

**Profile of a Female Scientist: An Interview with
Audrey Ellerbee
By Jennifer Kruschwitz**

Audrey Ellerbee

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.



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This month I had the chance to speak with Audrey Ellerbee, a scientist studying biomedical optics who graduated from Princeton with a B.S.E. in electrical engineering and a Ph.D. in biomedical engineering from Duke University. She is an active member of OSA, SPIE and the National Society of Black Engineers, among others. After teaching for a year in the Department of Infocommunications Technology at [Ngee Ann Polytechnic](#) in Singapore, she served as an Arthur H. Guenther Congressional Fellow. Take a moment to read about her many accomplishments and experiences in biomedical optics, around the world!

Kruschwitz: *For those of the MWOSA community, who aren't familiar with you, how did you get started in your career in biomedical optics?*

Ellerbee: My introduction to optics really began in my junior year of college as an electrical engineering (EE) major. To satisfy our major requirements, we had to choose an area of depth as well as take a number of courses to satisfy a breadth requirement. I was one of the few students in my class to select optics as a depth area. Although I'd chosen EE for my undergraduate major, I had known since high school that I wanted to study biomedical engineering. Therefore, combining biomedical engineering and optics in graduate school seemed a very natural and logical direction for my research.

Kruschwitz: *Biomedical optics seems to be such a "hot field" these days; would you explain a bit about what makes this field so exciting?*

Ellerbee: I think the most salient characteristics of biomedical optics that contribute to its rising popularity are that it is very applied and very practical. I wanted to study biomedical engineering



Audrey working in the lab.

because I wanted to do research that could impact the quality of life outcomes for people in a very tangible and meaningful way. Hence, my research is always motivated by a higher goal of helping people. At the end of the day, I'd like to know that my personal contribution to science has made a difference in someone's life outside of the research community. Biomedical optics certainly provides this opportunity.

Another exciting thing about biomedical optics is it is inherently interdisciplinary. Meaningful solutions can rarely be addressed by a single researcher or even a single research team. Although cross-disciplinary work is a trend in many fields, it is especially important for mine. In biomedical optics, scientists must work with clinicians or others in the biological community

to understand the nature of existing problems, with which understanding they can then return to their bench and work to engineer a viable solution. To be honest, it doesn't always work that way: sometimes scientists and engineers discover new technology without knowing its potential application. But in order to make it useful to the biomedical community, at some point there has to be an effort made to translate ideas from the bench to an environment where the broader community can make use of them. At any rate, learning about others' areas of expertise is always interesting and fun, and can bring new perspective to your own work.

Kruschwitz: *You were a visiting lecturer at [Ngee Ann Polytechnic](#) in Singapore from 2001-2002; what did you learn from your students?*

Ellerbe: After graduating from college, I deferred graduate school for one year to participate in a teaching program sponsored by [Princeton-in-Asia](#). My role was as a visiting lecturer in the Infocommunications Department of Ngee Ann Polytechnic, and I participated in all aspects of being a faculty member: advising students, teaching large (up to 400 students) and small classes, proctoring exams, etc. It was definitely one of the highlights of my life. Although it was awkward at times -- since some of my students were older than I was -- I learned much about teaching in different settings, and about how to inspire students in the classroom. The most important lesson I learned from my students was that each individual student is just that -- an individual. You can't tell how a person is, what they like or don't like, or their level of technical ability just by looking at them. Making such assumptions in the classroom can be detrimental to your teaching effectiveness. Every student should be given a chance to prove her ability in the classroom. Who knows where or when the next Einstein can appear? I have to say, though, my students were also responsible for teaching me the fun of para-para dance, which bubble tea tastes best, and where to find the best laksa in Singapore!



Audrey at the nature reserve that was around the corner from her home in Singapore.

Kruschwitz: *Last year, you served as an [OSA Arthur H. Guenther Congressional Fellow](#) and worked with Senator Carl Levin of Michigan. Tell us about this unique opportunity and the projects you most enjoyed working on.*

Ellerbe: During graduate school, I was very open-minded about post-graduate career options. When, three years before I graduated, a postdoc in my lab told me about a congressional fellow he had met, I knew instantly that this was an experience I wanted to have. Being selected as the Arthur H. Guenther Congressional Fellow was a dream come true (I was literally jumping up and down on my hotel bed when I found out). During my fellowship, I chose to work for Senator Carl Levin for a number of reasons. In addition to the Senator himself and his staff being extraordinarily friendly, I knew I would be given an opportunity to take on a large responsibility early on in my fellowship since (since two legislative assistants were going on maternity leave), as well as experience both the life



