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Career Development for Women Scientists in Asia

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Previously, challenges faced by women scientists have made it difficult for them to realize their dreams. The remarkable growth of Asian bioscience over the past decade, however, has created opportunities for young women in their home countries. The time is ripe for women in Asia to pursue their scientific aspirations.

The year 2011 marks 100 years since Marie Curie, one of the most notable scientists of the 20th century, was awarded her second Nobel Prize. In an era when it was still unthinkable for a woman to have a career, let alone one as a scientist, Dr. Curie faced—and overcame—insurmountable odds in her quest for knowledge. Dr. Curie was one of many pioneers whose courage, tenacity, and groundbreaking achievements spurred generations of young women to follow in her inspiring footsteps, and today, the notion that women do not belong in the sciences is as antiquated as corsets and foot binding.

Women across the globe have come a long way since the days of Dr. Curie, and more are opting to pursue careers in the life sciences. In Asia, changing mindsets and the recent growth in the bioscience sector has also enhanced career prospects in recent years. For instance, a decade or more ago, educational and career opportunities in the biosciences in this region were few and far between. Hence, it was not unusual for a young woman with a keen interest in the life sciences to head west to the US or Europe for education and training, as that was where pioneering research and exciting new advancements and breakthroughs were occurring. These were also the countries where women were less likely to face gender-related barriers or obstacles due to traditional cultural norms. On most occasions, after undergoing undergraduate, graduate, and postdoctoral training, young scientists would choose to remain in these countries to pursue careers in academia or industry since that is where the opportunities were.

The Rise of Bioscience in Asia

However, in the past decade, life science development in Asia has grown by leaps and bounds as countries in the region have placed a strong emphasis on establishing and developing their own homegrown industries. Research innovations, capabilities, output, and advances within the region are now on par with Western Europe and the US. While some of these are a result of government policies that aim to develop an environment of biomedical innovation and creativity, and a knowledge-based society, others are fueled by the private sector through strategic collaborations between research institutes and biopharmaceutical companies. For example, in China, the government has identified development of science and technology as one of the major goals of its national development strategy. Thus, through the country's "12th Five-Year Plan," the government aims to increase the R&D funding from 1.8% of GDP in 2010 to 2.2% in 2015 (Gov.cn, 2011). In addition, leading pharmaceutical companies such as GlaxoSmithKline, Pfizer, Novartis, Bayer, Eli Lilly, and Hoffman-La Roche have set up their R&D centers in China (Wikipedia, 2011). Regardless, these initiatives are opening up educational, training, and career opportunities in the region in areas such as basic and translational research, drug discovery, clinical research and development, regulatory affairs, biopharmaceutical manufacturing, and marketing and sales. Furthermore, a lot of the work is focused on areas at the forefront of bioscience. These developments have spurred many overseas-based Asian scientists to return to their "homelands" to take advantage of these opportunities, and utilize their expertise and experiences to help the development of local industries as well as train and serve as mentors to young scientists. In fact, China launched the Thousand-Talent Scheme in 2009 as a means of attracting Chinese scientists and industry professionals working in other countries to return to their homeland. Thus, there are considerable opportunities and avenues for young women eager to pursue a career in science.

Impact of Gender Disparity

It is evident that career development is highly dependent on the opportunities available. As the recent initiatives in bioscience development are country specific, there are naturally different opportunities available across the region. Furthermore, gender inequality continues to persist in some countries more than others, such that women in one country may find it harder to progress in her career than her peers in another country. Gender disparity is not unique to Asia. Global statistics indicate that gender inequality is still present, particularly at the higher echelons of academia and industry, in most developed countries. In fact, gender disparity in the sciences has been the subject of debate for many years. As highlighted in the report commissioned by the InterAcademy Council, numerous studies have been conducted to identify the causes and many countries have developed initiatives, in the form of committees, commissions, and proposals, to tackle this problem (InterAcademy Council, 2004). While efforts are being made to increase the participation of women in science at all levels, from recruiting more female graduate students to the appointment of women as senior research fellows and other high-level positions, the number of women in senior level positions is still very low. The key issue is determining whether women are intentionally held back from excelling by external factors or whether they hold

themselves back. For each, different sets of initiatives have to be implemented.

