

## **Women in Science**

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*Women have always been of critical importance in economic development despite studies indicating disparities in access to opportunities in science and other fields. They have been involved in diverse fields and industries such as business ventures, electronic products, textiles and garments, canned food, jewelry and footwear. They have also ventured into science and technology fields by becoming engineers and research scientists. Women also have a substantial role in agriculture and its numerous aspects like plant production, protection and soil science. Despite their extensive involvement in economic growth, women do not share in equitable terms with regards to ranks, positions and prestige in various activities relating to such. Since global competitiveness is dependent on a strong technological workforce and an environment that nurtures both men and women to contribute to new breakthroughs in policy reforms, products, facilities and services, there is a continuing need to assess the changes that are taking place at the national and regional levels.*

### **Introduction**

Women fulfill a pivotal role in economic development. In Asia, in particular, they actively participate in the informal and formal sectors of the economy and in goods and services that are produced for domestic and international markets. Their work as teachers, nurses, caregivers, entrepreneurs, homemakers, technicians, scientists among others are often characterized by perseverance and dedication, which more often than not are taken for granted.

With the advent of globalization, it is important to assess the role of men and women in contributing to the growth of societies. In addition, it is also necessary to address the imbalances in the allocation of resources, and the problems of access to opportunities by women in the different endeavors.

In the recently concluded Asia Pacific Economic Cooperation (APEC) Ministerial Meeting held in Manila from 15-16 October 1998, the participating Ministers issued a landmark Joint Ministerial Statement encompassing the concerns for gender under the theme "Women in Economic Development and Cooperation in APEC" and with sub-themes: "Women and Human Resources Development," "Women in Small and Medium Enterprises," and "Women in Industrial Science and Technology."

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Highlighting on the last mentioned sub-theme, the Ministers asserted: "In the light of new global, knowledge-based economy, competitive advantage requires a highly skilled and diversified workforce that will increase productivity and fuel innovation. Economies need the talent of their entire population, male and female, to create a leading edge workforce. This will be achieved through policies that place greater emphasis on science and technology education and training for skills upgrading and re-skilling. It further implies the full utilization of women's talent and competence in these fields." The Ministers further commended the APEC's Ministers of Science who in the Conference on Regional Science and Technology Cooperation held in 1996 "recognized the importance of removing barriers and promoting the full contribution of women to science and technology" and strengthen the exchange of scientific and technical men and women across the region.

Many studies indicate that the disparities in access to opportunities of women in science and other fields are also endemic in other countries. It is therefore significant that this Conference incorporated gender concerns and issues that enabled the Ministers to examine closely selected issues which will address the problem of imbalance and lack of access to employment, technologies, recognition, incentives and other important aspects related to gender.

### **Women in Diverse Fields**

In China, women accounted for one quarter of all business initiatives from 1978 to 1996. Thirty-four (34) percent of self-employed workers in Thailand are women; in 1994 the Philippines, 48 percent. Twenty-one (21) percent or 894 of research scientists and engineers out of 3,435 in Singapore are employed in private companies, higher education, government and public research institutes (Approtech Asia and Wise, 1992). Again in Thailand, women comprise between 75 to 85 percent of employment in five leading industries: electronic products, textiles and garments, canned food, jewelry, and footwear. In many export processing zones of industrializing countries where most of the work is labor intensive, low cost manufacturing, 80 percent of the workforce are female (APEC Ministerial Meeting 1998a).

In Canada (1996) women-led firms were creating jobs at four times the domestic average. Women were starting new businesses at double the rate of men in Australia while in the United States, employment by women-owned firms rose by more than 100 percent between 1987 and 1992. In Cebu, Philippines, it is estimated that informal firms contributed \$200 million of the province's \$700 million exports (1991) (APEC Ministerial Meeting 1998b). Nevertheless, more women can participate in big and significant business enterprises if there are more women in the science and engineering fields.

To further enhance the optimization of women human capital, it is essential that support be extended to programs and policies which will entice women to pursue science and engineering; thus providing the building blocks for a more proactive role in design engineering, biotechnology, information technology, materials science, environment science and related disciplines. Innovations in products, inventions, facilities and services encourage competition and entry into the global market. Without the necessary technical skills and expertise, creativity will be minimal.

Developing countries through wise policies encourage their people to pursue careers in science and technology. This includes a framework for education that gives premium to technical, scientific and professional pursuits for men and women. Women are rich reservoir of untapped potential who can meet the needs for skills and expertise in industrial projects. And yet data will show the doors are not completely open for all qualified women and the "glass ceiling" inhibits women from reaching many high positions in various enterprises, academic institutions and other undertakings.

