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Science needs Women 45

A conversation with Awardees of L'Oreal Fellowships, **Dr Li Jingmei** and **Asst. Prof Sierin Lim**

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Science Needs Women

Li Jingmei Sierin Lim

Introduction

The L'Oreal-UNESCO for Women in Science program was founded in 1998 in the firm belief that 'the world needs science and science needs women'. Every year, the program identifies, rewards, encourages and spotlights women from every continent whose discoveries have contributed to the advancement of scientific knowledge.

Women are largely underrepresented in scientific professions in most countries and while this situation has improved over the years, according to a report commissioned by the L'Oreal Foundation, a high school girl is three times less likely than a high school boy to go on to earn a doctorate in science. The report underscored the fact that society's pervasive stereotypes keep many young women away from scientific careers.

This program recognizes outstanding scientists in three different ways; the UNESCO-L'Oreal Awards for Women in Science, the UNESCO-L'Oreal International Fellowships, and the L'Oreal National Fellowships.

The Awards for Women in Science are five annual distinctions awarded to leading women researchers, one per continent for their scientific excellence. The awardees receive a laureate of $100,000 in recognition of their groundbreaking achievements and contributions to scientific progress. Two of these Laureates have gone on to receive Nobel Prizes.

The International Fellowships are granted annually to 15 young women researchers in the Life Sciences at the doctoral or post-doctoral level, three per continent. The fellowship would help them to pursue their research in some of the world's most prestigious laboratories.

The National Fellowships were designed to enable women at the doctorate level to pursue scientific research in their home country. These are awarded in 46 countries, one in the field of Life Sciences and one in Material Sciences. The fellows receive a $30,000 grant which they are free to use in any way they wish.

Since this program has been founded, over 2,000 women have been recognized in 115 countries, 82 Laureates honored for excellence in science, and 1,987 talented young women scientists granted fellowships to pursue promising research projects.

Singapore's Awardees

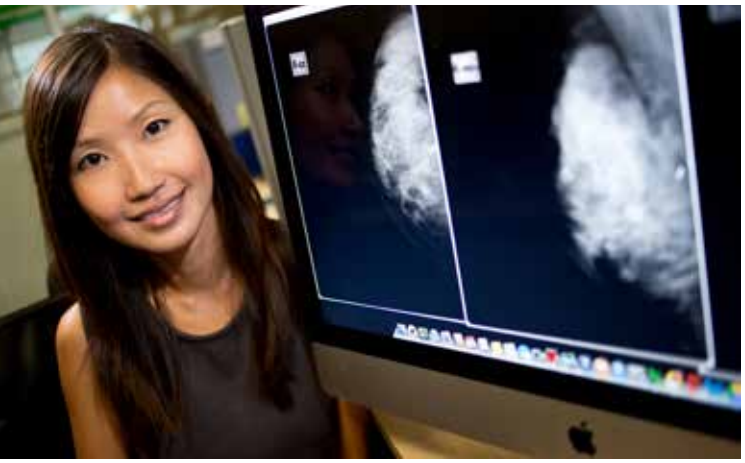
Since 2010, three women scientists from Singapore have been awarded the International Fellowship. Previously, Dr. Patricia Ng from the Agency of Science and Technology (A*STAR)'s Singapore

Immunology Network in 2012 and Dr. Marissa Teo of the National Cancer Centre in 2010. 12 scientists have been awarded the National Fellowship.

In 2013, two scientists in the field of Life Sciences have received fellowships. Dr. Li Jingmei from the Genome Institute of Singapore has received the International Fellowship, and Assistant Professor Sierin Lim from the Nanyang Technological University's School of Chemical and Biomedical Engineering received the National Fellowship for Life Sciences.

Rachel Lim had the opportunity to speak to both Dr. Li and Asst. Prof. Lim in an interview. We find out about their careers, the significance of the award to them and their future plans

