Help Those Missing from the Table – Confronting Gender Issues in New Looks

By SONG Jianlan (Staff Reporter)

Can new technologies endow women with new power? Yes, and no. Innovation and entrepreneurship might help women better address the challenges coming with this round of technological revolution, say elite women scientists.

Gender equality – Achieve gender equality and empower all women and girls – is listed the 5th of the 17 Sustainable Development Goals (SDG5) in UN's 2030 Agenda for Sustainable Development. (Link: https://sustainabledevelopment.un.org/sdg5) The widespread application of emerging technologies, elite women scientists warned, poses new challenges to this goal.

"I was shocked when I entered the meeting room to talk with our counterpart delegates in Finland for cooperation affairs," recalled Dr. Atya Kapley, principal scientist at the Environmental Genomics Division of the National Environmental Engineering Research Institute (NEERI) of India. "I was the only women in the ten-member delegation on the Indian side; as a sharp contrast, however, half of the members in the Finnish delegation were women," she said.

This spectacular disparity beheld many years ago has prompted her to do something. "This has to be changed," Dr. Kapley told the author between sessions of the Executive Board Meeting of the Organization for Women in Science for the Developing World (OWSD). Established in March 1989, this organization has committed itself to improving and developing innovation capacity of women scientists in the developing world, to providing them with equal opportunities for education and training, and to encouraging them to participate in science policy making and management, among other causes aimed at gender equality in science.

Fossilized Problem in New Disguise

Joining OWSD in 2002, Dr. Kapley has since been working to raise awareness of gender discrimination in the wider society, and to support women and girls in achieving their desired goals. In 2016, she was elected Vice President of OWSD for the Asia & Pacific region of the organization, and has since been serving on the nine-power OWSD Executive Board.

At the board meeting, Dr. Kapley and her fellow board members needed to address gender equality – the 5th of the 17 Sustainable Development Goals (SDG5) listed in UN's Agenda for Sustainable Development set for 2030. In so doing, they also encountered with challenges from the current era, and future.

"New technologies outstanding in this era, as well as those envisioned to prevail in future, are posing new challenges for women scientists," remarked OWSD President Prof. Jennifer A. Thomson, 2004 laureate of the L'Oreal/UNESCO Prize for Women in Science for Africa. Well known for her work on transgenic maize tolerant to drought and other abiotic stresses, Prof. Thomson is currently Emeritus Professor at the Department of Molecular and Cell Biology at the University of Cape Town (UCT), South Africa.

To address such new challenges, Prof. Thomson continued, OWSD decided to hold an international symposium on the theme "Women Scientists in Innovation & Entrepreneurship", ensuing the executive board meeting. "For example, future widespread application of artificial intelligence might cause a decrease in demand for human labor force, and hence incur unemployment. Women could be particularly vulnerable to subsequent harms, due to their weaker position and poorer opportunities for education and professional training," she explained. "An answer to such new challenges is to promote innovation and entrepreneurship in women scientists. Hence some members on the executive board who have been involved or interested in this field initiated this symposium."

Dr. Kapley is among those who have the aspiration to promote innovation and entrepreneurship in women scientists. "It does not necessarily mean we are doing business ourselves," she explained, "we are more like sowing seeds and disseminating knowledge to help training women in need." Such efforts to transfer advanced technologies might be particularly helpful for women in some special situations, she said, such as those who had to retreat from their professional life and stay at home to take care of the family. "Advanced technologies might enable women in such special situations to work from home."

Women Disappearing from Science

Inadequate representation of women in science has long been a problem across the developing world. Women are the minority in science. Moreover, the higher they advance along the academic hierarchy, the lonelier they are – the science world keeps losing women workers throughout the course, despite improved participation of women in science at the base of the pyramid. For example, China – a country known for very high women employment – sees very few women in its elite scientists. Among the 64 newly elected Members of the Chinese Academy of Sciences (CAS) announced in November 2019, only six are female.

This to some extent could be explained by the so-called "chimney effect" – a phenomenon women keep disappearing from their professional career or being "left behind" by their male colleagues, just like gases keep leaking from a chimney. Lots of girls do not have chances to go to college; and lots of women drop out when getting married or giving birth to kids; those who do stay and

stick to their science pursuit often have to spend more time taking care of the family than their male colleagues and hence fail to get promotion. At the top of the pyramid, survivors are those extremely lucky, and absolute minority.

