# Women Physicists in Asia

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Fermilab and the University of Chicago

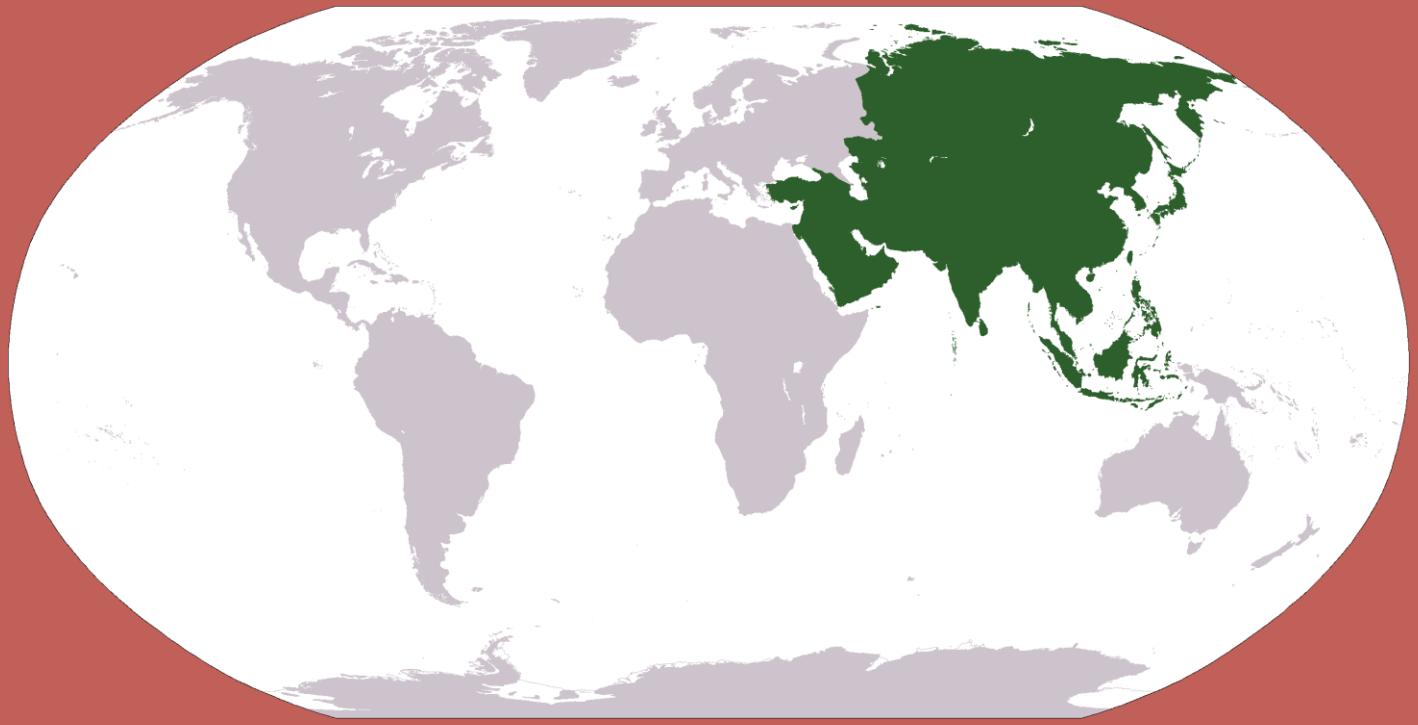
Around the World in 180 Minutes:
Differences and Similarities among Women Physicists

APS Meeting, March 17, 2009

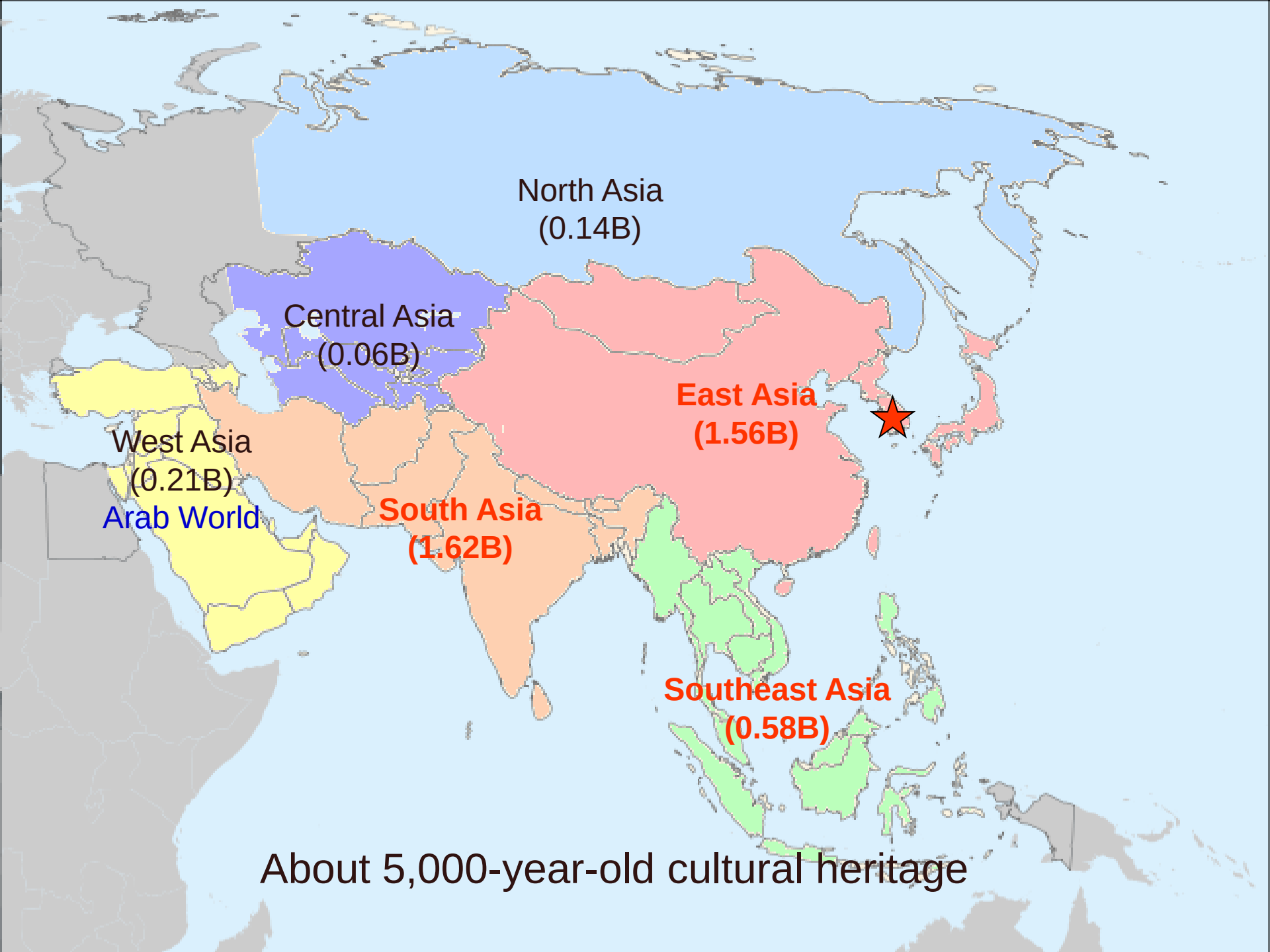

ICWIP 2008
The 3rd IUPAP International Conference on Women in Physics

This Presentation:
ICWIP + WGWIP Articles / Presentations, Other Private Communications, Internet Searches, ….. → Far from Completion!

# Asia



- World’s largest and most populous region
- > 4 billion people, > 60% world’s population