In Asia, gender disparity can be attributed to cultural factors and societal pressures related to the traditional roles women play in society. Therefore, in patriarchic societies such as South Korea and Japan, women are heavily under-represented in upper levels of academia and industry. In Japan, women make up only 12.4% of scientists in academia and even today, continue to be marginalized and passed over for senior positions due to their gender (Nature, 2008). Similarly, the population of female researchers in Korea is 17.4% (in 2008) and only 10.4% of these were in faculty positions (MEST, 2009). In China, a society which has always encouraged women to participate in the workplace, gender inequality also persists in the sciences. For example, in the Chinese Academy of Sciences (CAS), the prestigious and leading academic institution in China, a disparity is seen between the number of male and female Academicians, with ~6% female representation (CAS, 2011). However, as an ever increasing number of Chinese women pursue careers in science and technology, China is contributing the major share of women scientists in Asia. For example, in 2008, 14 million women (~40% of the total) were working in science and technology fields, while ~46% of the total graduate students are female (Chen, 2010).

Various reasons have been identified to account for the relatively low female representation, particularly in the upper echelons of science. Studies have shown that gender inequality is not apparent at the undergraduate and postgraduate level. However, the disparity is evident beyond that level. Hence, young women choose to study science, but they do not choose to pursue careers in science. In fact, in the past hundred years, 15 women have won the Nobel Prize in science, 3 of which were in 2009 (The Nobel Prize Internet Archive, 2011). There are several explanations for this. Women may lack confidence and motivation due to perceived barriers to entry-level faculty positions, discriminatory hiring practices, perceptions of the challenges women faculty members face, and a lack of role models and mentors in the field. Many women also put their career aspirations on hold or give them up altogether when they reach the period of their lives where they want to start a family, based on the idea that family-work commitments will impact their careers and place them at a disadvantage in academia. In fact, many young women in science opt out of a competitive academic career path in order to spend more time with their families.

In Asia, the problem has been more acute due to the fact that there have been few training opportunities available locally. Until recently, most aspiring scientists had to leave their home countries for the US or Europe for further training and to pursue a credible career in science. As many Asian societies are patriarchic, this would be difficult, requiring mutual family consensus. Furthermore, in Asian families, women are expected to shoulder more of the responsibilities of taking care of the family, so unless they have family support, it is very difficult for them to invest the time and dedication required for the demands of a career in the sciences. Thus, the gender disparity has stemmed from insufficient role models and the relative lack of support for women who strive for a career and a family.

Promoting Gender Parity

Recent societal changes in Asia aim to improve the situation, though. In countries such as China and Singapore, there is greater shared responsibility within the family structure, allowing women the freedom to pursue a career they desire. Policy implementation may also make a difference. The report commissioned by the InterAcademy Council has identified the following strategies to increase the number of women in science. Greater commitment from the top levels of the organization, establishment of an infrastructure such as a diversity committee, reviewing policies and procedures to ensure there are no differential impact on men and women, transparency in all communication, recruitment, promotion and awards, widening the inner circle, leadership training and mentoring, supporting a healthy work-family balance, and regular collecting of sex-disaggregated data and monitoring of progress (InterAcademy Council, 2004). However, it is up to the individual institutions to implement these strategies. Thus, to promote gender parity, many universities now provide maternity pay and child care facilities, and equal opportunities are enshrined in law.

Furthermore, many schemes have been developed both on a global scale as well as locally. One well-known global initiative is the L'Oréal-UNESCO Awards (L'Oréal-UNESCO, 2011). Jointly established by L'Oréal Corporate Foundation and UNESCO, over the past 13 years under the umbrella of "For Women in Science," the awards aim to promote women researchers who have made outstanding contributions to their field of work. Each year, five women scientists are presented with the L'Oréal-UNESCO For Women in Science Award, one from each of the following continents: Africa and Arab states, Asia, Europe, North America, and Latin America. Furthermore, 15 women postdoctoral researchers, 3 from each region, are awarded the UNESCO- L'Oréal International Fellowships for Women in Science. Since its establishment, 67 women have been presented with the prestigious L'Oréal-UNESCO award, two of whom received the Nobel Prize in 2009, while 864 fellowships have been awarded to young women scientists from 93 countries.

