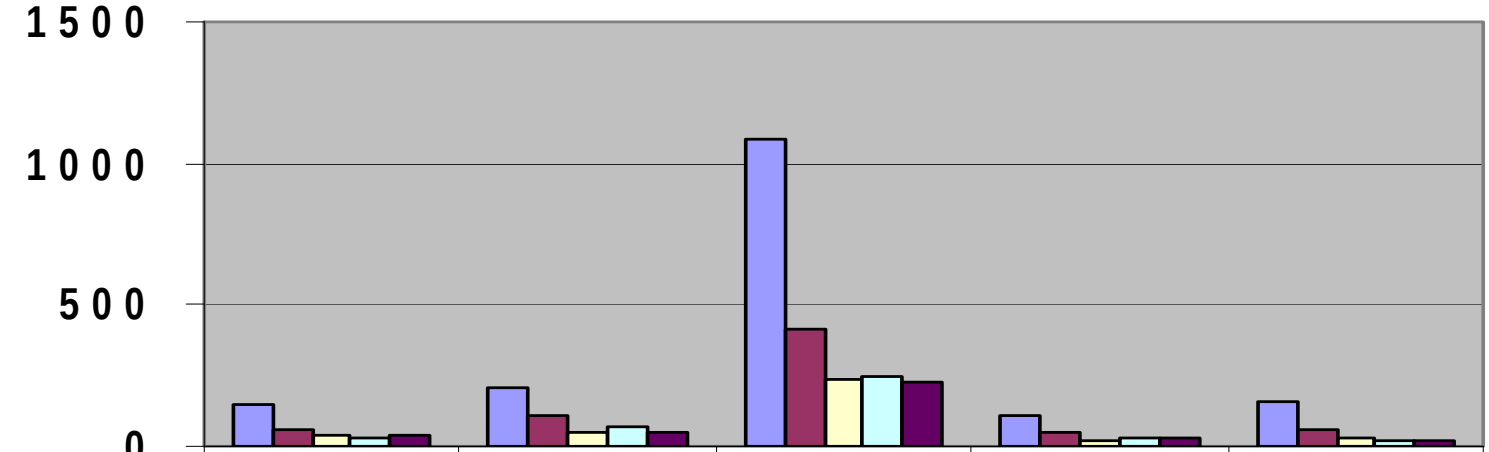
- **Female style in science**
  - **note details, accuracy, repeated studies to be sure before publishing or claiming results. Men see the mega picture before women and go faster!**
  - **As leaders, fussy for details.**
  - **Women achievers less sympathetic to younger women with family issues, feel they have tackled it and so should others! Women prefer male bosses!**
  - **Creativity: no differences but women more vulnerable to external influences to take it forward.**

Women Scientist Program (WOS), Govt. of India

Eligibility (WOS-A):

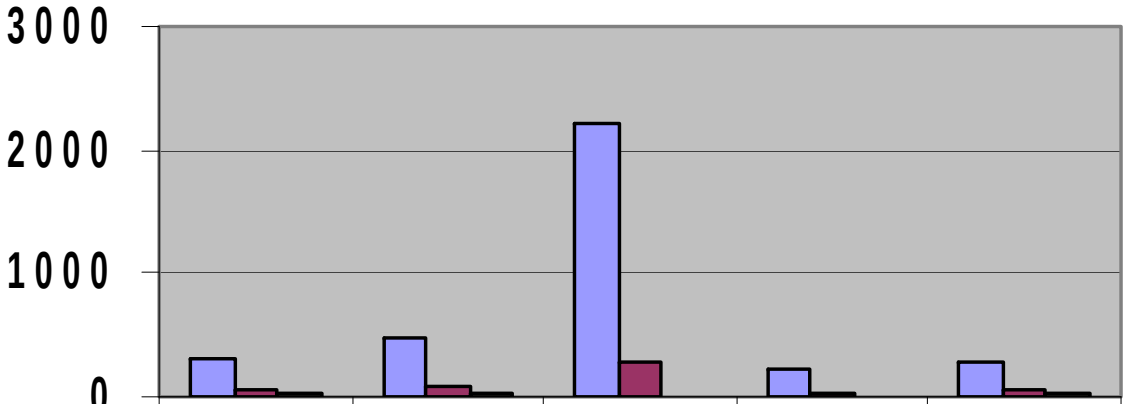
- **Person in regular job not eligible**
- **Post graduate – Rs 10,000/-, maximum age limit 35 years**
- **Doctorate – Rs 20,000/-, maximum age limit 50 years**
- **Break-in-career due to family reasons**
- **Demonstrable research experience**
- **Disciplines: Physical &Mathematical sciences (PMS), Chemical sciences (CS), Life Sciences (LS), Earth and Atmospheric Sciences (EAS) and Engineering Sciences (ET).**

Trend of Proposals Received (2003-07)