Dr. Kapley has been thinking about how to help them.

"We need to look deeper into it. It is not just a matter of numbers, but a matter of opportunity we lost. Many women are well-educated and some even complete their PhDs. But then they drop out or take a break in their career, and many never come back. In this way the country loses all the energy and money invested in educating and training them. This is lost GDP of a country," said Dr. Kapley in her presentation on women and biotechnology.

At the meetings Dr. Kapley reunited with her mum, Dr. Kaiser Jamil, a renowned expert in cancer research. As a Past President of the organization, she also serves on the OWSD Executive Board. "Science itself is not gender biased, it's the propagation of science that has brought in the bias," Dr. Jamil joined in the conversation.

It is really a happy coincidence, or even a miracle that two women from the same family have both fulfilled their desired goals to grow into distinguished scientists, and happen to both sit on the top governing board of an international scientific organization. "Yes, it is a strong tradition of our family to provide girls with equal opportunities in education and professional training," said Dr. Kapley. This tradition has been prevailing in her family for generations. "But many Indian girls are not so lucky as us," she said. "Many just cannot go to school, though the Indian Government offers all families with basic education for free. They don't need to pay tuition fees if they attend school, but gender discrimination ingrained in the culture stops them."

Dr. Kapley has benefited a lot from her mentors throughout her education and scientific career. Unlike other women scientists, she carried on in her research after the birth of her kids. "Both my mother-in-law and my mum – two very strong women – supported me. 'Don't quit, or you will regret,' they told me."

Again, not every women scientist is that lucky. Dr. Kapley deeply understands the situation, and would like to help those who have to quit in the early years of their career. "I had proposed some new programs under the framework of OWSD to help those junior women scientists. For the time being the organization has not enough funding to support my ideas, because it relies on donations to operate; but I hope they work in the future."

OWSD provides scholarships for junior women scientists from the least developed countries to pursue their doctoral degrees in China, India, Brazil, Mexico, Pakistan and Malay, but still no program is in operation for those who had to retreat from their research due to family reasons. How can we help?

In her presentation Dr. Kapley briefly reported how India is dealing with SDG5, gender equality. The Indian Ministry of Science and Technology has a number of initiatives to help women who have taken a break in their career and want to come back to science. Efforts include fellowships to help women who have dropped out from their professional lives, and biotech parks where women in the community can get technology aids and sell their products to make a living themselves.

"Women of some regions in India, for example, can produce enzymes at home, benefiting from such initiatives," said Dr. Kapley.

Dr. Kapley hoped these efforts could offer women with more power in deciding their own lives. "Concerning whether or not to come back to work, the decision shall be left to women themselves," she asserted.

More often, however, they are not asked at all.

Women scientists are missing out opportunities to manage high-tech start-ups

"Women Scientists Are Not Asked or Considered"

"Many decisions are made in the board room, to which women generally have no access," said Dr. Kapley, touching on another type of "disappearance" of women from professional life. Citing a feature report published in *Nature* in March 2013, she urged more attention given to the phenomenon that women are missing out opportunities to take part in the management of high-tech startups and other new business arising from the field between science and industry.

Titled "Barred from the boardroom", the report brought to light the absence of women from the

Absent from the boardroom: The gender issue raised in a feature report published March 2013 in *Nature* re-sparked discussions at the meeting – the same inconvenient truth in a subtler form.

boardrooms of high-tech startups – Despite the large number of eligible women candidates in biotech and other science disciplines closely connected to industries, only very few women scientists sit on the scientific advisory boards of enterprises based on knowledge of such disciplines: the proportion of women board members was lagged far behind the proportion of eligible women candidates.

"It has been over six years since the article got published, and the situation is still the same," commented Dr. Kapley, "women are just not asked or considered."

Prof. ZHAO Lanxiang and other elite women scientists with OWSD are looking at more subtle types of discrimination in science, which involves more and more commercialized activities today. As a researcher at the Institutes of Science and Development, CAS, ZHAO and her team took note of hidden discrimination built in some social institutions, examining human behavior that generally is not taken as gender-biased. For example, networking in science commercialization.

In her research, ZHAO compared the performance of female and male scientists at CAS in academic activities featuring closer relationship with business, for example science invention and commercialization, patenting and licensing, consultancy or R&D projects commissioned by local governments, cooperation with industries, and firm founding. Her team discovered significant performance disparity between the two genders in such activities, particularly patent licensing.

