Women Physicists in Asia

Young-Kee Kim
Fermilab and the University of Chicago

Around the World in 180 Minutes:
Differences and Similarities among Women Physicists
APS Meeting, March 17, 2009
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
East Asia (1.56B)
Southeast Asia (0.58B)
Central Asia (0.06B)
North Asia (0.14B)
North Asia (0.14B)
West Asia (0.21B)
Arab World
South Asia (1.62B)
Southeast Asia (0.58B)

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.
Differences from country to country are significant.
Working with something I find important and meaningful.
Report by Schreiner & Sjøberg, 2005

boys

14-16 years old

Norway
Iceland
Sweden
Japan
Denmark
Finland
Ireland
England
N. Ireland
Portugal
Greece
Poland
Estonia
Latvia
Trinidad & T
Malaysia
Russia (Karei)
Philippines
Botswana
India (Gurjarat)
Ghana (Centr)
Swaziland
Bangladesh
Zimbabwe
Uganda

Disagree Neutral Agree
I would like to become a scientist.

Report by Schreiner & Sjøberg, 2005

14-16 years old

Disagree Neutral Agree
IUPAP Member Countries

Non members, but countries with working groups

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,
Women Physicists in Asia

2\textsuperscript{nd} 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.

Youngah Park
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.
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
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.

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.
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
### Undergraduates

<table>
<thead>
<tr>
<th>Field</th>
<th>1970</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture &amp; Fisheries</td>
<td>140 thousand</td>
<td>1,860 thousand</td>
</tr>
<tr>
<td>Arts &amp; Physical Education</td>
<td>66%</td>
<td>53%</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>61%</td>
<td>56%</td>
</tr>
<tr>
<td>Medical Science</td>
<td>34%</td>
<td>51%</td>
</tr>
<tr>
<td>Living Science</td>
<td>74%</td>
<td>74%</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>9%</td>
<td>37%</td>
</tr>
<tr>
<td>Humanities</td>
<td>34%</td>
<td>57%</td>
</tr>
<tr>
<td>Education</td>
<td>52%</td>
<td>61%</td>
</tr>
<tr>
<td>Natural Sciences</td>
<td>44%</td>
<td>37%</td>
</tr>
<tr>
<td>Engineering</td>
<td>1%</td>
<td>13%</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>56%</td>
<td>56%</td>
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</tr>
</tbody>
</table>

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

Korean Physical Society Female Members

Women Majoring Physics

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

Youngah Park
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 health 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.

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

Chinese Academy of Sciences

Graduate Students

PhD Students

Ling-An Wu
## Senior research staff in CAS Institute of Physics

<table>
<thead>
<tr>
<th>Institution</th>
<th>Year</th>
<th>Full Prof.</th>
<th>Asso. Prof.</th>
<th>Lecturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shanghai Jiaotong Univ.</td>
<td>2001</td>
<td>3% (1/35)</td>
<td>24% (9/37)</td>
<td>25% (4/16)</td>
</tr>
<tr>
<td>Shanghai Jiaotong Univ.</td>
<td>2004</td>
<td>8% (3/37)</td>
<td>20% (7/35)</td>
<td>43% (7/16)</td>
</tr>
<tr>
<td>Fudan University</td>
<td>2004</td>
<td>3% (1/30)</td>
<td>43% (13/30)</td>
<td>20% (2/10)</td>
</tr>
</tbody>
</table>

![Graph showing the number of male and female full professors, associate professors, and lecturers from 1995 to 2004.](image)

Ling-An Wu
# China: High Ranking Positions

<table>
<thead>
<tr>
<th>Positions</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Chair Professors</td>
<td>4%</td>
</tr>
<tr>
<td>CAS “Hundred Talents Program”</td>
<td>5%</td>
</tr>
<tr>
<td>Basic Research Program PIs</td>
<td>5%</td>
</tr>
<tr>
<td>High Tech R&amp;D Program PIs</td>
<td>0%</td>
</tr>
<tr>
<td>Standing Committee members</td>
<td>8%</td>
</tr>
<tr>
<td>Chinese Academy of Sciences</td>
<td>6%</td>
</tr>
<tr>
<td>Chinese Academy of Engineering Science</td>
<td>6%</td>
</tr>
<tr>
<td>S&amp;T Prize for Young Investigators (over last 7 years)</td>
<td>7%</td>
</tr>
<tr>
<td>Top National Award for S&amp;T</td>
<td>0%</td>
</tr>
</tbody>
</table>
Taiwan: Women in Physics

From Students to Faculty (Year 2000)

Slow but steady growth over last 30 years

Ling-An Wu
Success rate: ~74% for Males, ~60% for Females
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
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
“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)

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

<table>
<thead>
<tr>
<th>Level</th>
<th>Students (thousands)</th>
<th>Teachers (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Primary (I-V)</td>
<td>11,721</td>
<td>8,679</td>
</tr>
<tr>
<td>Middle (VI-VIII)</td>
<td>2,762</td>
<td>1,882</td>
</tr>
<tr>
<td>High School</td>
<td>1,157</td>
<td>775</td>
</tr>
<tr>
<td>College</td>
<td>420</td>
<td>372</td>
</tr>
<tr>
<td>University</td>
<td>87</td>
<td>27</td>
</tr>
</tbody>
</table>

Women in Physics

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

Asghari Maqsood, Fatima Hasnain, Khalid Rashid

Quaid-I Azam 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
2005 WYP Poster #27 honoring Women in Physics in China
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.
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.
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 Sadow’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.
Website to support “women in physics” networking

- 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!