### **Women in the Science and Technology (S & T) Fields**

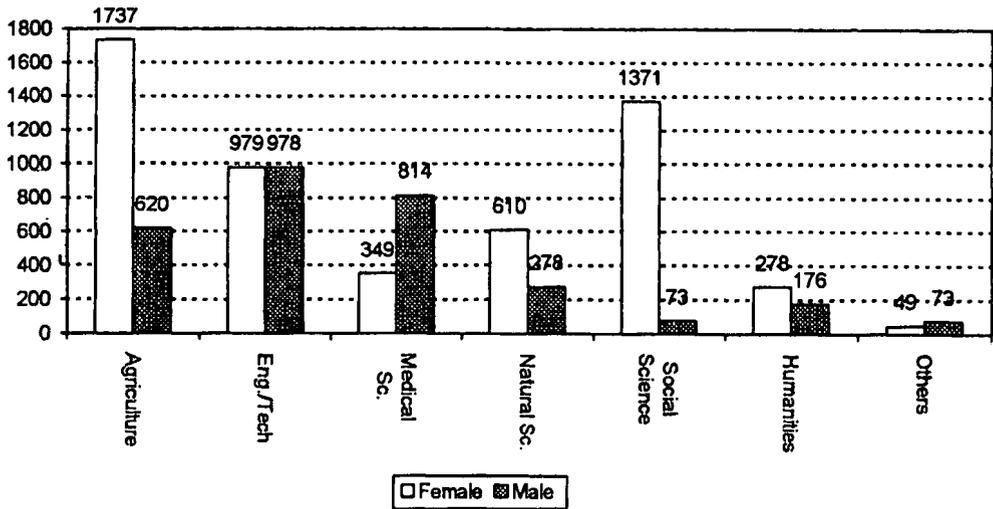
How far have women ventured in the engineering fields? In China, 18.57 percent female engineers work in government institutions (1988 data, Approtech Asia and Wise, 1992). In the National Research Council of the Philippines, 32 percent (57) of the members are women engineers. The female research scientists and engineers in Singapore who work in private companies, higher education, government, and public research institutes comprise 21 percent (894).

In the Philippines, 979 women out of 9,960 scientists and engineers are in the fields of engineering. Figure 1 shows that there are more females in the fields of agricultural science, natural science, social science, and humanities while males exceed the number of females in medical science and other fields. Males and females are about equal in number in engineering and technology (DOST 1993).

By sectors of performance, higher education employs the biggest number of research and development (R & D) personnel followed by government, private sector and, lastly, by nongovernment organizations (NGOs).

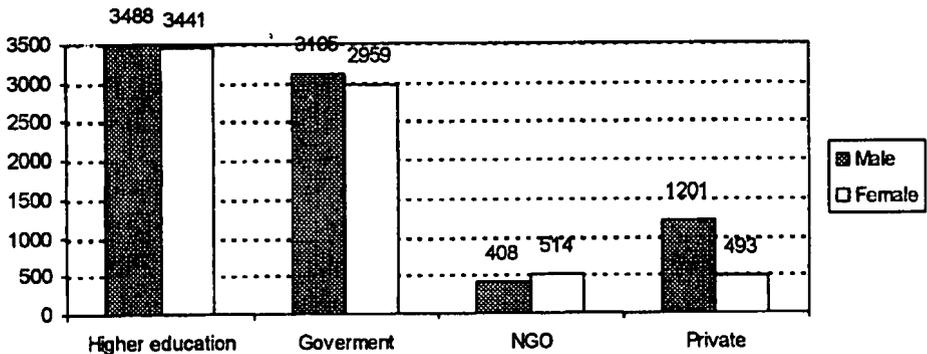
Only the NGO sector has more female R & D workers. In the other three sectors there is a bigger number of male than female R & D personnel but it is in the private industry that male R & D personnel are more than twice the female R & D workers.

**Figure 1. Science and Engineers by Field of Specialization**



Source: DOST 1993.