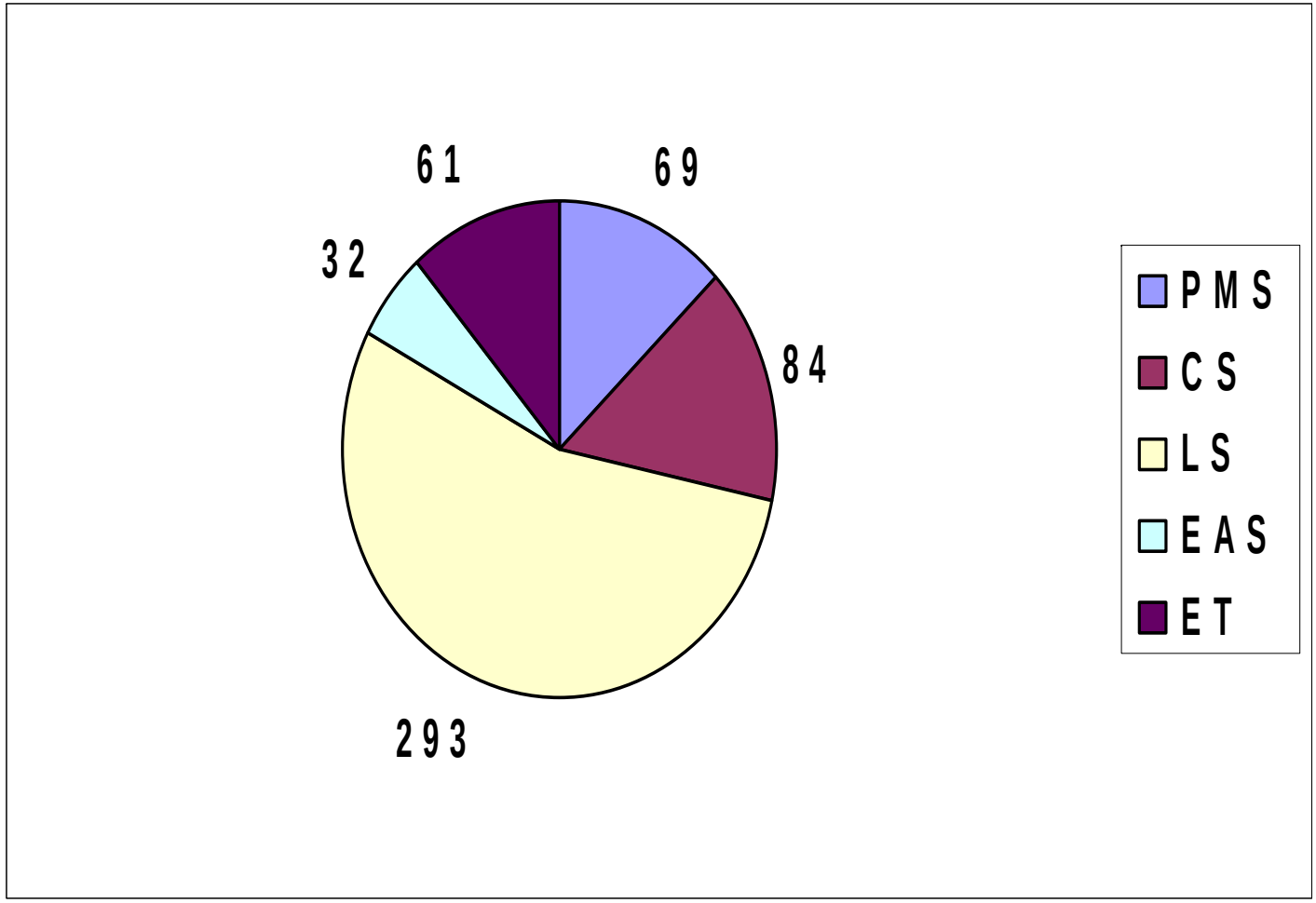
	PMS	CS	LS	EAS	ET
2003	151	208	1085	111	156
2004	61	106	412	45	61
2005	37	54	234	18	30
2006	34	66	245	25	21
2007	36	49	230	33	24

Selections against Received (2003-07)