Both personal and environmental factors could have contributed to the disparity, she said. For example, women are generally more risk averse, less predisposed to sell science, and less likely to ask; they tend to dislike competition and choose research fields with less commercial possibilities; and they generally take more family responsibilities than their male counterparts. On the other hand, they are restricted by smaller social networks, and less preferable for venture capitalists compared to men – they are just not asked or considered. They are excluded from the "boys' club" of commercialized science.

"We found in the research that women are not so good at informal networking," she said. "We define 'formal networking' as those networking activities established by social institutions; and 'informal networking' as more personal and not established by social institutions," she explained.

ZHAO's team found that women's disadvantages to males in networking, including smaller and weaker networks with industries and trans-disciplinary collaborators, as well as weaker networking intensity can explain a significant part of the gender gap in patenting productivity. They also found that women scientists tend to cooperate with partners of the same gender as them, no matter the partners are from other disciplines, governmental authorities, industries or academia.

"Female scientists do not perform so well as their male peers in academic commercialization," said ZHAO. Given the deepening influence of academic commercialization, she warned, gender disparities could increase if no measure taken. As a conclusion of her research, she advised policy-makers pay more attention to academic commercialization.

Meanwhile she advised female scientists establish more effective communications with their collaborators to close the "social network gap".

Moreover, a shift of emphasis from supporting projects to supporting network platform construction might be needed for policy-makers. "The construction of social network has become a new gender policy issue," she asserted.

"Informal Networking" Brought in Closer Look

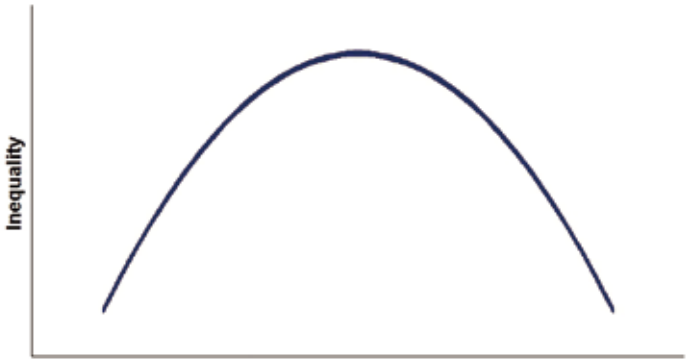
ZHAO's team found that it is difficult for women scientists to establish professional connections in an informal way; they need to rely more on formal channels to develop their social networks. "When two men meet, they can become friends easily; yet things are quite different for women."

Obviously, this "new" issue surprised some participants of the meeting, and soon stirred heated discussions and concerns. Women, generally thought to be good at communication and networking, turned out to be not good at "informal networking", this is apparently startling. But soon they realized how problematic this stereotype impression is. When examined more closely amid an interwoven network of social institutions, as analyzed by some participants, women's networking skills are often restricted or even prevented from happening by some "situational environment" factors. For example, women generally shoulder more family responsibilities than men, and when such networking activities happen, they are generally at home cooking or taking care of their kids. "A lot of networking occurs in pubs, but very few women scientists can afford the time to go there after office hours," they argued. Women are often absent from situations where informal networking prevails – they are busy somewhere else.

On the other hand, participants were also alerted to take note of possible influences from social institutions that have established or shaped "formal networking". Whether or not, and to what extent have they shaped networking etiquettes? To what extent males, the dominant gender of the human society, have shaped such social institutions? What has made the commercial world a "boys' club"? Some experts noticed that in areas where females take more senior positions, it is generally easier for junior women scientists to get promoted, indicating a role played by alternative social institutions.

"Previous gender policies focused more on individual support, while institutions played a more important role in providing formal channels. Therefore, gender policy needs to be adjusted to support institutions more than individuals," ZHAO proposed her team's advice.

"It is a social issue that could vary a lot across cultures and societies," ZHAO cautioned, despite signs showing that institutional challenges could be a global driver of gender disparity.



Shown is a hypothetical Kuznets curve. Empirically observed curves, which mirrors the real correlation between the proportion of rural population and the level of development, are not so smooth or symmetrical. First advanced by economist Simon Kuznets in the 1950s and 1960s, a Kuznets curve hypothesizes that as an economy develops, market forces first increase and then decrease economic inequality.
(Credit: Image by Princess Tiswas - wikipedia: http://en.wikipedia.org/wiki/Image:Kuznets_curve.png, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=2300359)

Investing in women in rural areas means investing in future sustainable development

Help Those "Left behind" in Rural Areas

Other elite women scientists are looking at the rural regions, where women are playing a major role in sustainable development, as a result from the migration of labor force from rural to urban regions, a worldwide trend today. In this tide of migration, more women than men are left behind.