**Figure 2. National R & D Personnel by Sector of Performance**

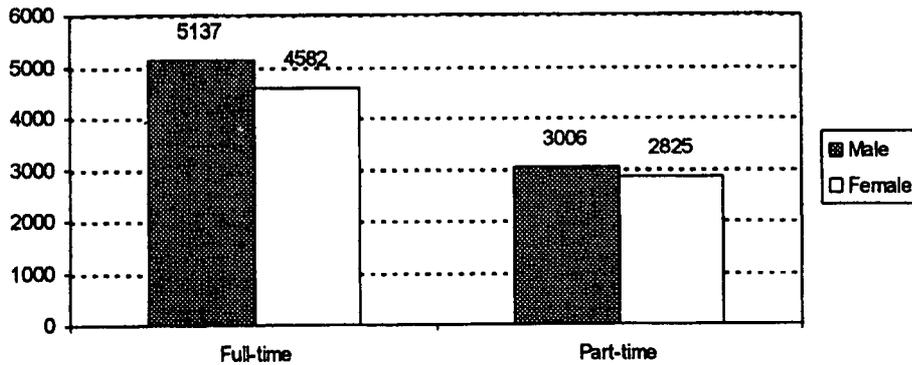


Source: DOST 1993.

Based on a NSSTA survey undertaken in 1993 in the Philippines the national R & D personnel is comprised of 53 percent male and 47 percent female personnel.

By type of involvement, there are more male personnel who are involved in both full-time and part-time work.

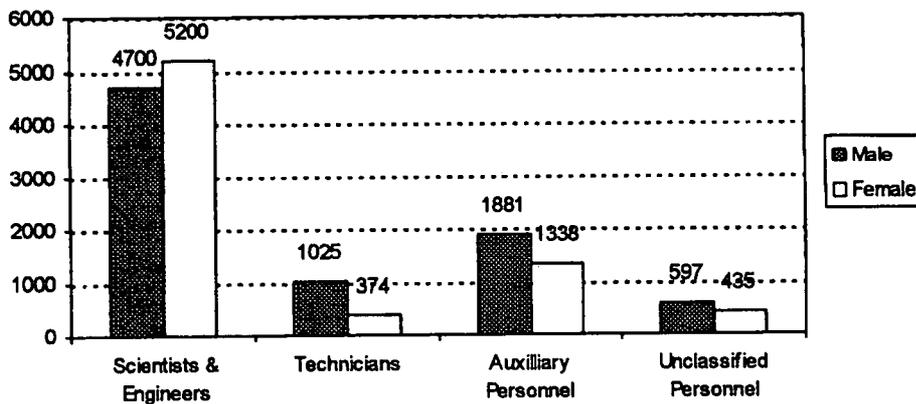
**Figure 3. National R & D Personnel by Type of Involvement**



Source: DOST 1993.

By category of personnel, a large percentage of the R & D personnel are scientists and engineers. In this category, more than half (53%) are females. However, a substantial number of women hold various positions in research institutions and in the academe.

**Figure 4. National R & D Personnel by Category of Personnel**



Source: DOST 1993.

For the rest of the categories, males outnumber females.

The data on women science and engineering in the U.S. are systematically organized and well presented in a report of the National Science Foundation (NSF) published in 1996. As far as levels of education is concerned 521 or 9.1 percent women in the United States acquired their doctorates in science and engineering while 1,305 or 37.1 percent finished their doctorates in social sciences (1993). In science and engineering fields, both number of women earning master's degree and their percentage of the total have risen steadily, increasing in the last ten years to 30,971 (36% of degrees awarded). In contrast, the number of science and engineering degree awards to men reached a high in 1977, then bottomed out in 1981; in 1990, the number climbed above the 1977 level and has continued upward since.

Women's master's awards varied by field. In the science fields, excluding engineering, women steadily increased their share. By 1993, women accounted for 39 percent of science master's degrees, up from 36 percent a decade earlier. Among the science fields, women were most heavily represented in psychology, earning almost 72 percent of the master's degree in 1993, up from 61.5 percent in 1983; biological/agricultural sciences (46% in 1993, 38% in 1983) and social sciences (almost 47% in 1993). Men were most over-represented in earth, atmospheric, and ocean sciences (72%) and the physical sciences (70%).

Women continue to be seriously underrepresented among engineering degrees. Their percentage of master's degree overall did increase, however, from nine percent in 1983 to 15 percent in 1993.

In terms of employment in the academe in the U.S. women faculty as a whole are less likely than men to be science and engineering faculty. Forty-four (44) percent of women are in nonscience engineering fields and only 24 percent are in science and engineering. These include physical science, psychology, mathematics and only six percent of the women are in the engineering faculty. As regards involvement in research women are less likely than men to be engaged in funded research, or to be principal investigator or to have published articles. Women are less likely to reach the highest academic ranks or to be tenured than men. They are less likely than men to be full professors and more likely than men to be assistant professors and instructors. Part of this difference in rank can be explained by age differences, but differences in rank remain after controlling for age. Among those who received their doctorates thirteen or more years ago, 72 percent of men are full professors.