Individual countries, especially those with poor gender parity, are also implementing strategies to promote better work-life balance for women in an effort to encourage women to pursue careers in academic research. In Japan, for example, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) has established programs that aim to encourage female researchers to return to work after having a child. These include regulations to protect women scientists from losing their grants while on extended maternity leave, as well as offering competitive grants to women returning to science after giving birth (OECD, 2006).

Korea has also implemented several strategies to encourage female participation in the sciences. The country's Ministry of Education, Science and Technology (MEST) along with the National Research Foundation of Korea (NRF) established the "Women Scientists of the Year" award in 2001. Comprised of a commendation from the Education, Science and Technology Minister and KRW 10 million in prize money, the award is presented annually to one female

scientist and one female engineer making outstanding contributions to scientific development (MEST, 2011). Other organizations have also established similar award schemes. For example, the Korean Federation of Women's Science & Technology Associations (KOFWST) a body overseeing the country's women's science and technology organizations, along with AMOREPACIFIC, has established the ''AMOREPACIFIC Award for Outstanding Women in the Sciences'' to promote the scientific contributions and achievements of women scientists so as to encourage future women scientists (KOFWST, 2011).

Similarly, among the many initiatives in China includes the China Young Women Scientists' Award, jointly established by the All-China Women's Federation, the China Association for Science and Technology, the Chinese National Commission for UNESCO, and L'Oreal (China) Ltd. The purpose of the award is to honor young women who have made important and innovative achievements in science and to encourage more women scientists to engage in natural science research (Baicheng, 2005). The CAS has also identified increasing women representation in science as an important priority. The organization hosted the Third World Organization for Women in Science (TWOWS) 4th General Assembly and International Conference in Beijing in 2010, a forum to address gender disparity in the developing world and promote initiatives to support and encourage the full participation of women in science and technology (CAS, 2009). Additional progress toward overall gender equality in the country can be seen by the recent announcement by the Chinese Ministry of Human Resources and Social Security on its review of the retirement age of women in China. Under the current regulations, regular female workers retire at the age of 50 and female public servants retire at 55, while the retirement age for men is 60 (China.org.cn, 2011).

Overall, all of these various schemes bring visibility to women scientists and by promoting their achievements on the world stage, highlight the role of women in scientific excellence. Furthermore, they encourage and inspire young women and give them the confidence to follow their dreams and aspirations.

Essential Ingredients for Success: Passion and Persistence

While it is essential to implement sound policies to support young women in their careers, women must also have the right attitude, be persistent, and be prepared to pursue their dreams with focused enthusiasm and drive. Success, I believe, firmly goes hand-in-hand with attributes such as creativity, aptitude, determination, and most importantly, passion. In fact, these are the qualities that have been the motivating force for me when striving for the seemingly unattainable or when faced with insurmountable obstacles.

Young women should not be disillusioned by the issue of gender disparity. While gender disparity will not be eliminated overnight, as long as women are aware of its existence and the various support mechanisms that are available to them to support their upward career mobility, they can still excel. Young women should also proactively seek out mentors during the early stage of their scientific careers. In fact, an area close to my heart is mentoring and encouraging women who are enthusiastic toward the advancement of scientific knowledge. Mentors provide support and encouragement, as well as invaluable guidance on research and career paths. They can also help dissipate unfounded fears. Young women should also be encouraged to join professional women's organizations in science and technology as they provide invaluable support as well as host forums on essential career-related topics. On the whole, young women must not hesitate to seek out assistance, if need be.

My Own Journey as a Scientist

My personal journey has been exhilarating and inspiring, filled with discoveries and disappointments, and a road compounded by both enormous challenges and a great sense of satisfaction. The strong sense of curiosity and the pure joy of learning and discovery has been the driving force that sparked my lifelong scientific career. Even while undergoing the rigorous training that is part of becoming a scientist, I was continuously inspired by potential new discoveries. With the encouragement of outstanding mentors, from my high school biology teacher to distinguished scientists, I was provided with equal opportunities and a supportive environment to build my career.

