

Profile of a Female Scientist: An Interview with Yunhee Kim By Jennifer Kruschwitz

Meeting brilliant people striving to make long-lasting contributions to the field of optics as well as the science-education community, has been a regular occurrence since my affiliation with the Optical Society of America (OSA). So when OSA asked me to interview and profile a few of the Society's female members for these newsletters, I jumped at the chance.

This month I had the chance to speak with Yunhee Kim, an OSA student member who describes her experiences studying Optical Three-Dimensional Displays in South Korea.

Kruschwitz: *Growing up in Seoul, South Korea, how did your passion for science begin? Did your parents or teachers have a great influence on this interest?*

Kim: My passion for science began when I was in the sixth grade with a science contest at school. I liked mathematics and science but I was never the best in the class. The contest was a written exam that did not include experiments; and I wanted the first prize! My mom always encouraged me by saying: "You can do it!" I challenged myself and studied very hard and got the best score in my school. Even now I remember the great pleasure it gave me to learn and study, and the feeling of accomplishment when I received first place.

This experience followed me through middle school and high school. I received the top scores in a science contest and was sent as a representative of my school to the national science contest. As I immersed myself more and more, I began to realize that there are so many things in nature which are beyond the language and logic of human beings; with little explainable through science. As a girl, I dreamed of being a scientist who would uncover part of the mystery.

Kruschwitz: *Eventually you entered the Engineering Department of Seoul National University and started to study Chemical Engineering, but quickly changed to Electrical Engineering, what led you to change your mind?*

Kim: Yes, at first my major was Chemical Engineering. During my freshman year Physics and Chemistry were required courses. Most of my colleagues in Chemical Engineering preferred Chemistry and chemical experiments, but Physics and physical experiments were so much more exciting for me! I really enjoyed doing experiments, writing reports and analyzing and comparing the experimental results with the theoretical predictions. In my sophomore year, my hunger for more Physics led me to attend a lecture on physical experiments in the department of physics. It turned out that the lecture was not

Yunhee Kim



Residence:
Seoul, South Korea

Advisor:
Byoung-ho Lee

Professional: *PhD student studying optical three-dimensional (3D) display.*

about classical Physics, but about electrical and electronic circuit experiments. The designing of electronic circuit was so interesting that I decided to change my major and to study Electrical Engineering.

Kruschwitz: *Would you tell us a bit about your advisor, OSA Board Member, Byoungho Lee and your experience as his student?*

Kim: My advisor is Prof. Byoungho Lee. Byoungho Lee joined the faculty of the School of Electrical Engineering at Seoul National University in 1994. He became a Fellow of SPIE (The International Society for Optical Engineering) in 2002 and a Fellow of OSA (The Optical Society of America) in 2005. He is serving as a Director-at-Large at OSA and is a member of the Awards Committee of the Board of Directors. He has served as an oversea editor for the *Japanese Journal of Applied Physics* and is now serving as a topical editor for *Applied Optics* and an editor for *Optical Fiber Technology*, as well as an editor for four domestic journals. His current research interests are three-dimensional display, diffractive optical elements, optical fiber gratings and nano-photonics including surface plasmon resonance applications.

When I was an undergraduate student I attended his lectures on “Fundamentals of Quantum Mechanics”, “Electromagnetic field” and “Fundamentals of Photonics”. The courses were very interesting and I decided to join his lab.

During my graduate courses, he was a model of what a researcher and an educator ought to be. He is a hard worker and he studies more than his graduate students do! He is always ready to advise each and every student and inspire us to overcome the current problems we are facing. I am very fortunate to have him as my advisor and it has led me to where I am today.

Kruschwitz: *It was actually a project you did for an Optical Engineering course taught by Prof. Lee that inspired you to pursue graduate work in his “Optical Engineering and Quantum Electronics Lab”. What about this project and the work, fascinated you?*

Kim: Yes, I was in my fourth year when I learned the principles of a laser, hologram and optical fiber in the course of photonics. My project for graduation was observing the output laser patterns from optical fibers, studying the theory and simulation of the patterns. The course and the project fascinated me, so I entered his laboratory for an M.S. course after graduation in 2003.

Kruschwitz: *During your graduate studies you received a prestigious scholarship from Samsung Electronics LCD, to fund your studies in Optical Three-Dimensional Display. Would you describe your research a bit, which as I understand it, is focused on enhancing the quality of reconstructed 3D images.*

Kim: Sure, my research is optical three-dimensional (3D) display; especially integral imaging and enhancement of the quality of the reconstructed 3D images. I proposed and demonstrated several methods to enhance the viewing parameters of 3D display.

Integral imaging is one of many promising techniques for 3D display, but it has some problems which need to be solved, such as the narrow viewing angle, the limitation of depth and the low resolution of reconstructed 3D images.

To widen the viewing angle I proposed a curved lens array method and advanced this method by adopting a projection system that uses a curved screen to expand the viewing angle.



Yunhee working in her lab.

To deepen the image depth, a two layered method is proposed. One is using multi-layered transparent LC display panels and another method is using polymer-dispersed liquid crystal (PDLC) films and a projector. I control the transparencies of PDLC films electrically and synchronize the projected images without any mechanical movement.

For high resolution 3D images, using double display devices with a beam splitter is proposed and I advance the system by adopting the pinhole array on LC in integral imaging. The pinhole array is moved electrically fast enough to make the after-image effect and displayed corresponding elemental images synchronously.

The schemes proposed are designed to enhance the 3D integrated image – viewing angle, image depth and image resolution. It is the theme of my Ph. D thesis. I believe that the proposed methods can contribute to developing an impressive 3D display.

Kruschwitz: *Is the field of imagining a “hot career” in Korea at this time?*

Kim: The display industry in Korea is a powerful one. Samsung and LG are the two most involved companies. They struggle to develop and produce better and better imaging. Many people are now focused on the next generation display, which could be the 3D form. Such conditions make academic-industrial cooperation very common nowadays.

Kruschwitz: *In addition to academics, what sort of activities do you enjoy in your spare time?*

Kim: One of my passions, in addition to studying, is creating flower arrangements. Many people find it very surprising to see a woman in engineering so eager to work with flowers. (I think it may be due to the preconception that engineering is rather cold and strict. I don't agree with that and think that a focus on human emotions and senses is needed for good engineering design.) The sight, the scent and the touch of flowers is very relaxing. I began to take flower arrangement lessons when I entered graduate school and still continue. Sometimes, I get so absorbed that forget to do my research, but at the same time it motivates me to study and manage my time



Yunhee with a hand tied bouquet she created.

well.

I also play racket ball. Even though I'm not very good, the intense exercise often helps me to get over the stress from school. As with Optics, the majority of people who play racket ball are men. I admit that the physical power of a woman is usually weaker than that of a man; but a woman should not give up the joy of playing.

Kruschwitz: *Thanks for taking the time to talk with me! Any parting advice for a young woman who may be considering a career in engineering?*

Kim: Imagine better human life in the future and that you and your career in engineering could contribute to creating that. Dream for a better future for yourself and never give up. Keep going! You can do it!



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Jennifer is a Sr. Optical Coating Engineer and President of her coating design firm, [JK Consulting](#). She received her Bachelors and Masters Degree in Optics from the University of Rochester in 1989 and 1995 respectively. She has been working in the field of optical interference coatings since 1988. Jennifer has been an active member of OSA since 1990, serving in a variety of volunteer and governance capacities.