Prof. ZHANG Linxiu, an expert in development economics, are among those who advocate to invest in the rural world. She has long experiences in rural studies in China building up human resources for sustainable development, with focuses on children's nutritional improvements and early childhood development, especially girls in these regions. Currently she is working as the Director of the UN Environment-International Ecosystem Management Partnership (UNEP-IEMP), a joint venture between UN Environment and CAS. UNEP-IEMP endeavors to provide science, policy and capacity services to developing countries to integrate ecosystem management approaches into national policies and plans

that enhance the delivery of ecosystem services for the wellbeing of humanity.

Women in rural China are major role players of sustainable development, asserted ZHANG, when analyzing how women are "left out" from the migration tide rushing from rural to urban areas.

Globally, rural population has been migrating to urban areas, attracted to better income and opportunities. "According to the 'Iron Law of Economic Development', the Kuznet's curve, the smaller is the proportion of population working in agricultural sectors, the higher is the income per capita," introduced ZHANG. "There exists no high-income country in the world with more than 10% of their population working in agricultural sectors," she said.

In China, the past 40 years has seen an overall increase in proportion of off-farm workers in the country's rural population. In 1978, no more than 10% of its rural population worked in off-farm sectors; in 1981, this number increased to 16%, and in 2015, more than 70% of its population worked in off-farm sectors.

"Migrants emerged as the fastest growing segment in the population," she introduced, based on data from a survey on employment and rural development conducted by her team in 2019. When analyzing the data by gender, her team discovered that women joined the migration later than men, but at faster rates.

"This also implies that more women remain in the rural area and the agricultural sector," she reminded of the hidden reality, against the encouraging background that both total and per capita GDP increased many times, contributing to poverty alleviation.

Seemingly, women are left out again in this wave of growth, featuring a shift of growing center from the rural to the urban world. However, given the importance of rural sustainable development, this also means they are the major players to achieve sustainable development goals.

Women to Hold Up "More than Half of the Sky"

"If things do not change, the environmental dimension of SDGs as well as the International Agreed Environmental Goals (IAEGs) would not be achieved under current policy scenarios," ZHANG warned, citing crises in biodiversity, soil pollution and climate change. Species are going extinct at accelerating rates, and the soil is being polluted seriously due to improper uses of fertilizers and pesticides.

When making transformative change, we need to reconfigure basic social and production systems, and structures, she urged. "Urgent actions are needed now, or we would have to face irreversible impacts on the environment and human health."

Rural women play a significant but changing role in sustainable rural development, ZHANG insisted. They contribute a lot to farming, especially when men in the family have emigrated to cities; they help a lot in food security, and more. "They are seed keepers, and the food producers; at the same time, they are fully responsible for household food consumption," said ZHANG.

In fact, women need to hold up more than "half of the sky" — in the farming sector, 68% are women. They are responsible for food production and consumption, and climate challenge as well. They play a leading role in sustainable rural development. Investing in women in rural areas means investing in future sustainable development. Armed with science and innovation, women can play a major role in sustainable rural development.

"Our responsibility is to empower women for their significant roles in agrobiodiversity conservation and healthy diets for healthy people, beyond sustainable rural development," she advocated.

Towards this end, a joint project between UNEP-IEMP, UN-Women, IFAD and locals has been initiated on "Strengthening Chinese women farmers' economic resilience to escape poverty and adapt to climate change". Under this framework, knowledge and technology support are provided to rural women in China. Different efforts have been made to help women deal with the challenges emerging from the new situation.

Some of their efforts prove to be effective. For example, actions to help improve biodiversity conservation, and those aimed at enhancing farmers' seed keeping as well as breeding system are improving the resilience of local food system. Efforts to link farmer's seed keeping system to community support agriculture (CSA) for agroecology and circular farming, and those connecting ancient native wisdom with modern scientific knowledge are also producing desired results. This project has also established connection between science and the business sector. Such partnership, plus supportive policies might help the rural areas successfully transform to a greener and more sustainable way of development.