Thus, while there is a positive trend towards women pursuing engineering careers, nevertheless, compared with other disciplines, engineering is still a male dominated profession in the United States.

This seems to imply that in industrial innovations, relatively fewer women can be involved. Significant steps must be initiated to mainstream women in engineering in the developed and the developing countries.

### Women in Agriculture: Philippines

In the agricultural sector in the Philippines, the National Agricultural System (NARS) data show that women have a substantial role in plant production, plant protection and soil science. On the other hand, majority of women scientists in the NARS are in the field of food and nutrition.

It is noteworthy that the staffing profile of the Consultative Group for International Agricultural Research (CGIAR) as of 1997 shows the predominance of men in key positions. See Table 1. Similarly, in the Philippines the distribution of men and women overseeing the review of agricultural projects indicate that more men occupy senior positions. The same situation exists in a Governing Council in the Philippines, the Philippine Council for Agricultural and Forestry Research and Development (PCARRD). The chairmanship of the majority of commodity teams of

**Table 1. Profile of CGIAR by Gender**

|  | Male  |    | Female |    | Total |     |
|--|-------|----|--------|----|-------|-----|
|  | No.   | %  | No.    | %  | No.   | %   |
| <i>International Staff by Level</i>        | 1,001 | 84 | 188    | 16 | 1,189 | 100 |
| Senior Management                          | 84    | 93 | 6      | 7  | 90    | 8   |
| Department Heads/Program Leaders           | 159   | 88 | 21     | 12 | 180   | 15  |
| Senior and/or Principal Scientists         | 379   | 89 | 47     | 11 | 426   | 36  |
| Junior or Associate Scientists             | 112   | 82 | 25     | 18 | 137   | 12  |
| Visiting Scientists/Research Fellows       | 67    | 77 | 20     | 23 | 87    | 7   |
| Postdoctoral Scientists/Fellows            | 89    | 77 | 26     | 23 | 115   | 10  |
| Associate Experts                          | 52    | 69 | 23     | 31 | 75    | 6   |
| Administrative and Program Support Staff   | 59    | 75 | 20     | 25 | 79    | 7   |
| <i>Nationally-Recruited Staff by Level</i> | 373   | 60 | 282    | 40 | 655   | 100 |
| Scientists                                 | 258   | 56 | 201    | 44 | 459   | 70  |
| Senior Managers/Administrators             | 115   | 59 | 81     | 41 | 196   | 30  |
| <i>Trainees</i>                            |       |    |        |    |       |     |
| Ph.D. Trainees                             | 201   | 62 | 121    | 38 | 322   | 28  |
| M.Sc. Trainees                             | 128   | 74 | 45     | 26 | 179   | 15  |

PCARRD are held by men. The commodity teams serve as the review group for agricultural and forestry projects which are submitted for funding by PCARRD and/or the Department of Science and Technology.

Women comprise approximately 50 percent of researchers in public-sector agricultural research. On the other hand, a 1992 study jointly undertaken by the International Service for Agricultural Research (ISNAR) and PCARRD show that women comprise 54 percent of the researchers in four agricultural research institutes/centers. While the women constituted the majority of the work force, they were underrepresented in senior and management positions. More women occupy junior level positions than men and men are twice likely as women to hold senior level positions (Del Rosario and Lorica 1996).

To enhance gender sensitivity in agricultural projects, PCARRD is actively involved in gender orientation seminars and has established networks on gender concerns with the International Research Institute, NGOs and other public and private organizations which are implementing programs on gender. It initiated the establishment of a data base on gender and conducts periodic orientation in agricultural universities and colleges.

### **Science and Engineering for the Young**

The Science Education Institute of the Department of Science and Technology (DOST) administers a scholarship program for science, science teaching, engineering, three-year technical courses or two-year technical courses for students who have completed their secondary education. Mandated by Republic Act No. 7687 (1994) the mass-based scholarship program benefits students who compete in a national examination. A quota of at least two scholars per municipality is prescribed in the law. The students must come from poor families (with income not exceeding P72,000 per year). There are 3,500 scholars enrolled under this program.

During 1994-1997 the proportion of male and female scholar students were almost equal.