What they do



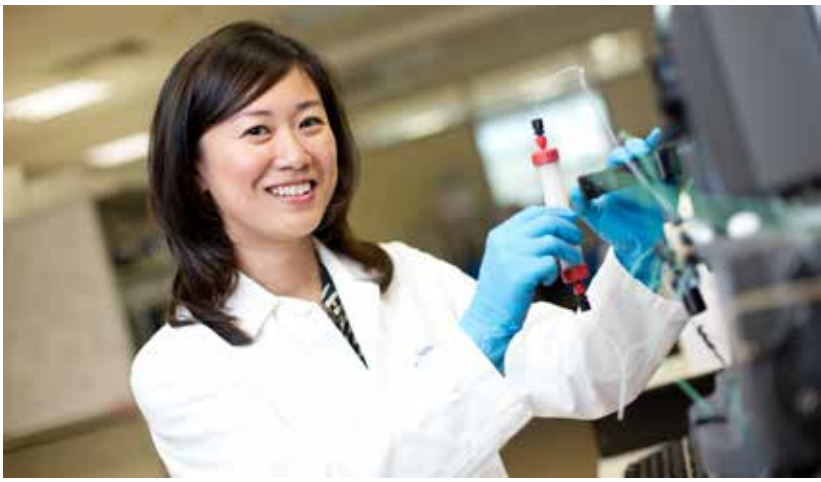
Dr. Li Jingmei: I'm trying to find genetic markers that can differentiate between breast cancer that is deadly versus breast cancer that might not grow or affect the women even if it's not treated. Breast cancer is not one disease, some tumors are more aggressive than others. We're trying to find early warning markers for the aggressive disease, one that can grow very fast and kill women very quickly. Research done previously has always focused on breast cancer versus no breast cancer. But breast cancer is such a huge umbrella of all the different subtypes of cancer, aggressive, non-aggressive. Now that we know a little bit more, we should differentiate between the aggressive and non-aggressive forms.

Most people don't know much about cancer so usually would go for the most aggressive form of treatment, which might not be necessary. So it's also important to educate the public.

I'm looking at single letter differences, in the mutations. These letters can be used to determine the risk of getting a disease in different people. We're looking for the significant snips (mutations) that can differentiate between the different forms of the disease. Each of these markers is called a common marker, as high as half the population can have them. The effect size of each is very small, and so a few of them would be needed in order to increase the risk of breast cancer drastically.

The biomarkers can serve as an early warning system. A woman can go for more mammograms at shorter intervals, if she's at high risk, because the cancer grows very fast. For example, currently it's once every two years, but she can choose to go every half a year, if she's at high risk. Or she can take preventive measures. Some women choose to take hormonal pills to lessen the risk of breast cancer.

I've completed a preliminary study using 2000 samples. We've actually found one significant marker. But you always need validation data sets so I'm going back to Sweden to collect more data.



Asst. Prof. Sierin Lim: I work with proteins and give them new functions that are distinct from what they normally perform in the body. I use them to carry drugs, and as an MRI contrast agent and to synthesize nanoparticles.

The way MRI works is by differentiating how water interacts with various tissues. When you have tumor in a tissue, the MRI would be able to pick it up, most of the time, as the water in and surrounding the tumor would interact distinctly from that in healthy tissue. The problem comes when the tumor is small, or if the edges are not distinguished making it very difficult for the physician to identify the lesion.

Contrast agent can then be administered. The contrast agent would be able to alter how the water orientates itself around the tumor, enhancing the contrast between the tumor and the healthy tissue.

In my lab, we are developing proteins to serve as carriers for contrast agent by loading it up with iron for example, making it magnetic. Upon administration, we hope to increase the contrast between the diseased tissue and healthy tissue. The protein not only can be used for imaging, you can use the protein to deliver drugs as well. So it will be both therapeutic and diagnostic.

The protein can be loaded up with the imaging contrast agents as well as the cancer drugs.

Most drug carriers would go all over the body, through the systemic circulation, and could cause some side effects. Our aim is to have the carriers accumulate in a certain place, for example at the cancer tissues.

Most cancer cells would have a specific protein on the outside called receptors. We are working on targeting our protein carriers to the receptors to enhance their localization delivery.

We are now performing animal studies to determine the clearance rate and immunological responses.

What got them into their respective fields

Dr. Li

My reasons aren't very logical. (*laughs*) I choose where I work and what I work on based on the people working there. When I was doing my PhD, I was lab-searching, I met this professor, who really looks like Einstein. That was my supervisor, and when I went to his lab it was a really happy place, and I thought I would be happy there too. He's really passionate and you really buy into all his teachings. So he got me into breast cancer and for seven years I haven't left. I'm going back to Sweden to work for him, using the fellowship.

Fortunately I don't have relatives who suffer from breast cancer, so I don't have any real first-hand experience with the disease. But because it's a women's disease, I kind of think it's closer. (*Asst. Prof. Lim: Something we can relate to, that we think we can probably contribute a little bit of understanding, a little bit of solution to the problem.*)

Asst. Prof. Lim

For me, it was also my Professor actually. (*Dr Li: Role models are very important!*) He got me into proteins and I just never left. I think the basic concept is that through the educational process, we identify our passion, you like something and try to expand it further. Finally, we find our own niche and decide what we really want to do in our career.

A big part (of getting into science) was my mom. She likes science. She would drop me and my brother off at the science section of bookshops. I picked up this science book and I just started reading. Our school holidays were usually filled with reading science magazines. She would also buy science books for us, so from very young, I was just attracted to science. Having someone there to encourage you every step of the way made a lot of difference. My mom and family give me significant moral support throughout the journey.