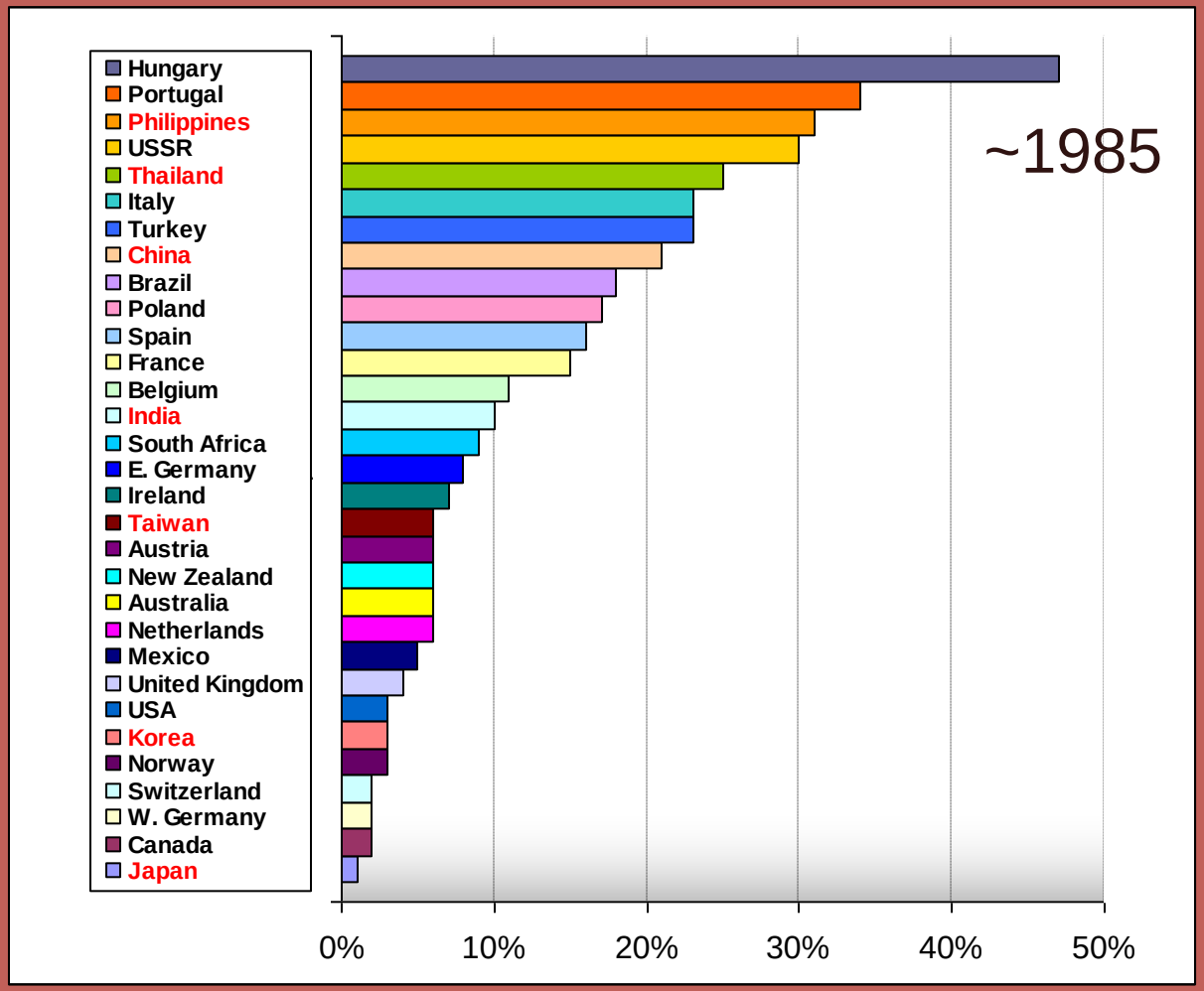

About 5,000-year-old cultural heritage

# Women in Physics

Although the problem of under-representation of women in scientific professions is universal,

there might be important regional similarities and differences in the manifestations of the problem.

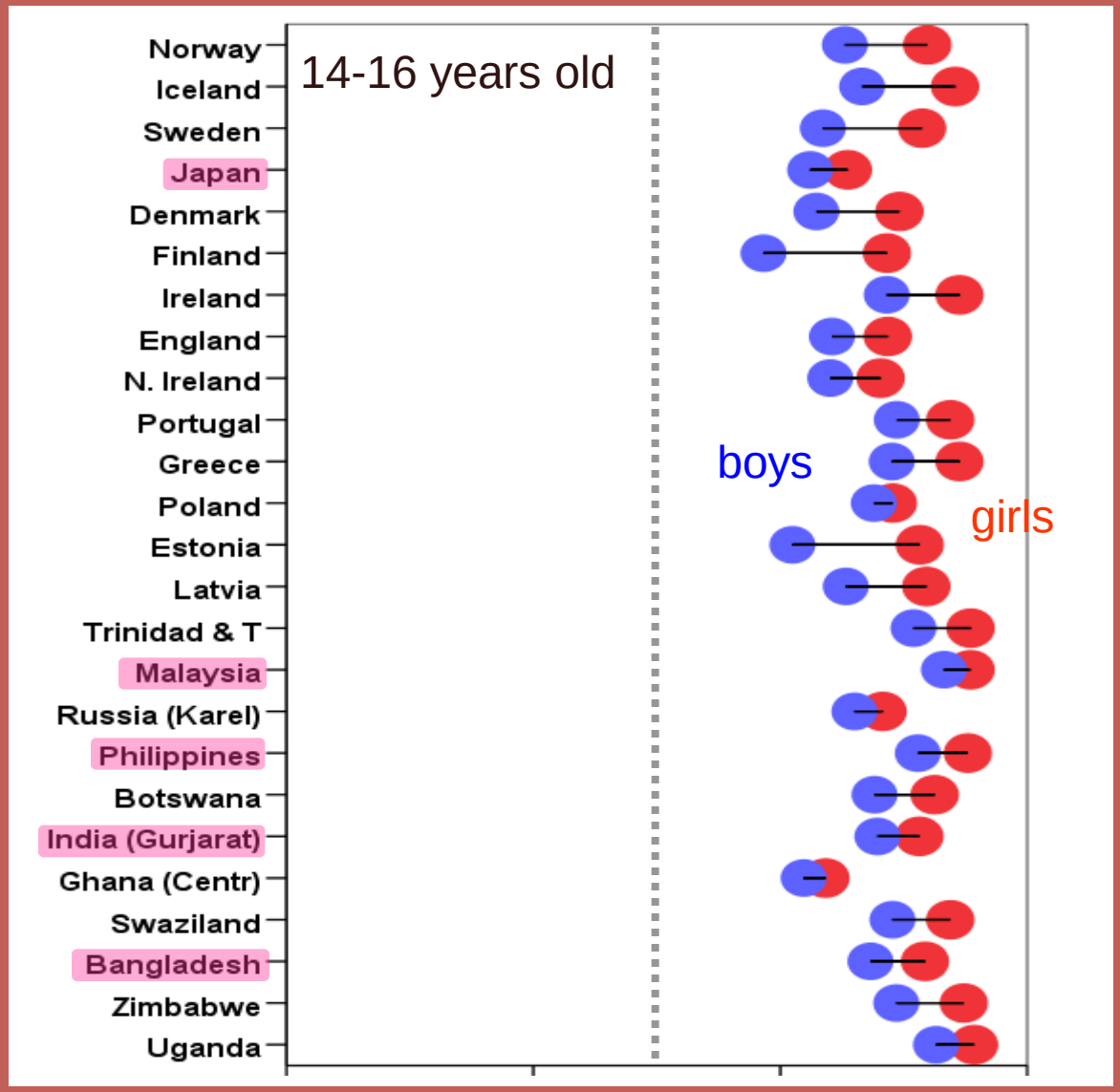
# Women in Physics Faculty Positions (%)




Differences from country to country are significant.