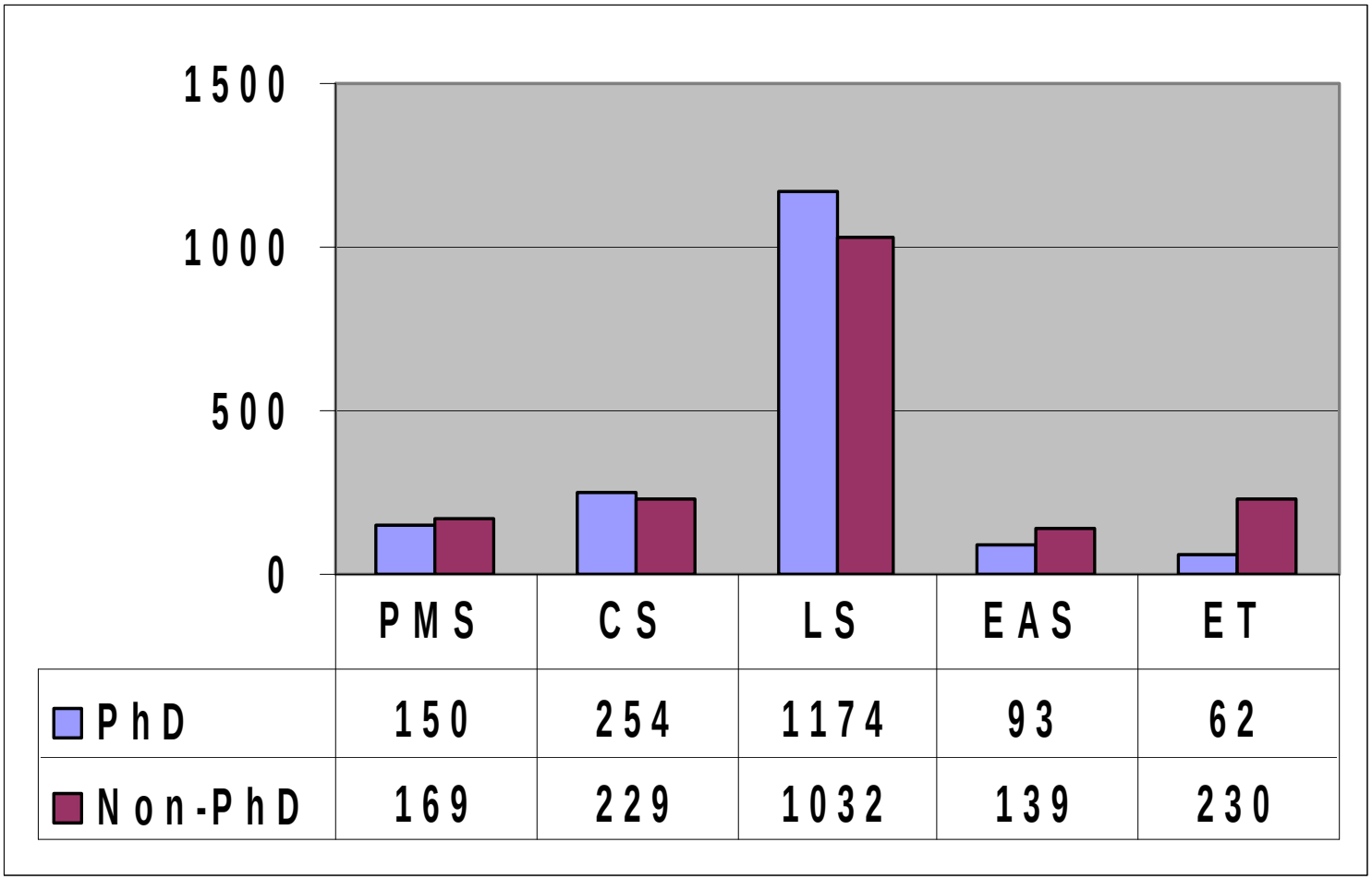


	PMS	CS	LS	EAS	ET
Received	319	483	2206	232	292
Selected	69	84	293	32	61
Success rate (%)	22	17	13	14	21

Discipline-wise Support (2003-07)