What the award means to them and how it would contribute to the science industry in Singapore

Dr. Li

Any kind of award is an encouragement. You sometimes need to know that what you're doing is important. Sometimes we need a kind of encouragement to keep going on, to help you see your final goal. And also, because it's L'Oreal, it's a lot of publicity for what I'm working on.

(The award) is kind of like an advertisement for Science. Science is always seen as a very boring field. It's possible to make it glam. I think when you have women in science, we show more passion, like when we talk about science, we put more emotion into it. We put a more human side to science, and I think that can reach out to the masses, the feminine touch. It's different.

Asst. Prof. Lim

It's an encouragement. It reinforces the fact that our research is useful, and will contribute to the society.

Having this award also allows me to reach out to the younger generation girls to inspire them to be scientists and to those who are considering science as a possible career path to actually go for it.

In the grand scale of Singapore research, women contribute to about 30%, which is higher compared to the world average. The award makes it possible for me to involve some of my female students to expand the current projects in the lab. I look at my part as (what I can do) in my immediate surroundings.

I occasionally open my lab on Saturdays for students (Secondary School level) to come in and do some science. To encourage them to learn more about science. In the long term, I contribute in training the future generations. (Asst. Prof. Lim teaches the students of NTU.)

Any criticisms they have encountered

Dr. Li

People are very skeptical about human genetics in general. So we always have to argue that the field is very young, it was only started in around 2007, with the first GWAS (genome-wide association study). It's not something you can achieve in ten years, you wouldn't know the whole genetic code, you wouldn't understand it. And we need to convince people that we are heading in the right direction, and sometime in the near future we will get there.

Future plans

Dr. Li

Eventually I would like to come back to Singapore to carry out my research here. In Sweden, the national registries make it very easy to carry out the research. So you are able to easily study the inheritance or prognosis of breast cancer. This cannot be done using Singapore data, because first, there are not enough samples, and no way to link family members. You would need to visit many physicians to request for the data. It's more difficult to carry out large-scale ambitious studies. I hope to find out more about breast cancer (in Sweden) and then come back to the Asian populations. Because we're quite special, we have so many races. It'll be interesting to find out if whatever observations we make hold true for the different populations.

Asst. Prof. Lim

I hope to be able to come up with a product that would help in the prevention, diagnosis, and treatment of various diseases. My research is a blend of basic science and applications. I'm working with clinicians to identify the most problematic cancer as well other diseases and develop technologies to manage them. We hope to bring our research into clinical, but we are still working on the animal models and from there, we'll see.

About the Interviewees

Li Jingmei is a breast cancer researcher at the Genome Institute of Singapore (GIS), A*STAR in the department of Human Genetics.

The central theme of Jingmei's research is the individualized prevention of breast cancer. She explores the impact of epidemiology and genetics on breast cancer etiology, with particular focus on biologically distinct disease subtypes. Together with her collaborators, they are furthering the limited understanding of mammographic density to gain insights into what constitutes dense breasts - one of the strongest risk factors of breast cancer – apart from being female – and how information can be captured from routine screening mammograms to predict breast cancer risk.

Jingmei attained her PhD in 2011 at the Karolinska Institutet in Sweden. She received her undergraduate degree in 2006 from the National University of Singapore and she is currently a Research Fellow (2011-present) at the Genome Institute of Singapore.

Sierin Lim is an Assistant Professor at the Division of Bioengineering, School of Chemical and Biomedical Engineering at the Nanyang Technological University of Singapore.

Sierin's Bioengineered and Applied Nanomaterials Laboratory (BeANs Lab) focuses on the design, engineering, and development of hybrid nano/microscale devices from biological parts by utilizing protein engineering as a tool. In particular, she is interested in self-assembling protein nanocapsules. The project scopes range from understanding the self-assembly mechanism to engineering the nanocapsules as platforms to carry various cargos for applications in medicine, energy, cosmetics, and food.

Sierin received both her B.S. and Ph.D. degrees from University of California at Los Angeles (UCLA) in Chemical Engineering and Biomedical Engineering, respectively. She joined NTU at the end of July 2007 after 2.5 years of postdoctoral research at University of California at Irvine (UCI). During her graduate studies, she received the UCLA Biomedical Engineering Departmental Fellowship and was actively involved in the Biomedical Engineering Society (BMES) UCLA Student Chapter serving as the president from 2003-2004 for which she received the Service Award. Upon arriving in Singapore, she founded the Biomedical Engineering Society (Singapore) Student Chapter (BES-SC) in 2009. In 2012 she was the Singapore recipient of the Asia Pacific Research Networking Fellowship from the International Federation for Medical and Biological Engineering.