The course where there is the least female enrollees is engineering. There are more female scholars in the three-year technical courses, applied sciences, basic sciences and science education. There is a 1:1 ratio of male and female scholars in the two-year technical courses. It is anticipated that given the budgetary support required to sustain this program, the number of women in science and technology will increase through the years. This has implications on the composition of the future workforce and contribution of women to the economy. On the other hand, the

care-giving functions arising from marriages will in all likelihood be transferred to institutions such as day care centers and nursery schools on a wider scale. However, this also implies that the future of women in science will be brighter with bigger opportunities for women to pursue scientific work in laboratories. They can aspire to achieve breakthroughs in the scientific world which will be useful to mankind. This optimistic scenario assumes that the government will patiently pursue gender sensitive programs and faithfully monitor the extent in which women scholars are tracked into science and technology careers after they complete their tertiary education. It is also hoped that as the population increases, the quota for scholars will increase in proportion to the number of students who qualify in the national competitive examinations.

### **The Engineering and Science Education Program (ESEP)**

The ESEP was conceptualized and designed by DOST in collaboration with leading state and private universities to upgrade the capability of faculty members and potential teachers in science and engineering to modernize the facilities for research and development and to provide library materials to colleges and universities which fulfill certain criteria. The program was funded by a loan from the World Bank (WB) and the Overseas Economic Cooperation Fund (OECF) and a counterpart fund from the Philippine Government. Scholarships were awarded for MS and Ph.D. in the Sciences, Mathematics, Engineering and Science Education Graduates of the program from 1989 to 1996 were 508; 59 percent of whom are women and 61 percent are males. Women MS grantees account for 57 percent; and for Ph.D grantees 68 percent.

The ESEP data indicate that women are being mainstreamed in S and T research and academic activities. Lately, a good number of the grantees both men and women have been promoted and recognized for their excellence in S and T endeavors. A second phase of ESEP is being explored for external funding. In any event, the rosy aspect of ESEP is the window of opportunity extended to brilliant women in science and engineering who completed their graduate degrees in well known centers of excellence.

### **The Scientific Career System (SCS)**

A special law established the Scientific Career System which rewards the productivity and achievements of men and women in science. This is a special career ladder that allows scientists in the government institutions and the academe to focus on research and development and obtain incentives in the form of a higher

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salary rate without holding administrative or executive positions in research or academic institutions or science-oriented agencies. Given the necessary qualifications and after a favorable assessment, a scientist can be granted the rank of a Cabinet member as Scientist V without discharging the duties of a cabinet member. The screening and evaluation of candidates to the SCS is undertaken by highly qualified scientists and the awards to the ranks of Scientists II to IV are given by the Scientific Career Council while the award to the rank of Scientist I is given by the President of the country, upon recommendation of the Council. To date, there are only 81 scientists who have been accorded the ranks under the SCS; 43 are males while 38 are females. In natural sciences nine are males, 19 are females; for agricultural sciences 24 and 13; in medical sciences, three and five; and in engineering and technology, seven and one, respectively. There are more women scientists in natural science and medicine than men.

The data does not imply that the high achievers in science and engineering are only 81. It is assumed that many scientists have not applied for conferment of rank because they may be already enjoying relatively reasonable compensation in the academe because of the standardization of the salaries of faculty members. Or they may be already holding good positions in the private sector. There is less imbalance in gender representation in the Scientific Career System.

While it is expected that more women will apply with the Scientific Career System to enable them to receive the rank of Scientist, there is nevertheless a need to encourage women scientists to continue to pursue their work as researchers and research leaders parallel with their teaching assignments. There are temptations to abandon or neglect these activities to accept full time consultancies in the private sector or industry. A compromise is embodied in the Magna Carta for Scientists, Technologists and Researchers in Government, a landmark law which was approved by Congress in 1997, where for a limited period, a scientist in a government agency or a state university can be seconded to the private sector without losing his/her tenure in government.

### **Issues and Constraints on Women Participation in Key Role in S and T**

The data in the United States and other Asian countries reveal that generally women scientists and engineers do not share in equitable terms the access to ranks, positions and prestige in various activities relating to S and T. In the case of the Philippines, the number of women holding senior academic positions such as deanship and chairmanship of science departments is increasing. Perhaps this is the exception rather than the rule. It appears that the gains in a few countries such as the Philippines are not easily replicable in the workplaces in other countries.

There are historical and cultural factors that affect the role of women scientists and engineers in endeavors where their special knowledge and skills can be optimized. Worth mentioning is the biological circumstance that women, especially the married ones devote their time in the prime of their lives to bringing up children and working as homemakers. And yet there are exceptional cases where married scientists and engineers who have children successfully harmonized their careers and marriages. This is often the case when the extended family system is in place and surrogate mothers, often the relatives of career women, take care of the children in their growing years. This is cultural benefit that women in the Philippines enjoy, and possibly in other Asian countries as well.