# Working with something I find important and meaningful.

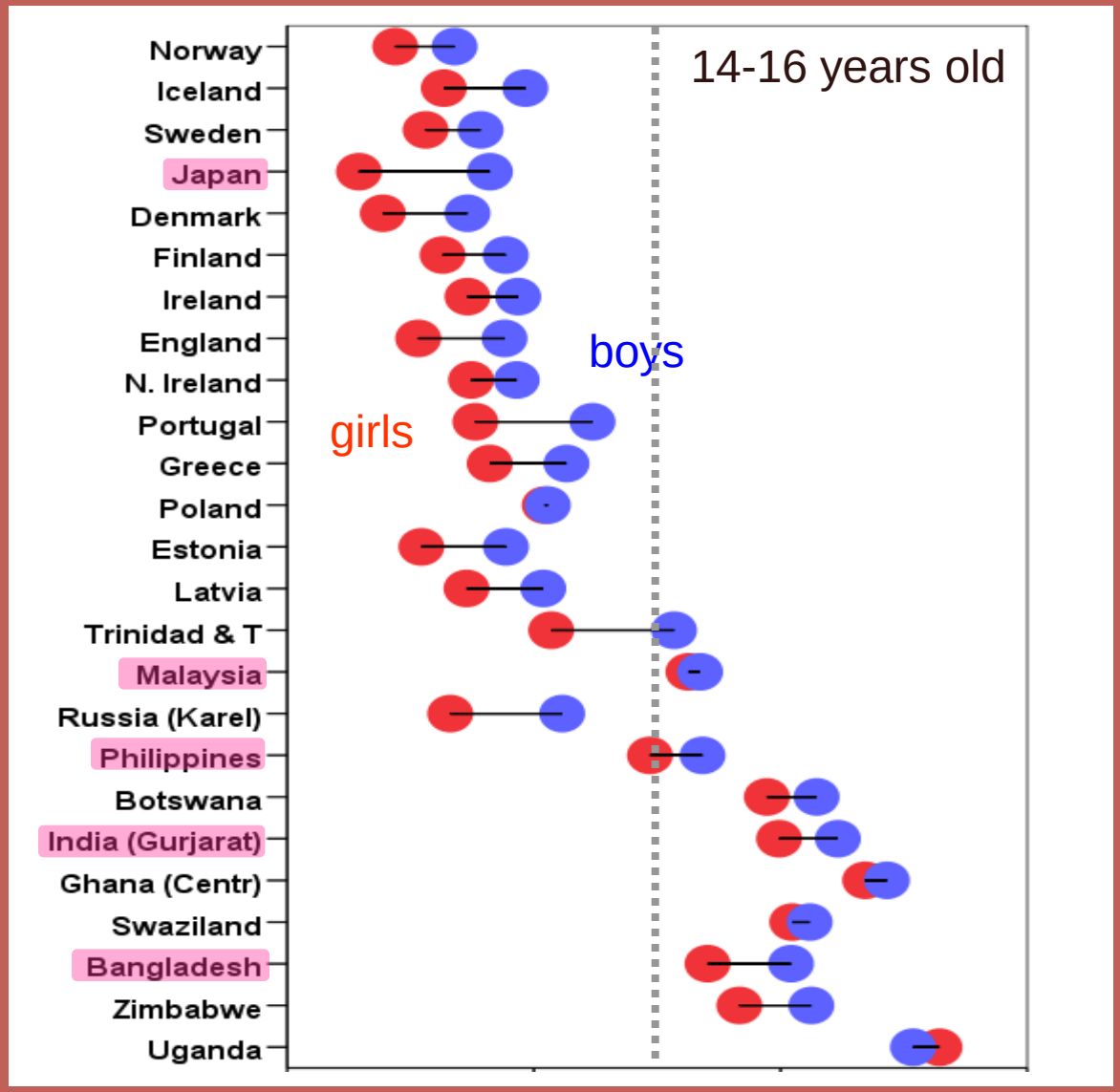
Report by Schreiner & Sjøberg, 2005



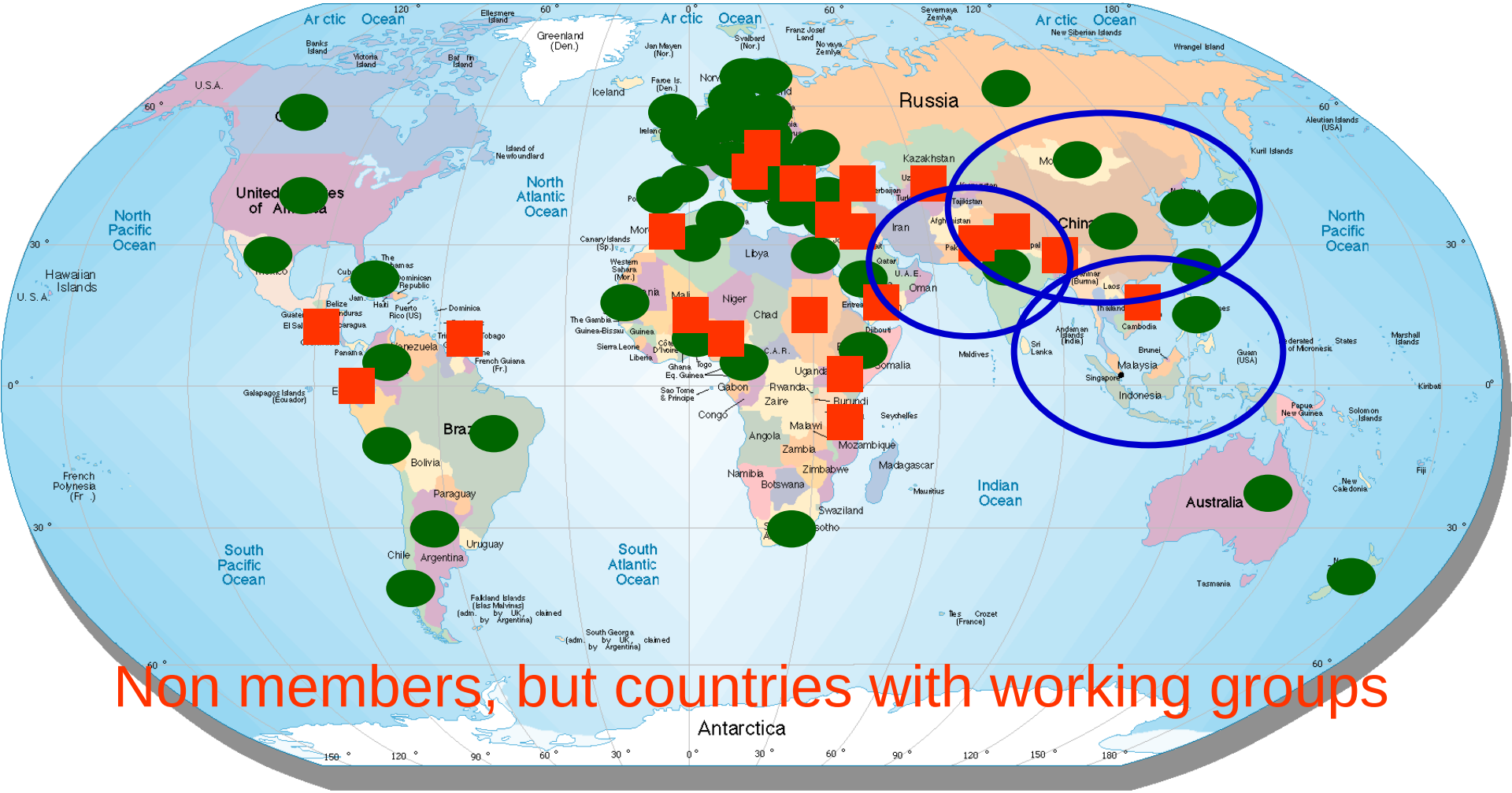

Disagree Neutral Agree

# I would like to become a scientist.

Report by Schreiner & Sjøberg, 2005



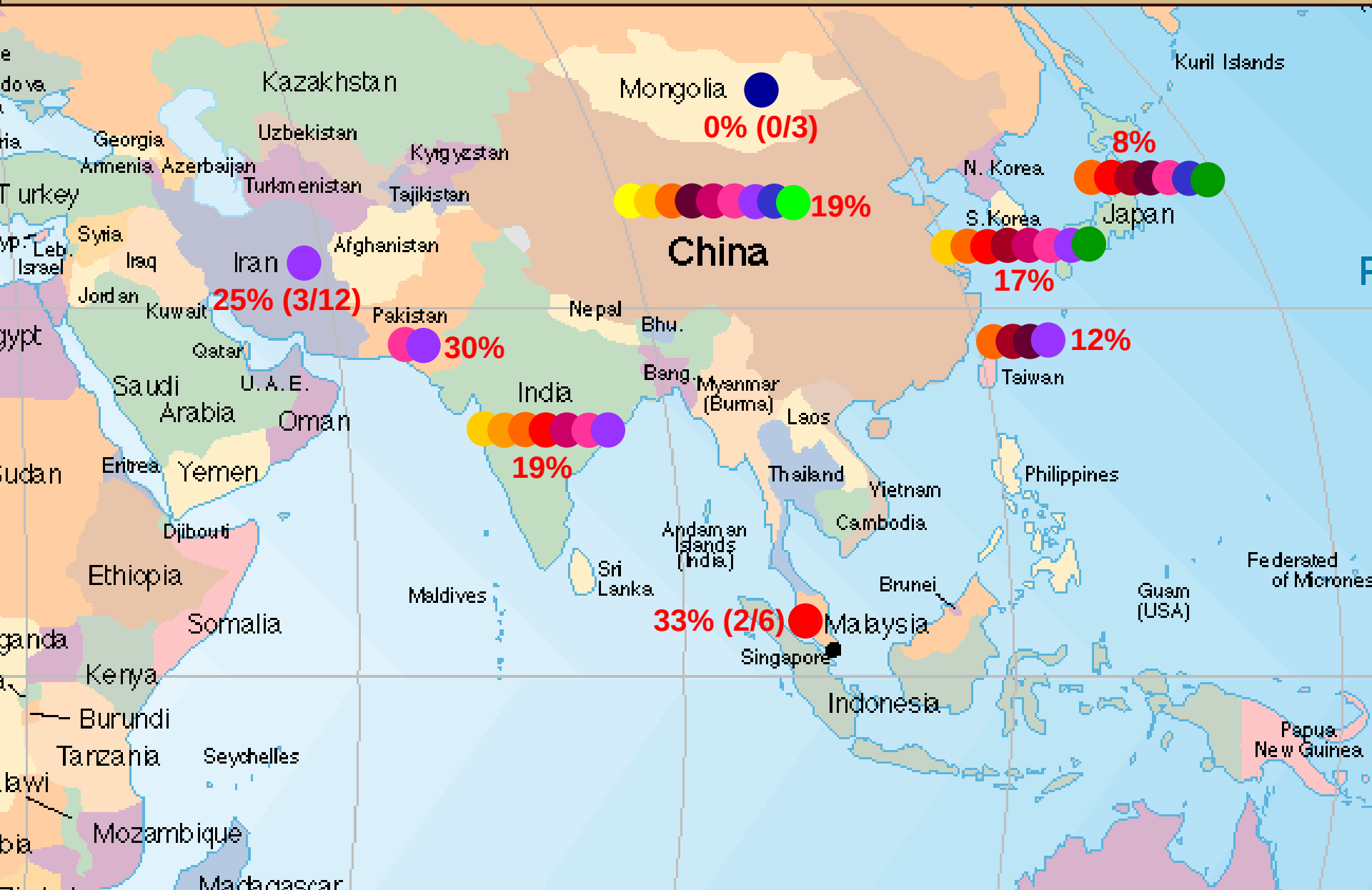
# IUPAP Member Countries



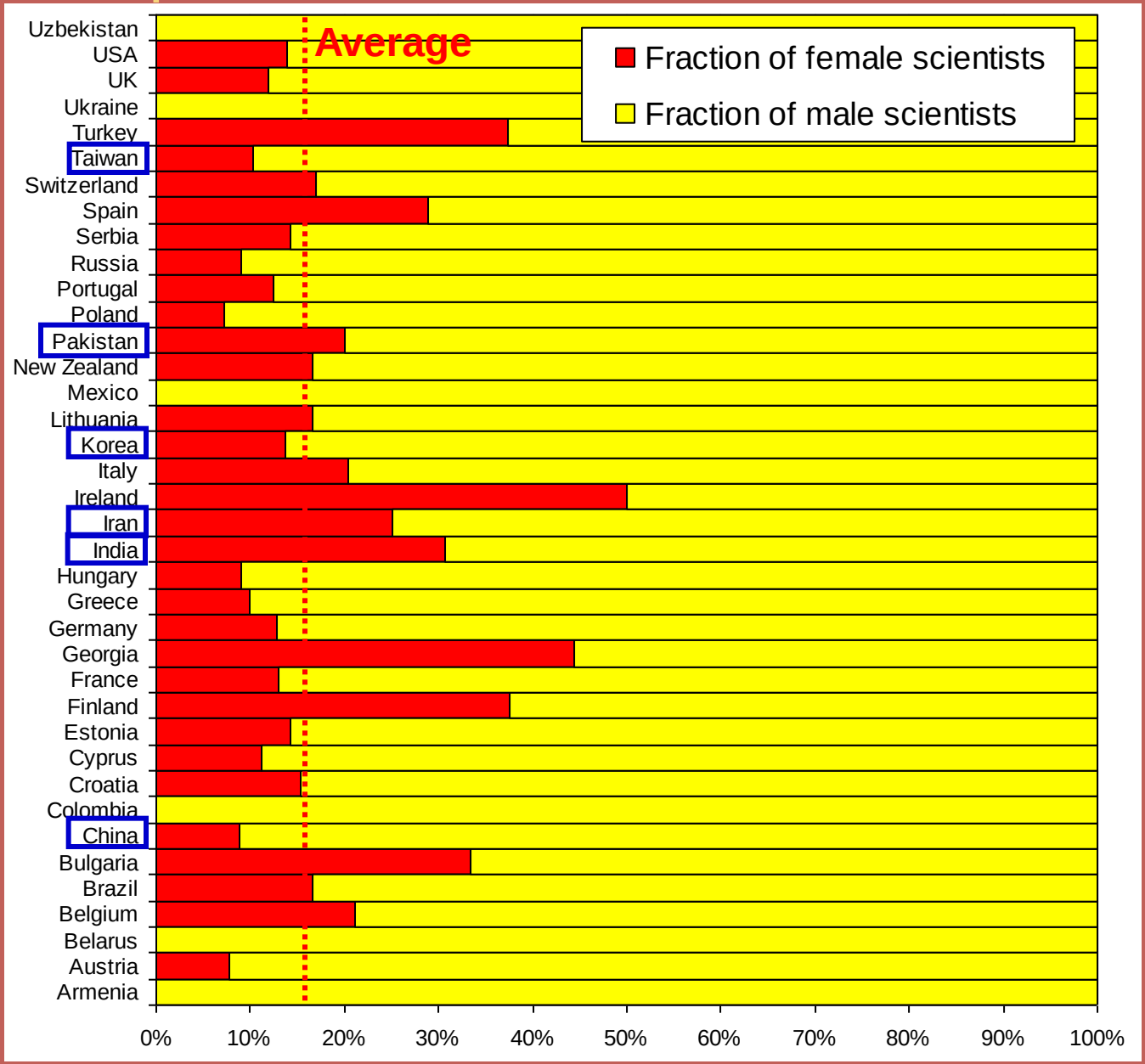

Source: Barbara Sandow

# Collaborating Big Science Projects (East, South, Southeast Asia)

**Particle/Nuclear Experiments (not complete): CLEO, MINOS, NOvA, LHCb, STAR, BaBar, Belle, ZEUS, CDF, ATLAS, DZero, ALICE, CMS, BES, H1, T2K, Daya Bay,**



# CMS Experiment



# Women Physicists in Asia

- 2nd International Conference on Women in Physics
  - May 23-25, 2005 in Rio de Janeiro, Brazil,
  - Only 15 Asian participants from China, India, Japan, and Korea among the 142 participants from 42 countries.
- Network
  - It is evidently necessary to develop and organize an international network, especially within the Asian countries which have similar cultural backgrounds and geographical closeness.

# Asian Networking

- International Workshop on Asian Women in Physics
  - 2005 in Korea


  - Over 40 people from 6 countries and regions attended, presented reports on their current situation and compared regional similarities and differences.

Youngah Park

# Education and Training in Asia

- Huge variations from country to country
  - Government Funding
  - Literacy Rate
  - Classroom Conditions
  - Physicists / Population Ratio
  - Lab Facilities in Universities
    - From “well equipped” to “hopelessly underequipped” / “extremely limited”
- Segregation by gender
  - Most of Asian countries segregate girls and boys for Junior high / High school education.

# 4000 Years of Women in Science

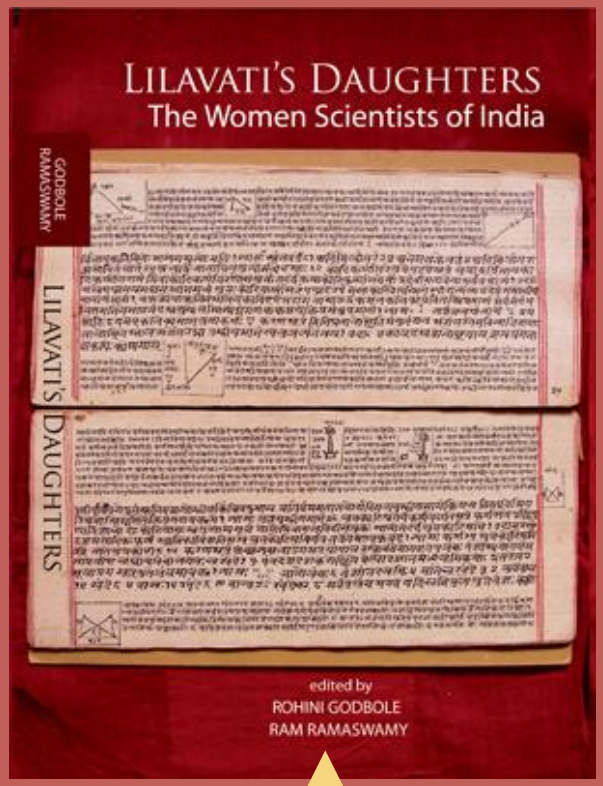
http://www.astr.ua.edu/4000WS/newintro.html

- Definition of Science (before 20th century)
  - Much broader
- Could any woman be a scholar?
  - Access to scholars and information depended on location, birth, and luck, on father, husband, or brother who was willing to share knowledge