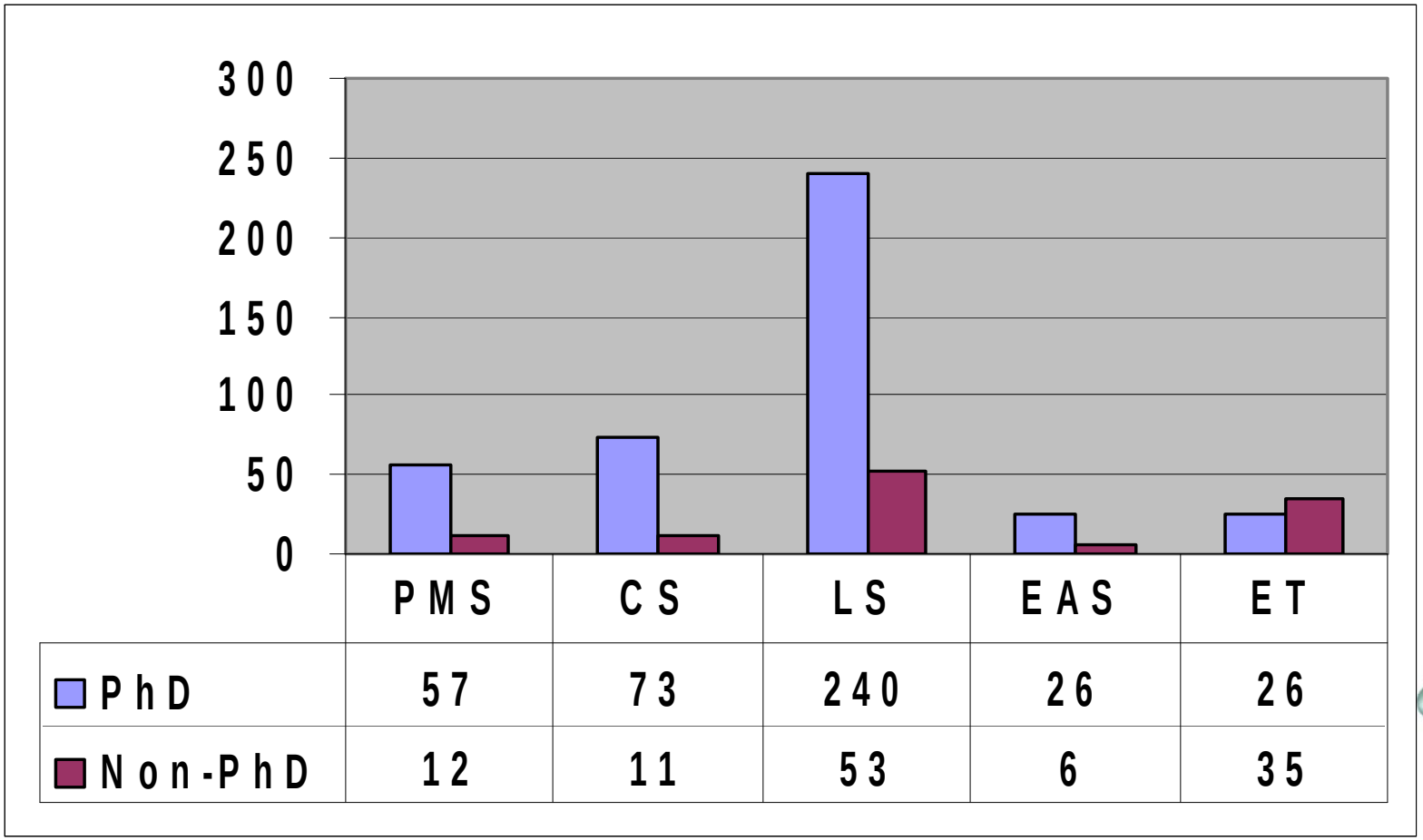


Ph.D. and Non-Ph.D Applicants



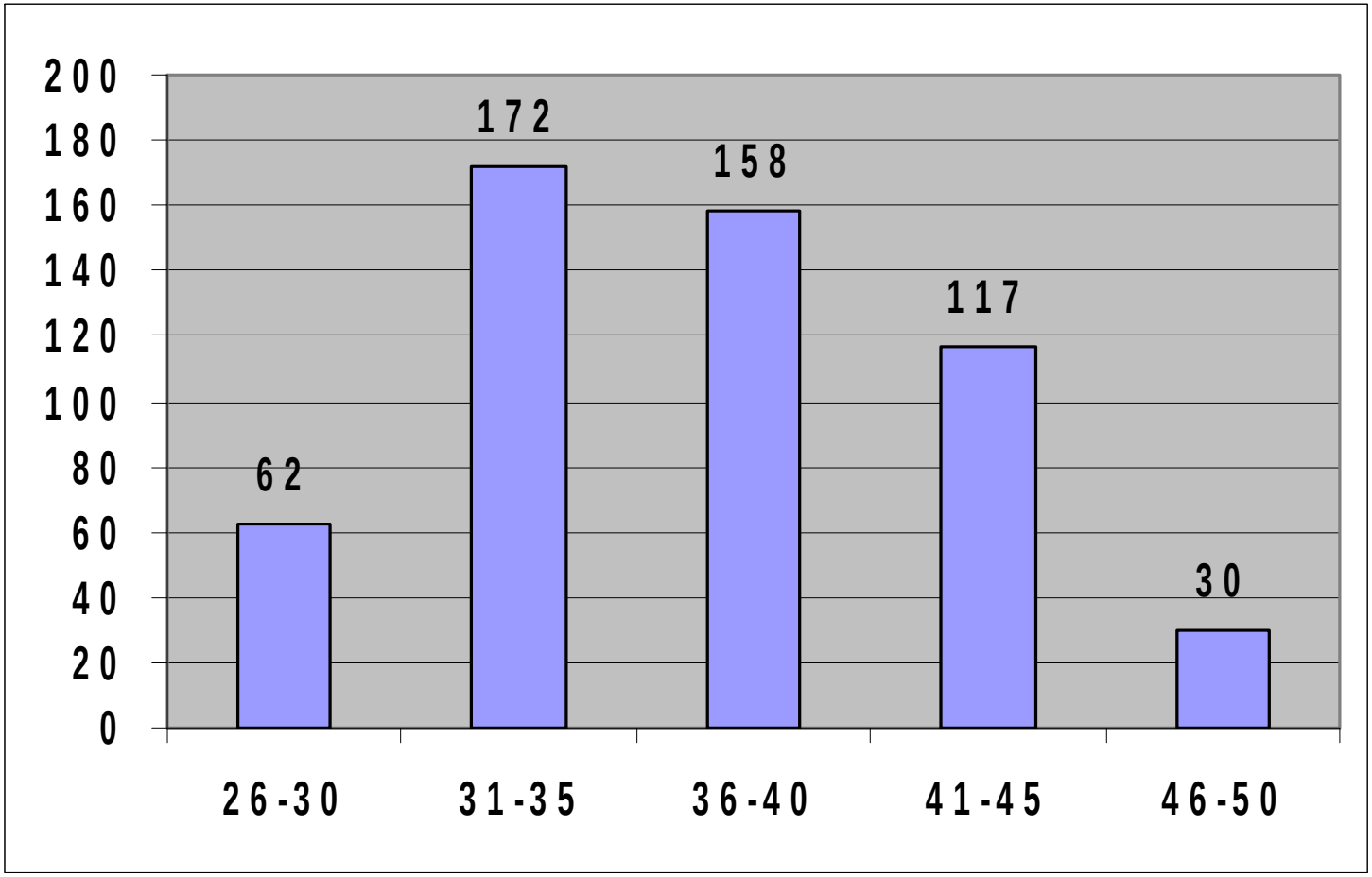
	PMS	CS	LS	EAS	ET
PhD	150	254	1174	93	62
Non-PhD	169	229	1032	139	230

