John Ohlrogge

How did you spend your career?

My original career goal was to become a researcher in medical biochemistry. However, while studying lipid biochemistry in graduate school at the University of Michigan, I realized that many areas of medical research were crowded with scientists competing on similar projects. Less research was being done on plants, which meant there were more opportunities to make new discoveries.

Therefore, I decided to do a postdoc at the University of California, Davis, with Paul Stumpf, who was a leader in plant lipid research. Arriving in Davis, having never taken coursework on plants, I was embarrassed by how little I knew about plants. I attended as many seminars as possible and read as much as I could to catch up. The diverse international group of postdocs and visitors in the Stumpf lab were wonderful colleagues who taught me protein purification, enzyme assay methods, and radiolabeling strategies. During this time, Stumpf was elected to NAS, and my work on the localization of acyl carrier protein was his first paper communicated to PNAS; it was my most highly cited work for many years.

After three years as a postdoc in Davis, I took a position in 1979 at the USDA regional research lab in Peoria, Illinois. Without teaching or committee assignments, Peoria was an excellent place to focus all my attention on research. However, I greatly missed the environment of a university. Therefore, I was

delighted when I received a call from Chris Somerville in 1986, inviting me to apply for a faculty position at Michigan State University. I was fortunate to receive an offer and to join a department and plant science community with many superb scientists. I took advantage of sabbaticals in 1994 (New Zealand and Sweden) and in 2000 (Australia) that provided opportunities to slow down a little and think more deeply about research, and these experiences were highlights of my career.

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

My career was guided by the goal to do research that would not only advance knowledge, but also benefit society. I wanted to be able to assure taxpayers who were supporting my research that their tax dollars were well invested. This led to a career-long focus on understanding the biosynthesis of seed oils that are a major source of food and a feedstock for many industrial products. We studied biochemical regulation of fatty acid synthesis and demonstrated in 1991 that control was exerted at the acetyl-CoA carboxylase (ACCase) reaction. Over the next few years we identified several genes encoding subunits of ACCase for both plastid and cytosol enzymes, helping clarify the structure and roles of these different ACCase isoforms. We also focused on in vivo isotope labeling as a strategy to distinguish between alternative pathways for oil biosynthesis. In one case, this allowed Jorg Schwender to discover a new pathway that uses RuBisCo to increase the efficiency of carbohydrate conversion to oil in green seeds.

Mike Pollard and I were postdocs together in the Stumpf lab, and I was extremely fortunate when he decided to leave industry to join my lab in 1996. Much of the most important work in my career was the result of synergistic collaborations with Mike that occurred through our different skills and approaches to research.

One key discovery in our lab had a serendipitous origin. While investigating acyltransferases that might be involved in seed oil biosynthesis, Fred Beisson and Yonghua Li-Beisson noticed that the seed coat of a mutant in a glycerol-3-phosphate acyltransferase (GPAT) was a different color and more permeable to salts and dyes. Further investigation revealed that the GPAT5 enzyme controls the synthesis of suberin in seeds and roots and is not involved in oil biosynthesis. This opened the door to identification of several

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other acyltransferases required for cutin and suberin synthesis and the discovery that some were bifunctional enzymes with a phosphatase domain that produced monoacylglycerol as a key intermediate in extracellular lipid biosynthesis.

Our lab also developed the website databases ARALIP (http://aralip.plantbiology.msu.edu/) and PlantFAdb (https://plantfadb.org/) as tools to present large amounts of information that can be easily accessed by anyone in the world. Producing ARALIP became an international team effort that was coordinated with writing a chapter, "Acyl Lipid Metabolism," for *The Arabidopsis Book* (2010). More than 25 Arabidopsis researchers contributed to the chapter and website. The book chapter remains one of the most read and downloaded of *The Arabidopsis Book.*

I dreamed for many years of producing the PlantFAdb.org website, but it was not until I retired in 2016 that I had enough time to achieve this dream. This website brings together >75 years of published data on the fatty acid composition of seeds of more than 9,000 plants. A unique feature allows users to easily explore chemotaxonomic relationships between >450 fatty acid structures and plant species by displaying these relationships on dynamic phylogenetic trees. An added benefit of both websites is that they also help us identify what is *not* known. By identifying gaps in knowledge, young researchers can find many important new topics to study.

How did the Society impact your career, and what motivated you to become a Founding Member of the Legacy Society?

The biggest impact ASPB made on my career was through publication of its two great journals, *Plant Physiology* and *The Plant Cell*. Through an excellent and transparent review process and dedicated staff, these journals have for decades maintained the highest standards. I was honored to serve as an associate editor of *Plant Physiology* for many years. Scientific publishing is now threatened in many ways, and I believe journals that are based in well-functioning professional societies, such as ASPB, are best able to resist commercial pressures and provide rigor and strength to our discipline that are available in no other way.

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

If you have a career in scientific research, you are lucky to have one of the best jobs in the world! I think young researchers early in their career should spend time to identify the 5–10 most important unsolved questions in their field and then decide to which of these they could best contribute. Approximately 30% of the genes in plants are of unknown function. This tells us we have a huge amount of work to do to understand plants!

But working too hard and too many hours is not good for scientific creativity. The best ideas usually come when we are relaxed. Spending time with family and friends must always be a priority, and this often will help your science be more creative.

Finally, most research in academics is supported by government grants, and I think we all should remember that we work for the taxpayers and have a moral obligation to try to help society with our research.

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