# 4000 Years of Women in Science: India

http://www.astr.ua.edu/4000WS/newintro.html

- Gargi
  - natural philosopher (Ancient India)
- Maritrayee
  - natural philosopher (Ancient India)
- Lilavati or Leelavati
  - mathematician (12th century)
  - Daughter of a noted mathematician Bhaskaracharya (1114 – 1185 CE). Bhaskaracharya wrote a book called “Leelavati”. The book was used to teach her algebra.




Essays of a hundred women scientists in India

One of the initiatives of the WiS panel of the Indian Academy of Sciences

Interesting/inspirational for children to learn about Indian women scientists

# 4000 Years of Women in Science: Korea

http://www.astr.ua.edu/4000WS/newintro.html

- Queen Seondeok (632 – 647 CE)
  - Astronomer (c. 630 CE)?
  - Queen Seondeok used her intuition, wits and charm to run the country.

Culture / learning advanced under her leadership. Cheom-seong-dae "star-gazing platform" (one of the oldest surviving observatories in East Asia) constructed under her reign.

# 4000 Years of Women in Science: China

http://www.astr.ua.edu/4000WS/newintro.html

- Si Ling-Chi (2640 BCE) “Lady of the Silk Worm”
  - First empress of China.
  - While sitting in her garden she deduced the secret of silk by watching the silkworms. She developed the process to remove the thread from the cocoon and set up silk cultivation farms and the weaving of the new cloth.
- Shi Dun, Inventor (c. 105)
  - Empress of China
  - Along with a member of her staff – Tsai Lun – developed the first paper from the bark of mulberry trees.

# 4000 Years of Women in Science: China

http://www.astr.ua.edu/4000WS/newintro.html

- Chien-Shiung Wu
  - 1912 – 1997 (born in China)
  - In 1956 – 1957, she and her colleagues conducted an ingenious experiment showing that – at least in the case of radioactive decay – nature knows left from right.
  - Wu's work verified a hypothesis put forth in 1956 by Tsung-Dao Lee and Chen-Ning Yang. In 1957 Lee and Yang received the Nobel Prize.
  - Over her lifetime, Wu's contributions to research brought her many awards.