Ph.D. and Non-Ph.D. Supported candidates

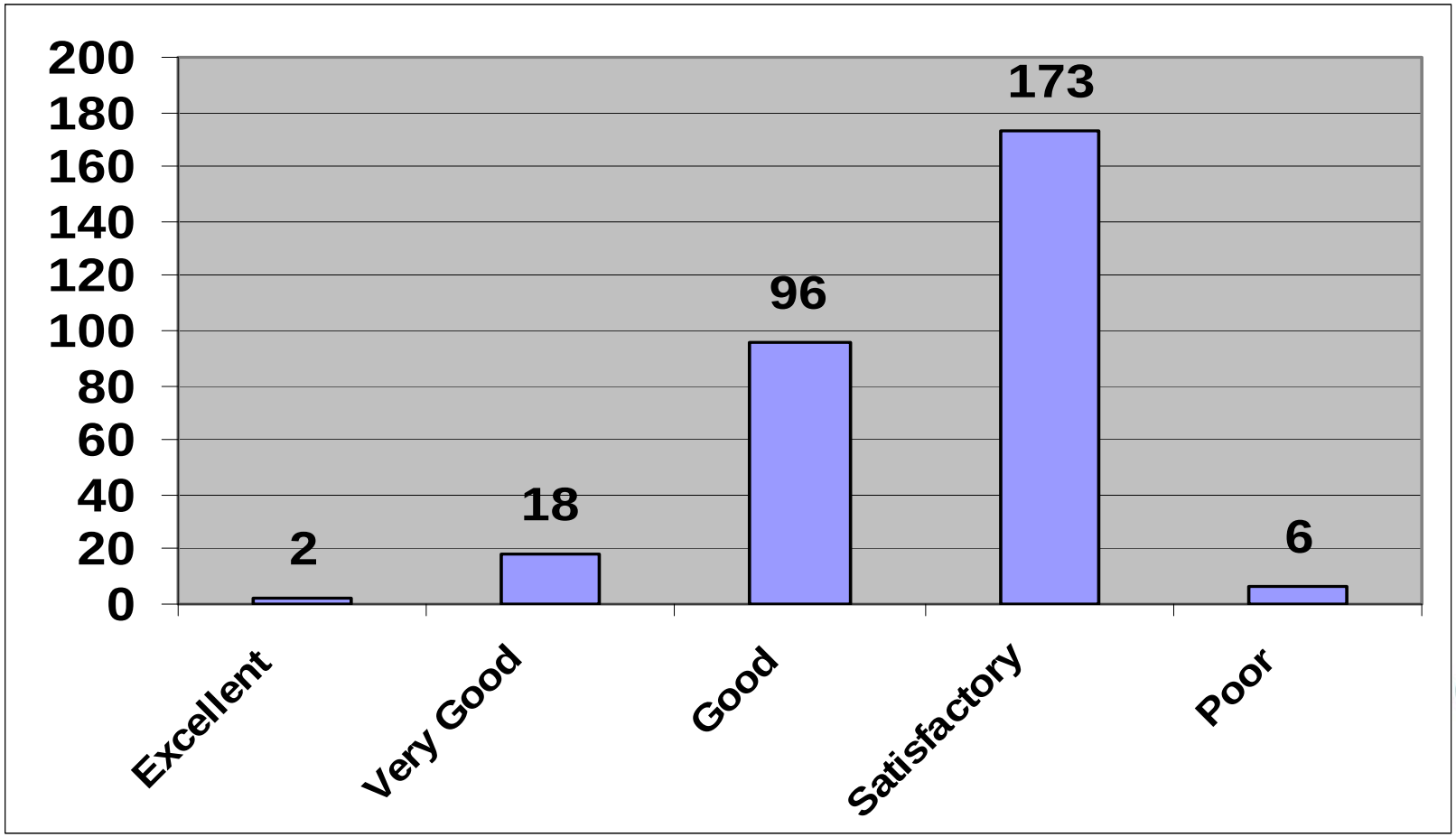


	PMS	CS	LS	EAS	ET
PhD	57	73	240	26	26
Non-PhD	12	11	53	6	35

Age-wise distribution of supported candidates



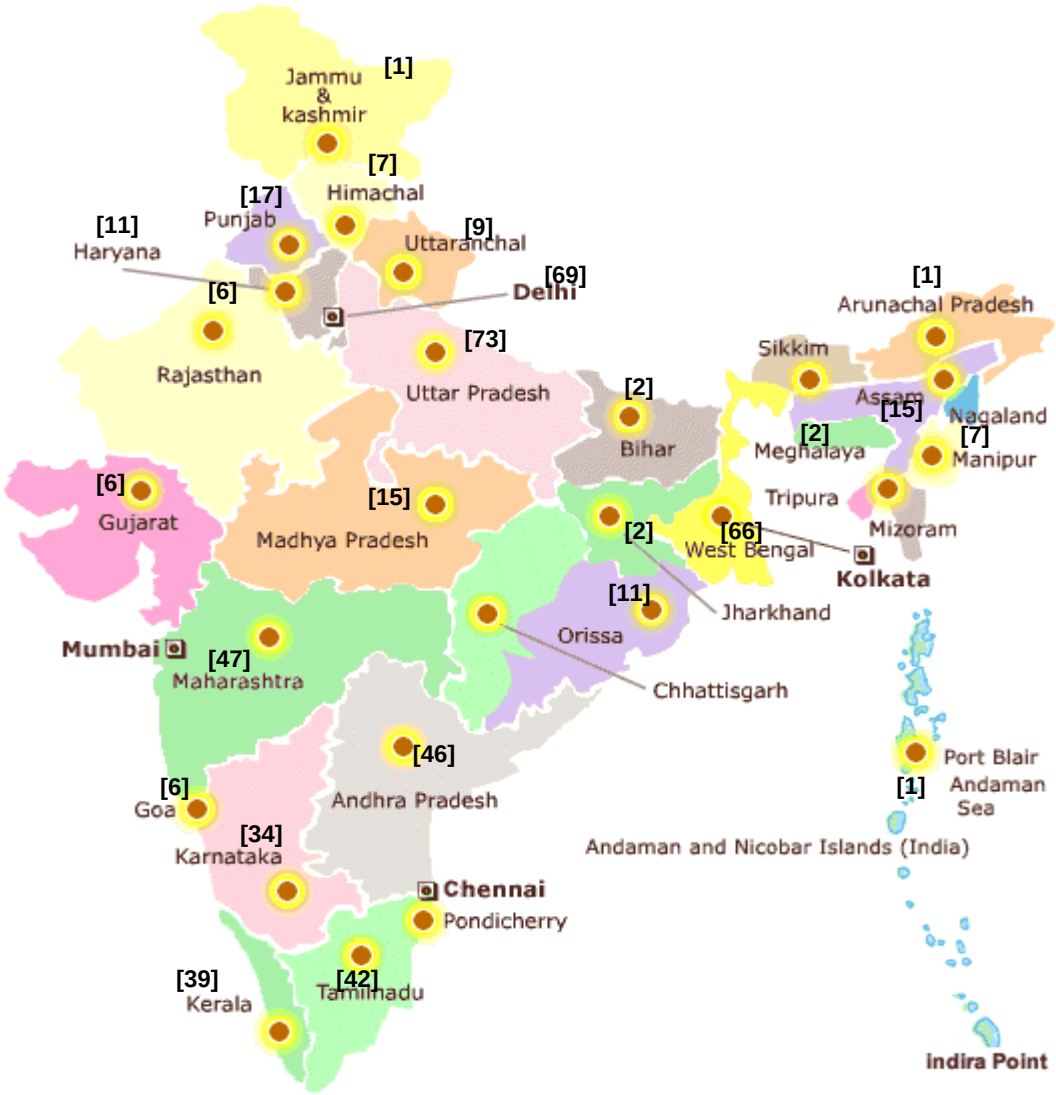
Evaluation of Ongoing Projects (2006)