Audrey and Senator Levin after finishing a live radio session.

a congressional personal office and congressional committee staff member. With the state of Michigan being home to a number of

auto industries and research universities, the Senator also has an interest in practical science policy that supports these institutions, the economic engine of which is largely research. The role of a legislative assistant gave me significant exposure to many aspects of the legislative process -- from the stage when a bill is just an idea up to where it becomes signed into law. I also had the opportunity to interact regularly with constituents via media communication and during office visits; to work with other staffers to discuss legislative language and consider amendments; and prepare hearings and interact with expert witnesses. To my great pleasure, I also spent a fair bit of time writing to and meeting directly with the Senator.

Given the large economic crisis our country found itself in during 2008, I was kept very busy following issues primarily related to the housing and banking industries, especially as they relate to tax policy. I also helped prepare hearings related to oversight of the banking industry. Taxes notwithstanding, it was nonetheless fascinating to see how much of the debate in Congress for all issues comes down to issues of finance and funding. Thus, even with a finance-heavy portfolio, I was responsible for following components of such diverse issues as renewable energy funding, manufacturing research investment, and Medicare/Medicaid policy. I also met with constituents who visited the office throughout the year, such as OSA members who came to see us during Congressional Visit Days.

Overall, the experience gave me a newfound appreciation for the work of our elected politicians, as well as an appreciation of my rights as a citizen and the channels available to me to voice my opinion on issues that affect policy decisions made in Washington.

Kruschwitz: *You have both international and domestic experience in education outreach; what can OSA members do to promote STEM education in their countries?*

Ellerbe: One thing my experience in Singapore taught me is that different cultural climates may necessitate different approaches to teaching and promoting STEM in the education system for various countries. However, no one educational system is 100% perfect. Just as no two students are exactly alike, so, too, different approaches are needed to promote STEM in different countries, or to different students within the same classroom. OSA members should view their cultural experiences as an asset that gives them an intuitive sense on how to best effect change and promote STEM education in their country, but should remain open-minded to implementing best practices of others as well.

Kruschwitz: *You are active in a variety of professional organizations including OSA, SPIE and the National Society of Black Engineers. How can a young professional, such as yourself, benefit from these affiliations?*

Ellerbe: In addition to their professional programming, these organizations provide ample forums for scientists to communicate their work informally to peers. Such opportunities for idea exchange are a very important part of the scientific process, and can be extremely beneficial for young professionals, in particular. For example, young professionals beginning their careers can use the people networks enabled by such organizations to reach up, out, and below them to access different forms of career support. More seasoned professionals can share technical knowledge and expertise, as well as play a mentoring role. Peer professionals can offer moral support and help you assess whether your experience (good or bad) is unique to your situation or normal for someone at your professional level. Interactions with those who yet aspire to be where you already are can provide many good teaching moments that are valuable confidence boosters and help cement the knowledge you already have. Finally, all of these organizations strive very hard to bridge interactions between academia and

industry -- something that is very difficult to create on your own -- which helps create a balanced perspective of the field and exposure to many career options.

Kruschwitz: *You have currently taken a leave from Stanford University to pursue a postdoctoral fellowship at Harvard University; through your experiences at universities around the world, what innovations do you expect to see in Optics over the next 10 years?*

Ellerbe: The pace of science increases so rapidly that it's hard to predict where the field will be in ten years. Given my passion for travel, interest in biomedical research, and love for optics, I am really hoping -- and expect -- to see optics play a bigger role in global health solutions. In the same way that the optical networking helped revolutionize telecommunication, mass commercialization of optics-based solutions for health care may soon lead to the sorts of low-cost / no-cost regime solutions that would make this technology accessible to people in developing countries, and to those within our own country for whom the current cost of health care represents an unsustainable portion of family income.

I definitely look forward to beginning my work at Stanford within the next few years and hope to work in collaboration with others in the School of Engineering and the Medical School to strengthen the biomedical optics program there.

Kruschwitz: *In closing, what words do you have for future scientists?*

Ellerbe: Scientists are united by a common passion for discovery. Contrary to what some may say, discovery need not happen in leaps and bounds, but rather requires only a steadfast willingness to ask one question at a time, and then another, and then another... I therefore encourage everyone with an inquisitive mind to consider studying science or engineering -- we need your ideas!



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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.