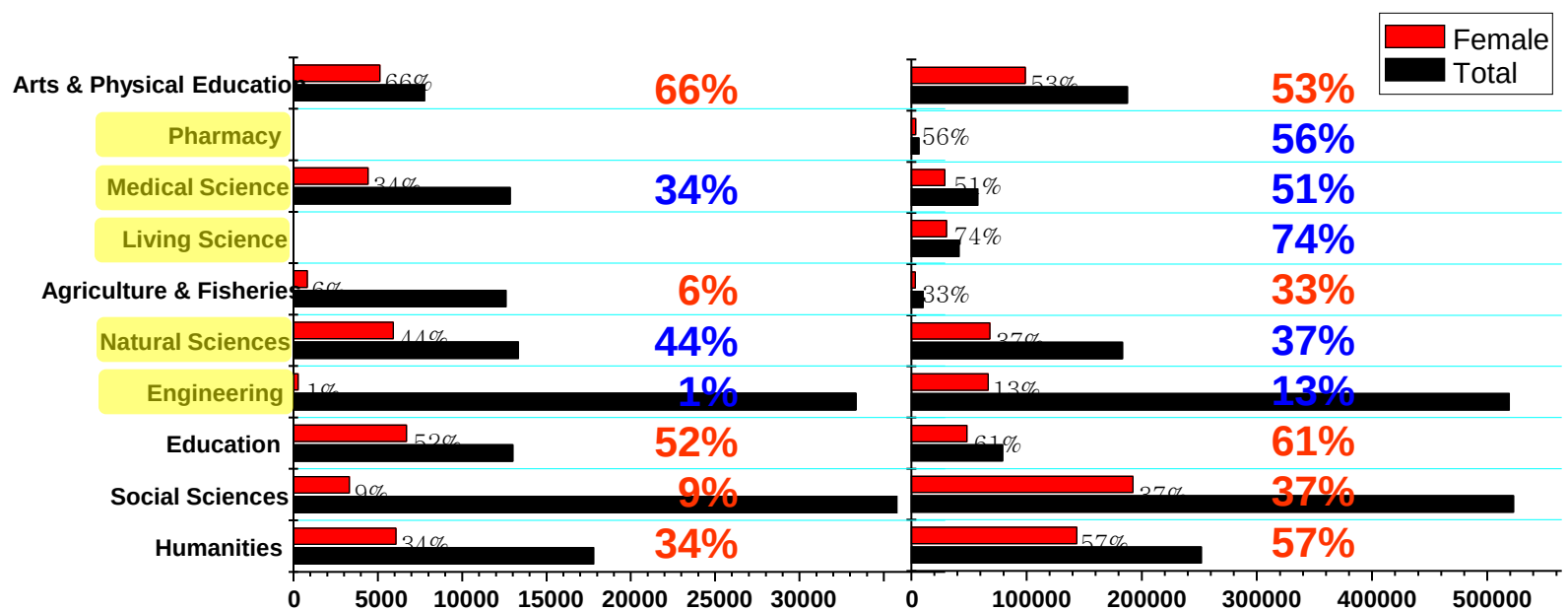
# More Statistics

# Korea

- In the Chosen Dynasty (1392 – 1910), women were expected to give birth to and rear male heirs to assure the continuation of the family line. Women had few opportunities to participate in social, economic, or political life of society.
- Few women received any formal education in traditional Korean society.
- In the late nineteenth century, Christian missionaries established girls' schools, allowing young Korean females to obtain a modern education.
- Women in Physics (South Korea)
  - 1st B.S. – 1951 (Seoul National Univ.)
  - 1st M.S. – 1961 (Purdue Univ.)
  - 1st Ph.D. – 1969 (Lousiana State Univ.)
  - 1st Korean Physical Society member – 1961

# Korea

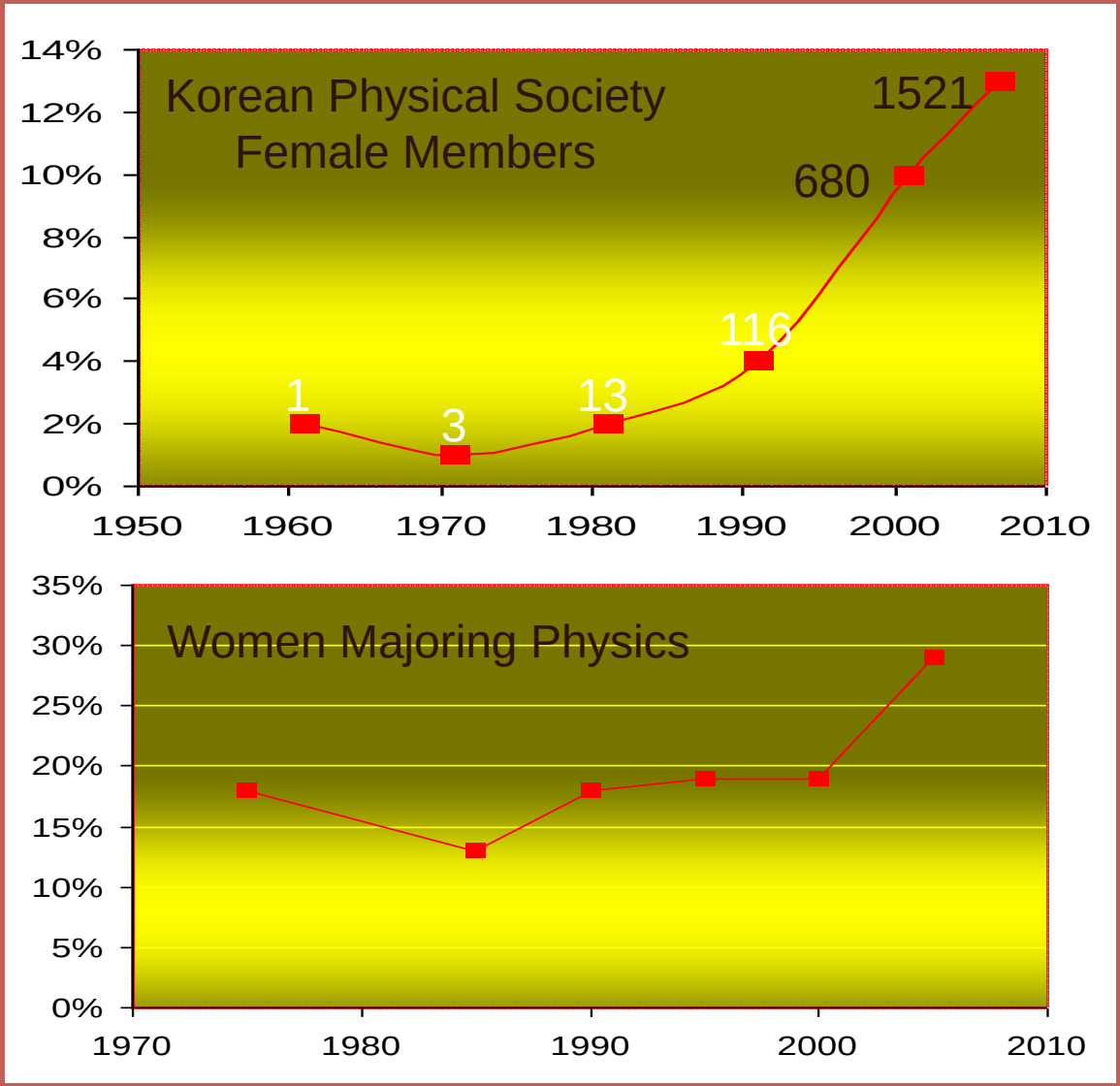
Youngah Park




Undergraduates 1970:140 thousand 2005:1,860 thousand

- Ho-Am Prize (the premier national award)
  - 54 awards given in science, engineering and medicine.
  - 1 given to woman

# Korea




~12,000 KPS members / 49 million = ~2 / 10,000

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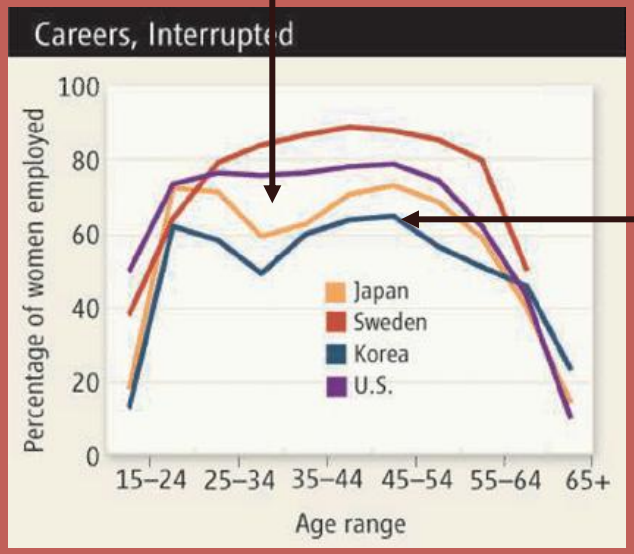
# Japan

- Women in Science
  - Scientific workforce: ~11% in 2004
  - Science and engineering doctoral programs
    - < 15% in 1995
    - 23% in 2004
      - 30% for health and life sciences
      - 20% for physical sciences (smaller in physics)
      - 15% for engineering
  - Associate professorships: ~10% in 2004
    - Future targets
      - 30% for heath and life sciences
      - 20% for physical sciences
      - 15% for engineering

# Japan

- Percentage of women employed
  - Women temporarily step off the career ladder.