Success Indicators

- **Papers published in indexed journals = 284**
- **12% have published papers in journals having good impact factor**
- **Ramanna Fellowship awarded = 1**
- **At least 2-3 may get Ramanna Fellowship this year also**
- **20% of them have got regular positions in good institutions**
- **21% are pursuing higher qualification**
- **3% have moved to industry**

Distribution of WOS-A (2003-07)



Mentoring Workshops

- JNTU, Hyderabad (February 9-10, 2007)
- DDU University, Gorakhpur (June 20-21, 2007)
- University of Kashmir, Srinagar (September 10-11, 2007)
- Institute of Bioresources and Sustainable Development, Imphal (November 5-6, 2007)

Glass ceiling

- Yes, glass ceiling is a reality and is very evident in India as statistics showed in my presentation.
- I may have touched but not broken through the glass ceiling on 2 occasions! These related to high politically sensitive posts.
- My career is acceptable to both men and women. Society has also recognised by civil recognition of Padmashri (India) and Chevalier (France). DSc Honoris Causa by Pierre and Marie Curie University, Paris 6.
- Being a women benefitted me ? Wearing a sari helps when I am abroad as people seem to remember me!

Women’s empowerment by S&T

- Reproductive technologies have benefited women who now have control over their bodies. They can decide when to have children, how many to have etc.

- Other engineering based tools have made life style change possible by reducing physical burden and saving time in household and work related chores. But they are still ergonomically designed for men except kitchen gadgets! In the developing world women do a lot of agriculture in the small farms as the men go out to earn a living, yet man has the best implements which he may lock up when he goes!

Contd..

Contd..

Women's empowerment by S&T

- Better ergonomically designed implements and laboratory equipments are required for women. Is any one listening?

- Information Technologies, Telecommunication **have provided a lot of employment to women in rural and urban India thereby empowering them financially.**

- Biotechnology **based employment is now possible in even rural areas in the areas of mushrooms, horticulture, fish farming which are favored by women.**

Improve participation of Women in Science

'*The world needs science and science needs women*' L'Oreal-UNESCO
particularly India

- **Encourage school enrolment in science.** India finds that if girls continue till secondary level they are more likely to continue in Science. Parents play a role in career choice
- **Political action in science policy.** Provision of scholarships and support for 15 years from school to post doc level-India's 11th Plan
- **Political action**. Gender based Budget by Govt of India. Min. of S&T actively engaged in WOS programe, Seminars to show case young scientist's achievements, gender based awards.
- **Prevent drop outs at child bearing age.** This is an economic loss, an 'internal leak' as education in India is publicly funded.
- Bring talented drop outs back to science **with bridge grants**
- **Provide facilities** eg. Creches, maternal leave, flexible hours, travel by air for young mothers(and fathers!)
- **Proactively recognise women scientist's contribution** by awards, academies etc. not discrimination but change in previous mindset. Eg.Sweden

Research in own country vs other nations

- **Research in one's own country** is emotionally and culturally satisfying.

- In 70's India was a tough place to do science in general and immunology in particular. Restricts in import of reagents, equipment, lack of literature (no internet), lack of communication with peers (telecommunication poor), lack of critical mass of peers to interact with.

- **Choice of research topic**. I could not have done my research elsewhere as I was working on immunology of leprosy, the human and not an animal model. India had a large burden of leprosy patients whom I could investigate and who were very cooperative.
- Others like me who were interested in local problems were happy in India.

Contd..

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Research in own country vs other nations

- The current atmosphere is very conducive as slowly excellent facilities have come up. There is reverse migration of overseas scientists back to Indian institutions and industry

- It is **not a must to go abroad** for training. But the young find it fun. Indians work better abroad! As long as they come back

- **Recognition.** There is a delay in international recognition, publication in good journals if your address is India! The same scientist publishing from a locale in USA gets more citations on the same topic! At present the best location is USA. But this will change as history shows us and Asia may become the center! I have been recognised nationally.