Furthermore, I strived to identify with good role models in my field of interest. A major role model was Dr. Rita Levi-Montalcini, an eminent neuroscientist and currently the oldest living Nobel laureate. Dr. Levi-Montalcini, a legend in her own right, excelled in the face of insurmountable odds. She pursued her dreams despite the objections of her father, who believed that a science career would affect her duties of a wife and mother. During the early stage of her career, with no funding and under the circumstances of war, she continued to undertake outstanding research from a home laboratory to study the growth of nerve fibers in chicken embryos. These studies laid the groundwork for her future work that shaped the understanding of neurogenesis. Later in her career, she chose to make tremendous contributions to the development of neuroscience in her home country of Italy.

I was thus inspired to always pursue scientific excellence and also to promote neuroscience and life science in Hong Kong. After receiving my PhD and postdoctoral training at Harvard Medical School, I worked in industry, first as Laboratory Head at Lifecodes Corporation and then as Senior Staff Scientist at Regeneron Pharmaceuticals, both biopharmaceutical companies based in the US. However, in 1993, I decided to return to Hong Kong with my family, and in spite of not having any university administrative or teaching experience, I jumped at the opportunity to join the then newly established Hong Kong University of Science and Technology (HKUST). Along with my colleagues, I enthusiastically embraced the challenge to help shape the life science programs at the university. During this period, science development was at its initial phase in Hong Kong; there were few commercial ventures and the biopharmaceutical industry was very much in its infancy. Therefore, in addition to developing the life science programs within the university, it was also our goal to lay the foundations for developing advanced neuroscience research, and in time, the capabilities to undertake drug discovery as well. Thus, a vision was born.

At HKUST, I decided to continue my work on trophic factors as well as neuronal development and synaptic plasticity, areas of interest that were sparked during the early stages of my career in the US. However, the research environment was quite different from the US, and creative strategies had to be established. With dedication and determination, my research flourished and I rose through the ranks within the university. An important factor in this success was networking with previous mentors, peers, and other scientists in the field.

As I worked to build my research portfolio and credibility, I also strived to turn my vision of developing a neuroscience hub in Hong Kong into a reality. For example, under my helm as Director of the Biotechnology Research Institute at the University, we established a multifaceted state-of-the-art drug discovery technology platform to drive local biomedical research toward a higher standard of excellence. Numerous prominent academic and industrial collaborations were also established to enhance the scope and quality of our research and strengthen the credibility of our work. With the invaluable contributions and support of committed colleagues and team members, I then spearheaded the establishment of the Molecular Neuroscience Center, with the mission to consolidate expertise and research initiatives in molecular neuroscience, and based on this strong foundation, our project on molecular neuroscience was selected as an Area of Excellence. This was an enormous achievement, as it allowed us to undertake exciting new initiatives in molecular neuroscience and drug discovery and, more recently, has garnered recognition from the China's Ministry of Science and Technology through the establishment of the State Key Laboratory (SKL) of Molecular Neuroscience at HKUST. The SKL represents China's recognition of HKUST's unremitting efforts and excellence in the study of molecular neuroscience.

Life science development at HKUST and in Hong Kong today is vastly different from when I first returned 18 years ago. Much progress has been made, such that there is a greater degree of funding support for innovative projects, there are more training opportunities locally, and the territory is beginning to witness the emergence of a dynamic research culture. Furthermore, HKUST is now recognized for leading-edge neuroscience research. In fact, due to its world-class reputation, extensive research outputs, and capacity to establish strong connections with leading neuroscientists and Nobel laureates, the university has been given the honor as the permanent site for the prestigious Gordon Research Conference in "Molecular and Cellular Neurobiology," lending further credence to the quality of work undertaken at the university.

The Future Is Bright for Women Scientists

A career as a scientist is highly rewarding. It is important to note, however, that accomplishments cannot be garnered overnight, but rather, are built one step at a time. There will be obstacles and numerous setbacks, but in my own personal experience, the keys to success have been passion, perseverance, dedication, teamwork, and developing an excellent support network. Asia is currently experiencing an exciting period of scientific development which requires tremendous input of talent, regardless of gender. There are infinite possibilities available to those who have the tenacity and determination to forge ahead with confidence and seize the opportunities. It is my hope that, over the next few years, these current advances in Asian biosciences will result in a significant increase in women scientists in the region such that one day gender will no longer be an issue and scientists will be viewed by their accomplishments alone.

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