Source:
International Labor Organization

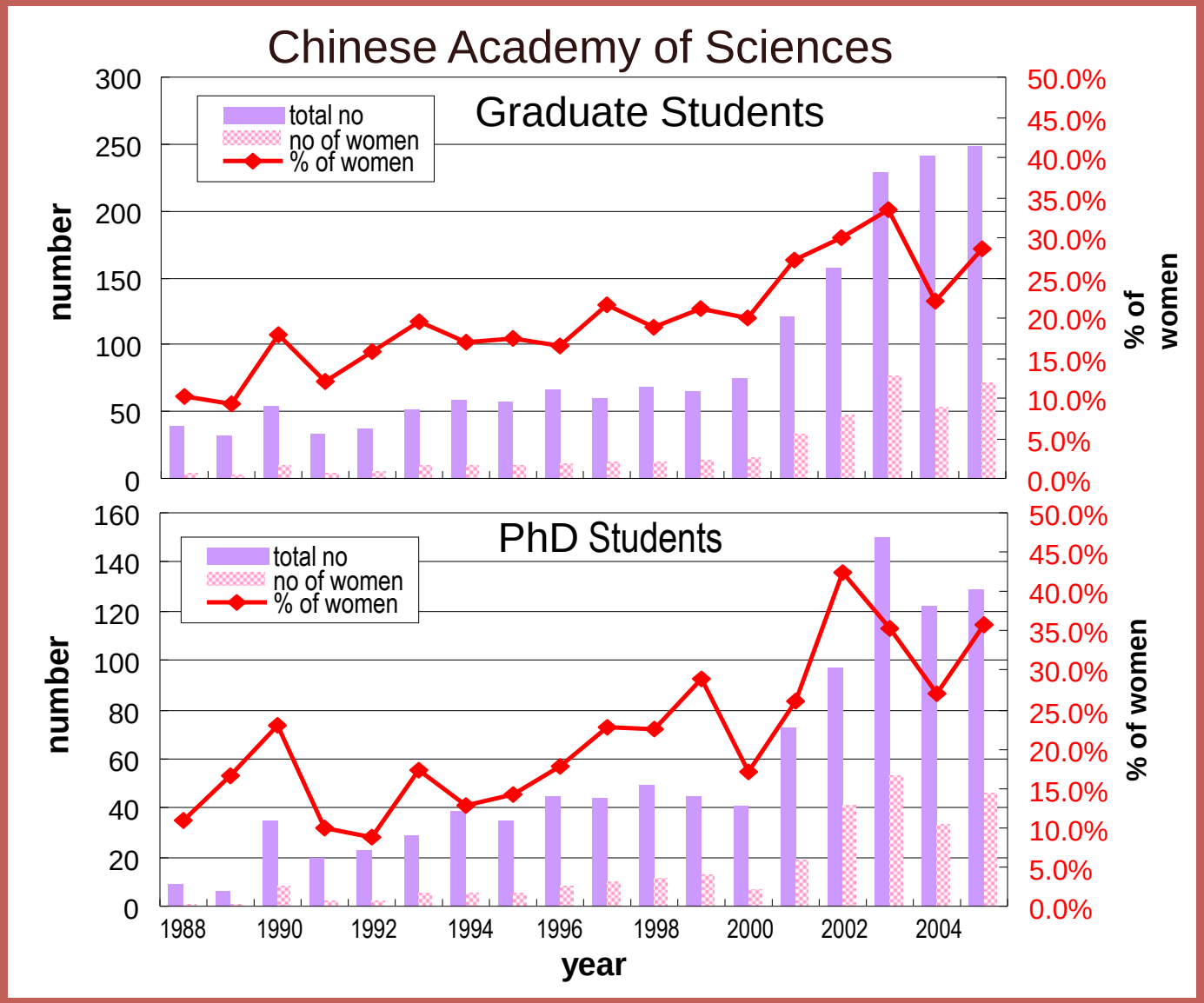
Unknown:
Jobs with less responsibility and fewer chances to advance to leadership positions

  - Returning to the scientific workforce after extended childrearing breaks is extremely difficult in physics.
  - Established grants to help women return to scientific work and balance research careers and family life.

# China: Women Employment (~2000)

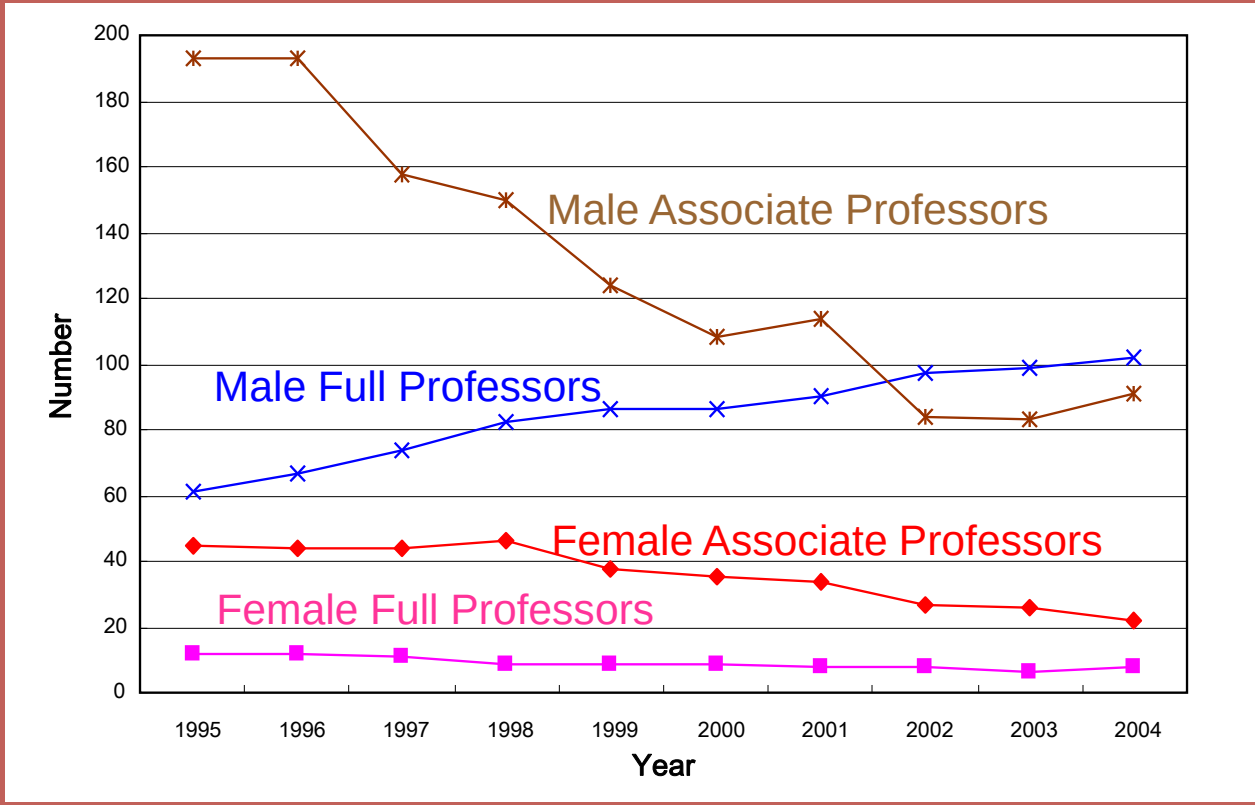
- 2001-2002 Survey
  - Total 730 million employees – 45% women
  - Women employees
    - ~70% are in the 3rd industry (service sector)
    - small fraction in high-tech sectors.
  - Women with BA degrees
    - undergraduate students (41%)
    - employment rate: ~87% that of men
- 2005 Survey
  - Finding research jobs
    - 93.8 % believed they had been discriminated
    - Job stability and high salaries main reasons for choosing science career