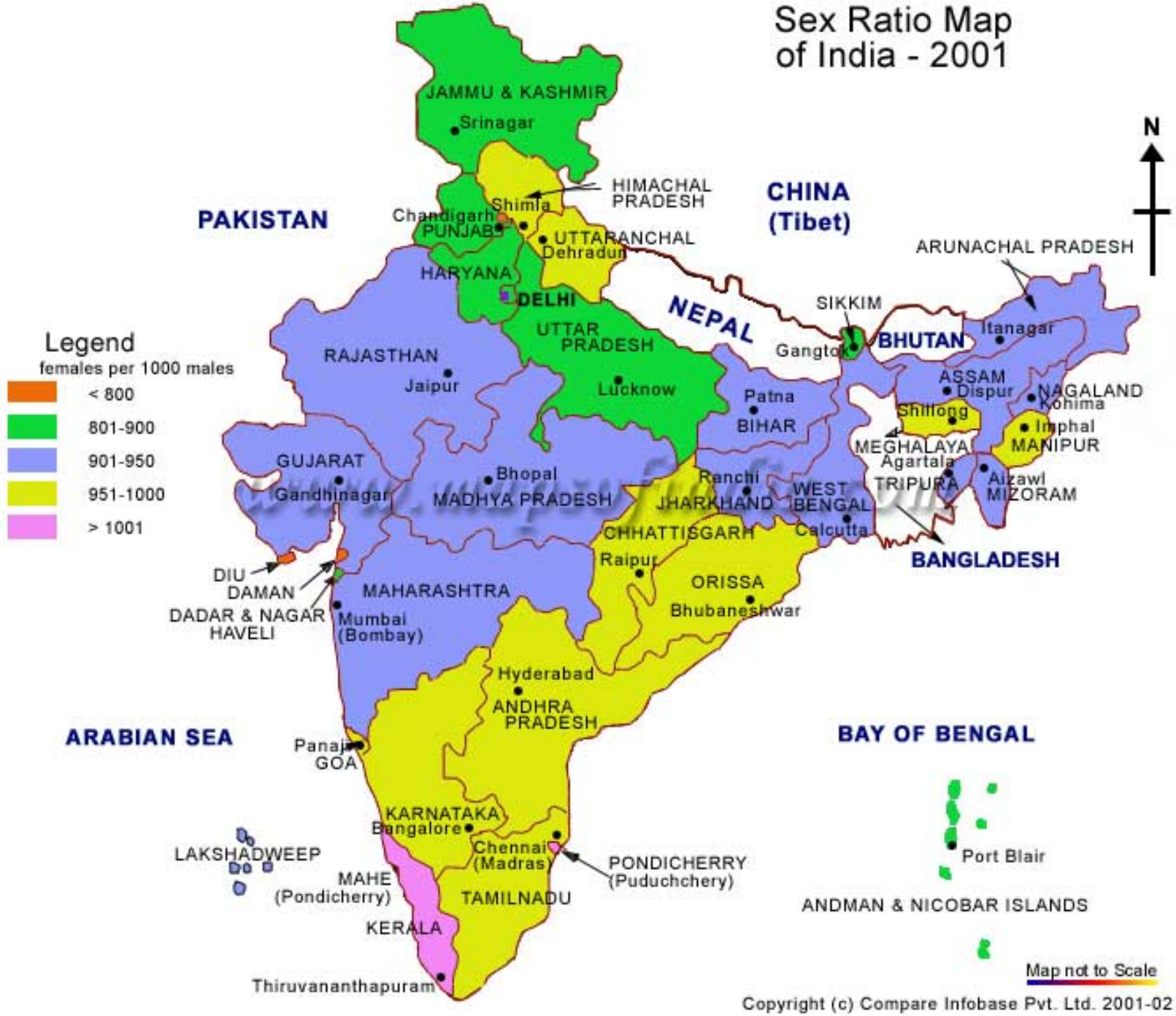
Remuneration-India

- **No gender discrimination in salaries for the same post in India.**
- **No gender discrimination in research grants once the woman has reached a certain position**
- **Tax benefits for women**
- **Encouragement for young women scientists under special programes for research**
- **There is a subtle discrimination in giving the appropriate level of a post in India as in the rest of the world. eg. Sweden**
- **In first and second level jobs employees ask questions on marriage, husband's career and children.**

Empowerment of Women Scientists

Conclusions

Empowerment of scientists cannot be in isolation. Society needs to empower women as a whole.


Sex Ratio Map of India - 2001
Legend
females per 1000 males
< 800
801-900
901-950
951-1000
> 1001
N
JAMMU & KASHMIR
Srinagar
HIMACHAL PRADESH
Shimla
Chandigarh
PUNJAB
UTTARANCHAL
Dehradun
HARYANA
DELHI
UTTAR PRADESH
Lucknow
RAJASTHAN
Jaipur
PAKISTAN
CHINA (Tibet)
NEPAL
SIKKIM
Gangtok
BHUTAN
ARUNACHAL PRADESH
Itanagar
ASSAM
Dispur
NAGALAND
Kohima
Shillong
Imphal
MANIPUR
MEGHALAYA
Agartala
TRIPURA
Aizawl
MIZORAM
Patna
BIHAR
Ranchi
JHARKHAND
WEST BENGAL
Calcutta
BANGLADESH
CHHATTISGARH
Raipur
ORISSA
Bhubaneshwar
GUJARAT
Gandhinagar
Bhopal
MADHYA PRADESH
DIU
DAMAN
DADAR & NAGAR HAVELI
MAHARASHTRA
Mumbai (Bombay)
Hyderabad
ANDHRA PRADESH
ARABIAN SEA
Panaji
GOA
BAY OF BENGAL
KARNATAKA
Bangalore
Chennai (Madras)
PONDICHERRY (Puduchchery)
LAKSHADWEEP
MAHE (Pondicherry)
TAMILNADU
KERALA
Thiruvananthapuram
Port Blair
ANDMAN & NICOBAR ISLANDS
Map not to Scale
Copyright (c) Compare Infobase Pvt. Ltd. 2001-02