Two serious scholars on women have written extensively on women's careers in science and how their work and home environment have influenced their decisions in their lives as professionals, wives and mothers. The constraints which women scientists confronted where by no means completely overcome by a significant number of these courageous ladies. However, there were those who struggled, won and reaped the benefits of their endeavors.

Vivian Gormick is a writer and essayist and interacted with her "subjects" while preparing her book *Women in Science: Portraits from a World in Transition* from which we cited her insights and analysis. Her astounding stories of women in various fields of science depict the human phases of scientific undertaking, the devotion required of scientists as they seek to unravel the secrets of phenomena in nature and the disappointments and successes that mark each human adventure. She has also written *Essays in Feminism*.

Pnina G. Abir-Am is a scholar and writer on the history of science and technology who holds a bachelor of science degree major in chemistry and a doctor of philosophy degree in history of science. Her article titled "Women in Modern Scientific Research: A Historical Overview" is a rich analysis of the impact of gender on the careers of women scientists and movements in various disciplines, professional advancement and achievement. She has also written a book entitled *Research Schools of Molecular Biology in US, UK and France: A History of Collective Creativity in the 20<sup>th</sup> Century Science*.

Nevertheless, not all women who have graduate degrees in science and engineering and who could have carved their future as outstanding scientists preferred their careers. In some cases, a bright future was waived to preserve a marriage or to retain a job in an institution where males dominate key positions, on the belief that these circumstances are inevitable and tolerable. It is often said that to succeed and rise to a high position a woman must be twice as good as a man. Existing case studies seem to support the view that performance of women scientists must be

nurtured in an environment where equality is the norm; that a good scientist is a good scientist regardless of his/her sex.

A number of case studies on women scientists written by Vivian Gormick (1984) defines key issues on careers vividly in the following paragraphs:

Among these women the question of having families and still being a serious full time scientist constitute a major dilemma that has resulted in an open debate. It is a question central to feminists concerns, one that will be grappled with for generations by those who know that ultimately all people must share in the world enterprise, and all people must parent children. The scientists of whom I now speak have brought this problem-alive in every sphere of working life; in America today, into science, and they are forcing into their profession the continuous reminder that attention must be paid now to the meaning of intimate relations in a working person's life; something no scientist has ever had to attend before.

The debate itself reflects the heterogenous composition of women scientists. It is not at all that there is a single monolithic view to which "women in science" subscribe. There are as many views as there are women to hold them. This multiplicity is evidence of the vigor of the argument and the depth of its possible consequence. Again because the case is being debated so vociferously, the question is nourished, made to grow, allowed to worm its way slowly into the social reality of science and scientists (Gormick 1984).

On the other hand, McGregor and Harding (1996) assert that the most frequently reported barrier to women in science and technology—as in many other areas—is the challenge of combining career and family women who give priority to child-bearing and child-rearing during periods critical to career development and promotion within the current reward systems suffer the career consequences. Where men and women do not equally share children and household work, it is frequently women who sacrifice their education and career opportunities for the home and family. Such choices—so long as society and S and T institutions do not value them—will result in lost opportunities to advance careers and compete for tenure or overseas scholarships and a loss to the S & T community (World Science Report 1996).

They further cited the disparity in salaries for equivalent work as well as the lag in promotions and tenure of women in their workplaces, causing a "dampening effect upon women's aspirations and expectations." Significantly, they called attention to the "glass ceiling" for women in science and technology decisionmaking bodies—the higher in the system, the fewer the proportion who are women. They further pointed out that this phenomenon cannot be attributed only to a smaller supply pipeline. Appointments are not keeping pace with increased number of professional women candidates with experience (World Science Report 1996).

Pinna G. Abir-am (1996) eloquently explained that addressing gender concerns can be guided by the criteria of historicity, disciplinarity, nationality, familial status

and gender consciousness. She explained that throughout the first two-thirds of the 19<sup>th</sup> century science remained largely restricted for women and that elite universities and national academies remained bastions of gender discrimination. Despite this circumstances she identified a number of Nobel laureates: Marie Curie, Irene Joliot-Curie, Gerty Radnitz Cori, Marta Geopertz Mayer, Dorothy McClintock, Rita Levi-Montalcini and Gertrude Elion. On disciplinarity, she asserted that the distribution of women scientists across disciplines is skewed while reflecting a historical accumulation of cultural stereotypes. She pointed out that the stereotype is evident in medicine, a field compatible with the cultural image of women as nurturers and a concentration on pediatrics, obstetrics and psychiatry.