# China: Women Students in Physics




Ling-An Wu

# Senior research staff in CAS Institute of Physics



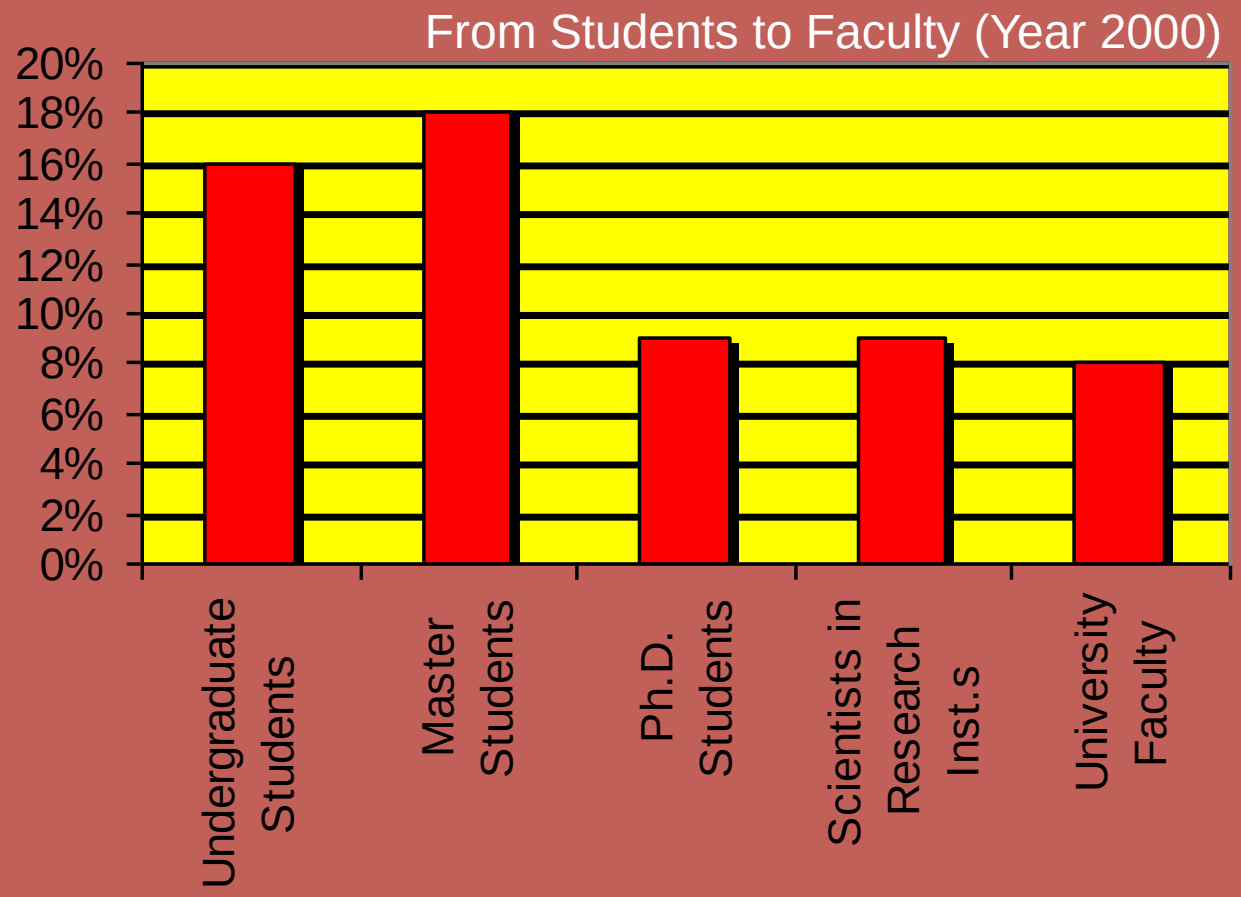

| Institution | Year | Full Prof. | Asso. Prof. | Lecturers |
|---|---|---|---|---|
| Shanghai Jiaotong Univ. | 2001 | 3% (1/35) | 24% (9/37) | 25% (4/16) |
| Shanghai Jiaotong Univ. | 2004 | 8% (3/37) | 20% (7/35) | 43% (7/16) |
| Fudan University | 2004 | 3% (1/30) | 43%(13/30) | 20% (2/10) |

Ling-An Wu

# China: High Ranking Positions

| Positions | Women |
|---|---|
| University Chair Professors | 4% |
| CAS “Hundred Talents Program” | 5% |
| Basic Research Program PIs | 5% |
| High Tech R&D Program PIs | 0% |
| Standing Committee members | 8% |
| Chinese Academy of Sciences | 6% |
| Chinese Academy of Engineering Science | 6% |
| S&T Prize for Young Investigators (over last 7 years) | 7% |
| Top National Award for S&T | 0% |

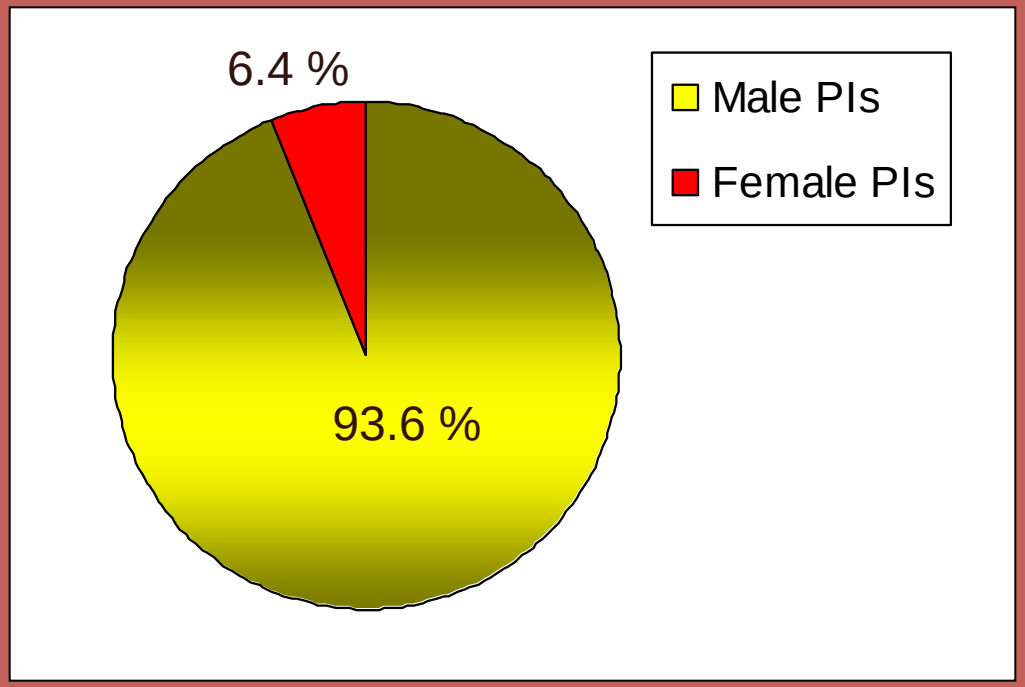
# Taiwan: Women in Physics




Slow but steady growth over last 30 years

Ling-An Wu

# Taiwan: Grants




Success rate: ~74% for Males, ~60% for Females

Ling-An Wu

# The Philippines: Women in Physics

- Physicists and Physics Societies
  - ~80 active physicists (85 million population)
  - 3 major physics societies
    - the Philippines is an archipelago
- Filipino women physicists
  - Do not suffer any discrimination in their careers, but significantly less than male physicists (only 13% of total).
  - Undergraduates: Equal number of males and females
  - Masters: more females than males
  - Ph.D.s: considerably less females than males

Maricor Soriano, 2005

# Malaysia

- Women are generally well respected and given equal chances with men to pursue their careers (government’s policy). Women holding high positions in society is rather common.
- Support for women scientists was given another hefty push in 1999 and the seriousness of the government about women's issues established.
- Malaysia's vision 2020 is to turn the country into a fully industrialized economy. A knowledge-based economy was identified as one of the keys. S&T and R&D are prerequisites for knowledge creation and innovation.
- With this background, the women of Malaysia can and will play an equal role with men to realize the nation's vision.

Khalijah Mohd Salleh, Azni Zain Ahmed, Samirah Abdul Rahman

# India

“As in most countries, the percentage of women in physics and other sciences in India is low; however, the nature of the problem may be somewhat different in India than in many Western countries.

For example, there does not seem to be a general perception that women lack the intellectual skills required for a career in physics; instead, the problems seem to arise more from societal perceptions of appropriate roles for women.”

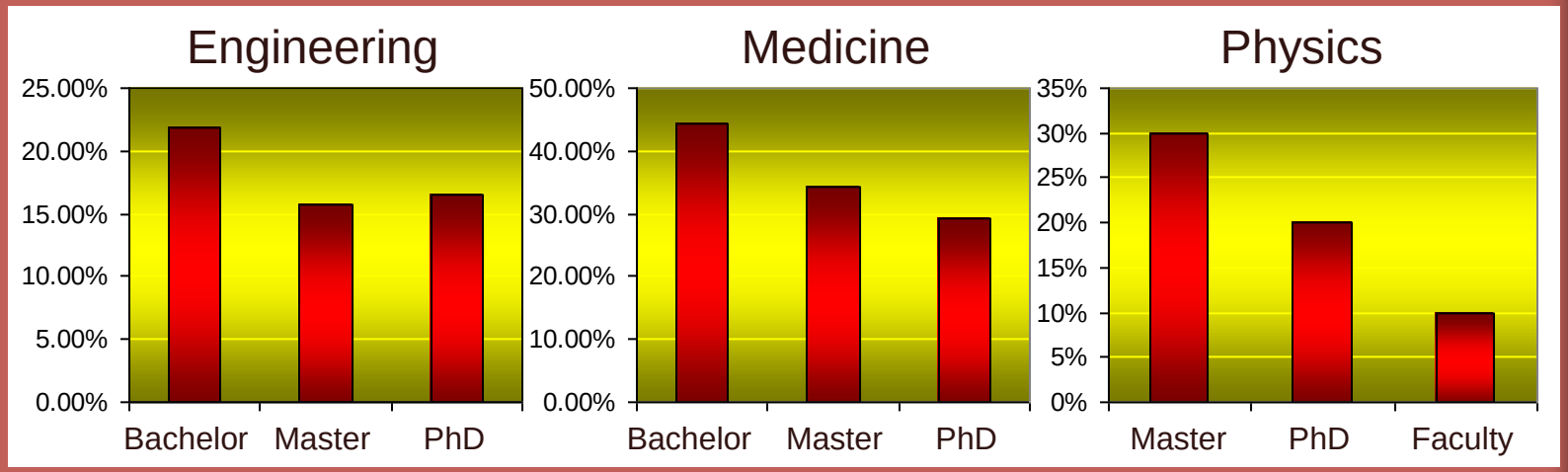
Rohini Godbole, Neelima Gupte, Pratibha Jolly, Shobhana Narasimhan, and Sumathi Rao

# India

- Enrollment of women in universities
  - 1950-1951: 10.9%
  - 2000-2001: 39.4%

(>1/3 science students are women)

2000-2001 Survey




Rohini Godbole, Neelima Gupte, Pratibha Jolly, Shobhana Narasimhan, and Sumathi Rao

# India: Women in Physics

- What causes this precipitous drop in physics?
  - Probable great factors
    - Increased responsibilities due to marriage and motherhood
    - Possible biases in faculty level hiring
- Other issues
  - The Bhatnagar Award (the premier national science award) has never gone to a woman physicist.
  - Almost no women physicists are lab directors or members of grant-awarding committees
  - Most of women in physics come from urban backgrounds, nor rural areas.