HARYANA
Sex Ratio Map
HIMACHAL PRADESH
Panchkula
CHANDIGARH
(State Capital/Union Territory)
UTTARANCHAL
Ambala
PUNJAB
Yamunanagar
Kurukshetra
Kaithal
Karnal
UTTAR PRADESH
Sirsa
Fatehabad
Jind
Panipat
Hisar
Sonipat
Rohtak
NEW DELHI
Jhajjar
Bhiwani
Gurgaon
Mahendragarh
(Narnaul)
Rewari
Faridabad
RAJASTHAN
N
Map not to Scale
Legend
Females per 1000 males
< 850
850-900
> 900
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Grooms go begging in Haryana

Female foeticide forces them to buy brides from other states

By Rashme Sehgal
TIMES NEWS NETWORK

Rohtak: Two decades of female foeticide have caught up with the Harayanvis. Young men wanting to get married are left abegging. There are simply no brides available. The situation is so grim that families are forced to buy girls for anywhere between Rs 20,000 and Rs 30,000 from Madhya Pradesh, Bihar and West Bengal. They are then palmed off as members of their own *biradiri*.

SUNDAY SPECIAL

"The scarcity of marriageable girls in our state is akin to the shortage of grain during famine," laments Ram Kumar Hooda, a panchayat member in Bhali village in Rohtak district. And Gyano Devi, sarpanch of Mayna village in Panipat district has six lanky Jats warning her, "Tai, we will accept your sarpanchi only if you find brides for us."

According to the 2001 Census, the districts with the worst sex ratio are Sonepat (783:1000), Rohtak (796:1000), Ambala (784:1000) and Kurukshetra (770:1000). This is in the 0-6 age group.

Bhagwani from Bhali village admits that both her grandsons married girls from Gohra village in the Sagar district of MP. "What could we do? A boy reaches marriageable age after he turns 18. My grandsons were 27 and 28 years old. A close relative of ours, whose son was 32 found a girl from Sagar. We decided to follow suit."

Bhagwani's young bride Gora, with distinctly tribal features, denies she was bought."I'm a Jat by caste but I'm learning to speak the local language," she insisted. Though Bhagwani also denied paying a bride price, her neighbours insist she did. "Most of these girls being brought in from outside are paid for and end up being treated as bonded labourers," one neighbour insisted.

The situation, says Dr Richa Tanwar, director, Women's Studies, Kurukshetra University, will worsen in the coming years as the sex ratio among the literate population has dipped: 618 girls to 1000 boys.

The tricky part is for the boy's family to convince the villagers that these 'outsiders' belong to the same caste as them. Most panchayats are willing to turn a blind eye as long as the girl is not an SC/ST. "Our boys are so desperate they are willing to marry girls from any caste, be it Kumhar, Lohar or even the backward classes. They will however not marry into SC/ST families," adds Hooda.

Ram Ratri, a fellow panchayat member adds, "Polygamy is common in Harayana; men will marry twice and thrice to get a male child. But I won't be surprised if, due to the shortage of brides, families revert to the earlier practice of polyandry where one bride was shared by the male members of a family." "We have no jobs, we have no land and now there seems to be little prospect of our getting married. What kind of future can we look forward to?," questioned 21-year old Ramesh.

Manisha, associate programme coordinator for the government-aided Population and Development Education Programme says, "Having fewer women does not mean the premium on them increases. On the contrary, they are being subjected to more violence and families are being forced to keep them cloistered in their homes."

More than 100 million women are missing'
Amartya Sen 1988

No. of Females per 1000 males

	All India	Punjab
1991	945	875
2001	927	793

per capita Rs 15,562 Rs 20,463
Female literacy rate increased by 53%
Human Development Index moved up from 134 to 115
In 1992, 73rd Amendment gave women 33% total seats in local governments.

Empowerment of Women Scientists

Conclusions

- **Women scientists need to play a proactive role in improving systems that *men made for men*.**

- **Women came later into science and need to identify the changes required for their betterment**

LILOVARTI or LEELAVATI

LILOVARTI or LEELAVATI
natural philosopher (12th century)
Sanskrit Vedic literature refers to her as a respected natural philosopher and the **inventor of mathematics**. According to Soumyadeb Ghosh, **the daughter of a noted Indian mathematician Bhaskaracharya (1114-1185CE).** He did many important things in astronomy and mathematics including resolving a problem with the zero. He was the first to note that division by zero did not give zero; it resulted in infinity. **He wrote a book on algebra called Leelavati. The book was named after his daughter, also called Leelavati.** The book was used to teach her algebra. She was an excellent mathematician. In 1816 the book was translated into English. **However, Soumyadeb Ghosh tells us that Leelavati herself is the author of the book and quite famous in her own right.** Clearly we have more research to do here!