On nationality, Abir-Am mentioned that in the US, UK, France, Russia and Canada have useful studies on women in science. She mentioned that the movement of Russian medical students in Switzerland and American biologists in Central Europe at the turn of the century suggest that cross-national migration relaxes national-cultural codes of social and gender control, a control which has historically restricted women's access to science through discrimination in national systems of education.

With respect to familial status, Abir-am stresses that women scientists up to the 1970s were constrained to choose between marriage and careers and by subordinating their careers to marriage, often lose opportunities to progress in their careers. Thus, Barbara McClintock, geneticist laureate and Rita Levi-Montalcini, biologist laureate chose to remain single. Collaborating with husbands who are scientists have shielded women from total invisibility but has resulted in projecting their work as being merely derivative from that of their husband—implying a dependent status.

Abir-am raises a significant question—have women scientists pioneered gender concerns thereby reflecting these in correcting gender bias in scientific knowledge? These disciplines include among others, those relating to anthropomorphic disciplines such as primatology, reproductive biology or neurobiology. The answer perhaps is that most recently, women scientists have banded themselves in networks of professionals whose objective is to mainstream gender in their endeavors (World Science Report 1996).

The studies and views articulated by gender advocates converge on major issues—equal access to opportunity by women in science, fairness in compensation, and recognition of their crucial work in nation-building. In the difficult years facing the Asian region, men and women are human capital that must be mobilized to respond to the problems. We cannot ignore the value of women, particularly those in science whose intellect, capacity for hard work, and creativity have contributed to knowledge and innovations.

### Recent Developments in Regional Fora

The United Nations Fourth World Conference on Women (FWCW) which was held in Beijing in 1995 raised global concerns including the feminization of poverty, women's participation in the economy, unequal access to health and education, inequality between men and women in political participation, and the violation of human rights of women. The Beijing Platform for Action embodies twelve areas of concern. Those which are relevant to science and technology and the economy are these issues: feminization of poverty; inequality in access to and control over economic structures; differential impact of policy on women; underrecording and undervaluing of women's work; and gender inequalities in the management of natural resources and in the management of natural resources and in the safeguarding of the environment.

In 1996, the United Nations Development Program (UNDP) in collaboration with the United Nations Development Fund for Women (UNIFEM) and the M.S. Swaminathan Foundation organized a conference for scientists, policymakers, researchers and science administrators to discuss the theme "Women in Science and Technology; Science and Technology for Women." This was held in Chennai, India and the participants were called the Resource Group of Women Scientists and Technologists in the Asia-Pacific Region. The participants formulated and adopted a significant document called the Chennai Declaration. This document contains an agenda for action enlarges the role of women in science and technology and harness science and technology for women.

The Resource Group agreed to act as "facilitators in the task of bringing the benefits of modern Science and Technology to the service of women, particularly in priority areas like nutrition, health, education and economic livelihood and security." They also agreed to serve as a pool of experts to empower poor women to use cutting-edge technology such as biotechnology, material and health science through relevant technology transfer mechanisms. Model projects will be developed and implemented in the countries in the region to enhance the capacity of poor women to "increase their income and break the cycle of poverty" (UNDP 1998).

Related concerns were addressed in a meeting in Jakarta among women scientists, policymakers and researchers under the auspices of Indonesia, UNESCO and multilateral agencies (1996). Collaboration among the Association of Southeast Asian Nations (ASEAN) countries and interventions in the APEC fora to advance gender concerns were discussed both in Jakarta and Manila in 1996. A Conference on Gender, Trade and Investment Liberalization, and Economic and Technical Cooperation for Sustained Growth and Equitable Development was held in Manila in October 1996 with the Philippines, Canadian International Development Agency

(CIDA) and UNIFEM as sponsors. It attracted 100 participants from the APEC Economies.

The women's role in small and medium enterprises, in industrial science and technology and human resources development as areas of intervention in APEC were extensively discussed in this Conference. The Senior Women Leaders Network was organized, which was later shortened to Women Leaders' Network (WLN). It is composed of women leaders from government, the private sector, NGOs, including labor organizations, and universities in the APEC economies. While it is not a formal body of APEC, its principal objective is to advocate for gender's perspectives and women's full participation to be integrated into APEC trade and investment liberalization programs and policies. WLN drafted a Manila Declaration which provided key recommendations to the Senior Officials of APEC. The Subic Declaration of the APEC Leaders' Meeting in 1996 stated clearly thus: "We welcome the progress of APEC fora in involving business, academics and other experts, women and youth in 1997 activities and encourage them to continue these efforts."

