Shauna Somerville

How did you spend your career?

My career was spent in academia. After completing my PhD in 1981 at the University of Illinois at Urbana-Champaign, I started with a temporary teaching position in the Genetics Department at the University of Alberta. From there, I took a Research Associate position in the Botany Department and DOE-Plant Research Laboratory at Michigan State University. I subsequently accepted a faculty position at Michigan State University and advanced through the ranks. In 1994, I moved to the Carnegie Institution of Science, Department of Plant Biology and, in 2008, moved to the Plant and Microbial Biology Department at the University of California at Berkeley, where I was a professor until my retirement in 2021.

My PhD studies with Bill Ogren (retired, University of Illinois at Urbana, Champaign) were on photorespiration – using mutational analyses to dissect the photorespiratory pathway, which was disputed at the time. When my husband, Chris Somerville, and I arrived at the DOE-Plant Research Laboratory, I was eager to find another area of research to pursue and talked with several colleagues about their own research fields, while looking for opportunities where I might make a contribution. It was a series of discussions with a graduate student, Roger Wise (currently: Iowa State University), Al Ellingboe's last student at Michigan State University, which convinced me to work on powdery mildew diseases. With my background in genetics, I was attracted to the Gene-for-Gene hypothesis in plant pathology. This hypothesis was the summation of years of genetic studies on the inheritance of disease resistance in plants and the virulence of their pathogens. The hypothesis provided explanatory power for observations made by plant breeders and suggested mechanisms that could be tested with the new molecular methods of plant biology developed in the early 1980's. Since that time, our understanding of host-pathogen interactions has evolved and broadened in complexity. This field of research has been a rich source of new insights about plant functions, from signaling and vesicle trafficking, to cell death and how these processes impact host-pathogen interactions.

What do you consider to be your most important contributions to plant science?

I played a part in bringing Arabidopsis to plant pathology. I was discouraged with early attempts by plant pathology colleagues to find a suitable Arabidopsis pathogen. I think they felt an introduced (in the USA) weed like Arabidopsis would not have any significant diseases. But over the years, examples of every major pathogen group have been studied in Arabidopsis and the information gleaned from these studies stimulated new discoveries and new applications for crop plants. It has been very satisfying to witness the demonstration of the value of a model plant to understanding plant biology.

A series of experiments that began in the 1990's with a postdoctoral fellow, John Vogel (currently: Joint Genome Institute), were insightful to me. As the field of plant pathology was crowded with people identifying new resistance genes and pursuing studies to determine how they function, John and I decided to ask this question: "What plant components contribute to susceptibility?". With an obligate biotrophic pathogen like powdery mildew, we hoped to identify an "achilles heel", i.e., a plant component without which the pathogen could not survive. John isolated a series of mutants that were resistant to the Arabidopsis powdery mildew and presumably compromised in "susceptibility factors". Subsequent studies have shown that some of these mutants are

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altered in various aspects of plant cell wall structure. This suggests that stealthy pathogens, like the powdery mildews, need to be able to breach the plant cell wall without raising an alarm. Presumably, part of their host specialization includes cell wall degrading enzymes that allow entry of the pathogen with minimal host cell wall disruption.

Another highlight was a project arising from the work of Michele Heath (retired, University of Toronto) on defenses against non-adapted pathogens (i.e., non-host resistance). This was a collaborative project with Hans Thordal-Christensen (University of Copenhagen) and Paul Schulze-Lefert (Max Planck Institute, Köln) and their co-workers, and a talented group of students and post-doctoral fellows in my lab initially led by a graduate student, Mónica Stein (currently: Universidad del Valle de Guatemala*)*. Again, using a mutational approach, our three groups identified Arabidopsis mutants with compromised resistance to the barley powdery mildew pathogen. These mutants led to the discovery of a novel phytoalexin biochemical pathway in Arabidopsis and highlighted the focal accumulation of subcellular defenses at sites where pathogens attempt to gain entry to cells and the role of vesicle trafficking in plant defense.

These research achievements were dependent on a group of very talented and inspiring graduate students and postdoctoral fellows. My interactions with them in the lab, and subsequently watching their careers develop, has been a constant source of joy.

When did you become a member of ASPP/ASPB?

I do not remember clearly when I first joined the ASPP society, as it was called then, but it was early in my career. My PhD advisor, Bill Ogren, encouraged membership in the society.

How did the society impact your career and what was your motivation for becoming a Founding Member of the Legacy Society?

Over the years, the society newsletters were always welcome arrivals in my mailbox. They provided updates on colleagues, advances in the field and information about opportunities for funding – this was especially important in the days before the internet, and it remains important by providing targeted information relevant to plant biologists. The hard copies of the journals were "must reads" on Saturday mornings when I was starting out. I have fond memories of scanning the articles in my field and of reading those random articles that just looked interesting.

With the expansion and broader dissemination of knowledge and of disinformation in society, I feel that scientific societies like the ASPB play an ever more important role for plant biologists. The ASPB provides a centralized source of information useful to its members, it highlights new advances in the field, and it supports young scientists.

What important advice would you give to individuals at the start of their career in plant science?

I find this is a difficult question to answer. I feel that the nature of academia has changed in the almost 40 years since I started my career. If I could speak to my younger self, I would say to be bolder and to hold precious the time when your mind can wander freely - to be creative, to think beyond the next experiment, to look for opportunities in areas that are poorly explored. One of my favorite seminar series early in my career (in the 1980's) at the Plant Research Lab was one in which senior colleagues talked about classic unsolved problems in the field. A talk by Jan Zeevaart on the nature of florigen still stands out for me. It was at a time when molecular techniques were first being adapted for use in plants and one could see how the new methods would open new avenues into these classic problems. Another favorite was the once-a-month lunch-time discussions at the Carnegie Institution – we were a diverse group researching plant development, algal photosynthesis, cell wall biosynthesis, transport mechanisms and phytochrome signaling and presenting your "craziest" ideas for feedback was a great way to hone your ideas and push the boundaries of what you might think of as possible. Sabbatical periods can also be very productive. Chris and I spent several months in Paris before I started my PhD studies and I spent

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6-months with Jeff Dangl and Sarah Grant (currently: University of North Carolina) at the Max Delbruck Institute in Köln, prior to our move to the Carnegie Institution. Stepping out of day-to-day routines and engaging with new colleagues was very stimulating on both occasions and both periods presaged a change in research direction. One needs to cultivate a habit of being creative. Take advantage of sabbatical leaves when they arise.

Academic family tree: https://academictree.org/cellbio/tree.php?pid=656606