Rohini Godbole, Neelima Gupte, Pratibha Jolly, Shobhana Narasimhan, and Sumathi Rao

# Pakistan

- ~150 million people (99% Muslims and 1% Christians)
- Language for higher education is English – issue

- Issues towards women's higher education
  - Early marriage, subsequent family responsibilities, lack of support from the family elders and husband for higher education.

- Parents prefer their daughters to adopt either medicine or teaching professions
  - The society accepts these as relevant women professions and they offer part-time job opportunities.
  - Women students favor medicine and teaching jobs.
  - Many women today are attracted by business administration and information technology – better rewards

Asghari Maqsood, Aziz Fatima Hasnain, Khalid Rashid, ICWIP 2002
Aziz Fatima Hasnain, Jabeen Islam, ICWIP 2008

# Pakistan

| | Students (thousands) | | | Teachers (thousands) | | |
|---|---|---|---|---|---|---|
| Level | Male | Female | F (%) | Male | Female | F (%) |
| Primary (I-V) | 11,721 | 8,679 | 43% | 236 | 138 | 37% |
| Middle (VI-VIII) | 2,762 | 1,882 | 41% | 46 | 50 | 52% |
| High School | 1,157 | 775 | 40% | 144 | 80 | 36% |
| College | 420 | 372 | 47% | 17 | 10 | 37% |
| University | 87 | 27 | 24% | 4.7 | 1.2 | 20% |

Women in Physics

| Institution | Ph.D.s | Faculty |
|---|---|---|
| Quaid-IAzam University | 13 / 69 (23%)<br>from 1967 to 2001 | 3 / 16 (19%)<br>1 Dept. Chair |
| Karachi University | | 2 |
| Punjab University | | 1 |
| Other state universities | | 0 |

Asghari Maqsood, Fatima Hasnain, Khalid Rashid

Quaid-IAzam Univ. 2009 Grad. Physics Class: 18 females / 35 total

# Iran

- ~1.7 million university students (population 60 million)
  - Percentage comparable to developed countries
  - “Number of young women earning university degrees, including degrees in mathematics and science, is high”
- # of physicists with doctorate degrees in all of Iran ~350.
  - Heavy teaching loads make it difficult for university professors to pursue vigorous research. Equipment is often inadequate for state-of-the art research. Strong activities in condensed matter physics, string theory, …
  - Women are not absent from university teaching positions. The head of Physics Dept. at Sharif Univ. is a women.
- The first IUPAP prize in 2008
  - Young physicists in particle physics
  - gone to Yasaman Farzan (Theorist).

# New Initiatives

# Physics Camp for High School Girls

- To bring the excitement of physics to girls at an early stage
  - Korea: launched in 2002

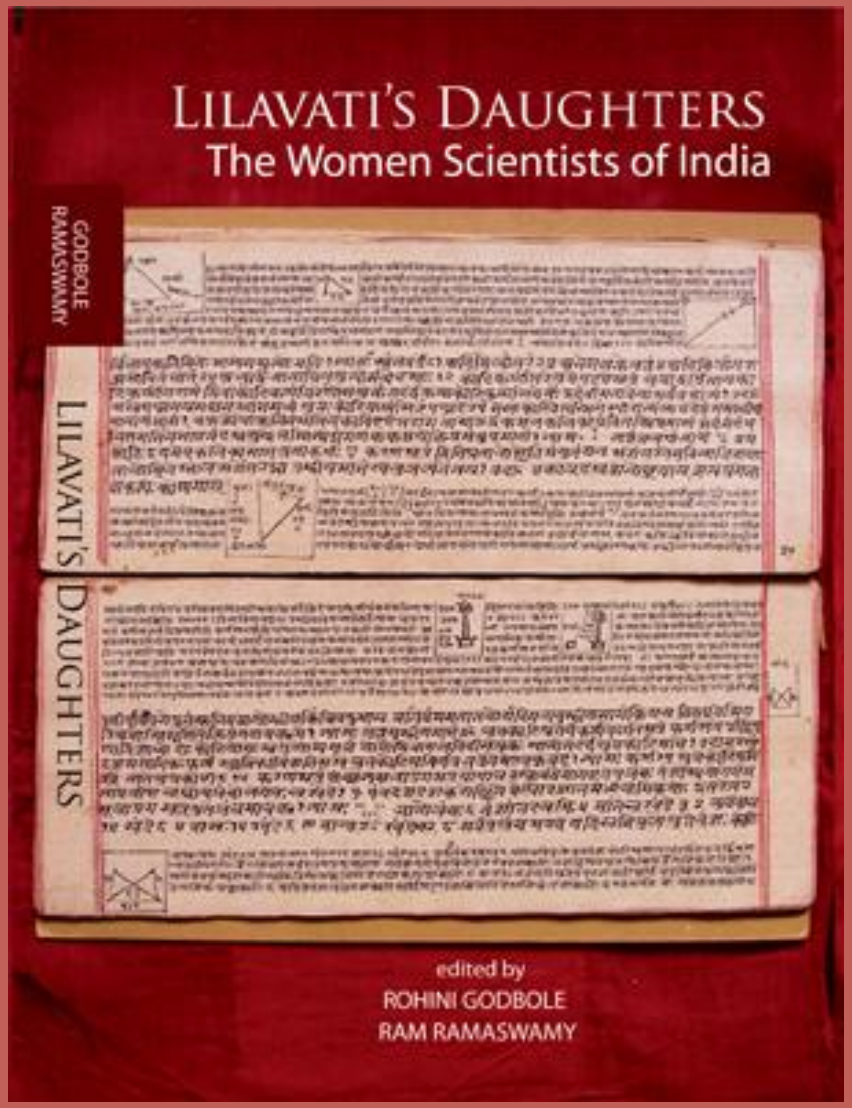

  - Japan: launched in 2005

Youngah Park, Atsutaka Maeda, Setsuko Tajima

# Awards and other programs to promote Women Physicists

- Awards, Prizes, ….
  - China: Xie Xi-De Prize established in 2007
  - Korea: Awards for Master / Ph.D. students established in 2006
  - Japan: Postdoctoral fellowship program restarted in 2006
  - Japan: Women researchers support model nurturing program established in 2006.
- Childcare support system
  - Some countries – in progress
  - A lot more could be done.
- Workshops / seminars organized
  - Women in Physics or Women in Science and Technology
- Data about “Women in Physics”
  - Many countries continue to collect data

# India




Essays of a hundred women scientists in India

One of the initiatives of WiP panel of the Indian Academy of Sciences

Interesting/inspirational for children to learn about Indian women scientists

# China


2005 WYP Poster #27 honoring Women in Physics in China

# Korea

- Published a book with stories of present Korean Women Scientists

# Closing Remarks

- Education and Training (beyond gender issue)
  - Huge variations from country to country
    - Literacy rate, classroom conditions, lab facilities in universities, access to scientific information
  - Segregation by gender for high school education is common.
- Women holding high positions in society is rather common.
  - There does not seem to be a general perception that women lack the intellectual skills required for a career in physics
  - Instead, the problems seem to arise more from societal perceptions of appropriate roles for women.

# Closing Remarks (cont.)

- There has been an increasing awareness that the shortage of women physicists (and scientists) need amelioration.
- In many Asian countries, up to the master / Ph.D. degree, the percentage of women seems even larger than many Western countries. However, there is a precipitous drop at the post-doctoral level and beyond, largely due to societal pressure to give up their careers for marriage and motherhood (discrimination in hiring can not be ruled out).
  - Need to develop schemes to help women balance research careers and family life.
- High-profile initiatives in some countries have begun to address this issue. While it is too early to judge how much of an impact these initiatives will have, it is an encouraging sign that the issue of women in physics is, at the very least, receiving notice.

# Closing Remarks (cont.)

- Networking could play an important role in improving the "women in physics" situation.
  - Recommended by ICWIP and WGWIP
  - There exist many "women in physics" organizations / groups / activities (world-wide and local). Connection/communication among them could be improved significantly.
  - This became the primary discussion item
    - Barbara Sandow's visit to Fermilab on Feb. 17th, 2009
    - Round-table discussion with women physicists from Argonne lab, Fermilab, Fermilab users (university community).

    Led to set-up a website at Fermilab.

# Closing Remarks (cont.)

- Website to support “women in physics” networking
  - http://www.fnal.gov/diversity/women_in_physics/
  - A resource to connect women in physics
    - Advocacy Efforts
    - Resources / Statistics
    - Laboratory / University Programs
    - Youth Education
    - Women Physicists – Image Bank

    across the globe

- Just beginning and much more information to be added (please contact ykkim@fnal.gov) for suggestions/comments/additional information.

Asian women are moving ahead!