Furthermore, the leaders asserted in the Vancouver Meeting "We believe APEC should take specific steps to reinforce the important role of women in economic development. We welcome the offer of the Philippines to host a Ministerial meeting on Women in 1998 in Manila to take stock of the progress to date involving women in APEC's agenda and to determine next steps to integrate women into the mainstream of APEC activities."

The Vancouver APEC leaders' meeting reinforced the Subic Declaration. Furthermore, a number of countries such as Australia, Canada and the Philippines actively encouraged the gender programs of the Industrial Science and Technology Working Groups, the Human Resources Development Working Group, among others. The Ad Hoc Group on Gender, Science and Technology held an Expert's Group meeting in March 1998 to ensure the systematic collection of data on gender among the economies. Other Working Groups in APEC such as the Transportation Working Group, the Tourism Working Group identified the need for training and contributions of women in the transport and tourism sectors (APEC Ministerial Meeting 1998b).

Notwithstanding this progress at the APEC level, the number of women delegates in APEC delegations or programs are not significant. While the chairperson of the Senior Officials in the Philippines is a woman (an undersecretary of the Department of Foreign Affairs), very few women are chosen to head the delegations in the various APEC fora.

The Ministerial Meeting on Women explored the strategies to enhance their role in the various APEC working groups including the working group in Industrial

Science and Technology. Consequently, the Joint Ministerial Statement of October 1998 recommended that APEC address the range of factors that discourage female youth and women from pursuing interests in and considering careers in science and technology; and to make great efforts to understand and preserve local knowledge systems and indigenous science and technology, including promoting mutually beneficial exchanges between practitioners of modern and traditional technology.

On a broader scale, the ministers urged the APEC leaders to (1) recognize gender as a cross-cutting theme in APEC; (2) place a high priority on the collection of sex-disaggregated data; (3) implement gender impact analysis of policy, program and project proposals as an integral component of APEC decisions, processes and activities, including planning, priority setting, resource allocation, design, implementation and evaluation; (4) place a high priority on the development of further studies on the impact of the financial and economic crisis on women and the development of strategies to minimize any disproportionate effects on them; and to explicitly integrate economic interests of women into regional and domestic strategies for economic recovery and future prosperity; (5) accelerate the progress of integrating women in the mainstream of APEC processes and activities; (6) promote and encourage the involvement of women in all APEC fora; and (7) ensure the implementation of the foregoing recommendations and accountability for results. An output that was proposed to be developed by an Ad Hoc Task Force is a Framework for the Integration of Gender in APEC. This is expected to be completed in 1999.

The Science and Technology Ministers of the APEC economies met in Mexico City last October 1998. They adopted the Mexico Declaration which acknowledged the significance of the role of S & T in fostering economic growth and social development. It encouraged APEC fora to take several actions which include among others the "elimination of barriers to the fullest participation in, and contribution to S & T by all members of society, with special attention to underrepresented segments, such as women and persons with disabilities."

### Conclusions

Women's entry and successes in various S and T activities have somehow improved in a number of countries. In general however, the number is not truly significant.

While historical and cultural factors tend to contribute to the "slowness" in sensitizing people to gender concerns, these should not deter us from assessing where we are now and where we want to go on gender concerns.

The Chennai Declaration and the Plan of Action are concrete measures which will move countries in the Asia Pacific Region to use science and technology to

minimize poverty especially among women. The opportunities of sharing experiences and replicating projects with appropriate modifications to suit country specific needs will be useful outcomes of the projects in the Region.

Similarly, the Ministerial Meeting on Gender initiated by the APEC economies is a tremendous breakthrough for women. Hence, this significant milestone must be considered by other countries as they examine their national programs on gender. Since global competitiveness is dependent on a strong, technological work force and an environment that nurtures both men and women to contribute to innovations in policy reforms, products, facilities and services, there is a continuing need to assess the changes that are taking place at the national and regional levels. Truly, careers in science and engineering for men and women must be fostered; education and the training of young men and women on knowledge-based skills must be pursued; regional programs on gender must be encouraged; and networks on gender and science and technology must be enhanced. It may be appropriate for multilateral organizations to identify interfaces in their programs and conduct joint projects that will integrate related studies. The outcomes of this assessment undertaken in a collaborative way can contribute towards the identification of strategies and the development of a Framework for Gender in Science and Technology. Such a Framework will ensure the access of women to S and T opportunities, including an equal share and participation in vital decisionmaking and the optimal use of the resources in the Region.

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