Louis A. Sherman

How did you spend your career?

My background and career differ from those of most in ASPB, but it will shine a light on the strengths of a diverse organization. I was a physics major at the University of Chicago and was forced to take a couple of quarters of biology. The first course in the sequence was Genetics, and the fact that an area of biology benefited from quantitative analysis was eye opening; I began thinking of moving into a field that bridged physics and biology. Fortunately, Chicago had a remedy for that, and I was accepted into the Department of Biophysics on completion of my BS in physics in 1965. I began thinking about a field like photosynthesis because it was a photophysical problem that might allow me to combine biophysics and genetics. The only faculty member working with green things at that time was Bob Haselkorn, who was interested in plant viruses, but who also had begun to study cyanophages—phages that infect cyanobacteria. Thus a lifelong association was born (with both cyanobacteria and Bob!).

I completed my PhD in biophysics in 1970 and then continued with the plan by doing a postdoc with Rod Clayton at Cornell. Rod made many conceptual and experimental advances in photosynthesis, and I was fortunate to spend time under his tutelage. I also learned how to design and build optical equipment, and this came in very handy as a young faculty member. I worked with photosynthetic bacteria in Rod's lab, the only time I strayed from work with cyanobacteria.

I began my career at the University of Missouri in Columbia in 1972 and spent 17 gratifying years there. My long-term goal was to identify a genetic system in a unicellular cyanobacterium, and I continued phage work with cyanophages that I isolated, in part looking for lysogeny. I also began work with photosynthetic membranes. A sabbatical in 1979 enabled me to identify a good transformable strain, *Synechococcus* sp. PCC 7942, and this set the stage for the next decade. This turned out to be an excellent genetic system and enabled the first of my graduate students, Susan Golden, to identify three copies of the *psbA* gene, a novel finding at the time. The lab also worked on photosystem II (PSII), especially PsbO and the water-splitting apparatus in PSII. One side project began with analysis of growth under Fe-limiting conditions, and this became a major undertaking that led to the identification of IsiA, a novel Chl-binding protein that became prominent under low Fe and other oxidative-stress conditions.

I was appointed director of the Division of Biological Sciences at Missouri in 1985, and one objective was to build up our faculty in plant sciences. In 1989, I was asked to fill a similar role as head of Biological Sciences at Purdue University, and I served in that capacity for over a decade.

My research during these past 30 years can neatly be categorized as that performed during my time as head and that performed as post-head. During the 1990s, my research covered three major areas, two of which were quite new. I continued the work on photosynthesis, especially on the function of PsbO and other components of the water-oxidizing complex. We also studied the structure and function of the photosynthetic membrane using many different techniques, including immuno-electron microscopy, and we pioneered a number of important techniques.

The first new area was based on a NASA center I helped bring to Purdue—it was one of the three NSCORT (NASA Specialized Center of Outreach, Research, and Training) programs established by NASA and provided an opportunity to determine how to provide food and oxygen to keep astronauts alive during long-term space travel and colonization. The center involved a total of nine faculty, including those from Engineering, Food Sciences, and Horticulture, and was led by Cary Mitchell in Horticulture. This

continued on next page

was an extraordinary opportunity and brought me into contact with many plant scientists. Of course, I handled the cyanobacterial component of the project, and our efforts would have made it much easier for Matt Damon to survive his time on Mars! One component of this work was the involvement of a unicellular, nitrogen-fixing strain of the genus *Cyanothece,* a strain that could fix both CO_2 and N_2 from the air and thus provided both important macronutrients for growth. We then began studying the regulation of such strains in order to answer the question of how a unicellular strain could evolve O_2 in the same cell that was fixing N_2 with the enzyme nitrogenase, which is poisoned by O_2.

I have always been grateful that I was able to continue research after 15 years doing administration, and in many ways, this period was one of the most challenging and satisfying. It provided the opportunity for prolonged collaborations with a former postdoc (Rob Burnap, at Oklahoma State University) on microarrays of *Synechocystis* sp. PCC 6803 and with a former student (Himadri Pakrasi at Washington University in St. Louis) on many areas of genomics, transcriptomics, and proteomics, mostly with *Cyanothece* strains. These studies revolved around gene regulation and led to many new and exciting results and regulatory models. We were also able to have a series of *Cyanothece* strains sequenced by the DOE Joint Genome Initiative, and this provided a great deal of novel information about the metabolism of cyanobacteria (to say nothing about upsetting cyanobacterial nomenclature—the one genus became three defined genera). Finally, we (Himadri as PI, myself, and many others) were awarded a Grand Challenge Grant from the Environmental Molecular Sciences Laboratory at the DOE Pacific Northwest National Laboratory to study the dynamics of membranes in cyanobacteria. These studies have emphasized the cleverness of an organism that has evolved over ~2.5 billion years and highlighted my 50-year fascination with these microscopic green things.

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

I could mention many specific findings and conclusions, and a few are briefly discussed above. But the most important contribution was establishing cyanobacteria as an excellent model system for the study of photosynthesis. For those used to a few specific systems, such as Arabidopsis, the landscape was far different in the 1970s. Studies were performed on many plant systems (who remembers winter vs. summer spinach?), as well as many microbes. In many cases, the photosynthetic microbes were grown under a wide variety of conditions, and it should now be of no surprise that experimental results varied from lab to lab and that scientists argued over virtually every finding. The acquisition of a good genetic cyanobacterial strain led to the identification of other such strains, and cyanobacteria became one of the most popular systems for the study of the photosynthetic mechanism. In turn, other cyanobacteria were identified for the study of various processes, and there are now more than 1,500 cyanobacterial sequences available.

When did you become a member of ASPP/ASPB?

The exact year in which I became a member is now lost in the fog of time, but it was in the mid-1970s. The journal *Plant Physiology* was a most important one, and a subscription to this journal (and membership) was a first step toward becoming a serious scientist. During the 1980s, I became more involved with the Society, including on the editorial board of *Plant Physiology*. Major changes were made to this journal during that period, and the journal and the Society had an improved profile among life sciences societies.

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

Listen up, because I want to give you some examples of why ASPB is one of the most accomplished and important scientific societies. The story will start with cyanobacteria and end with plant sciences and genomics.

The annual meetings were always valuable, and I attended as many as I could. My closer involvement with ASPP began in 1987, when the meeting was held in St. Louis. Bob Haselkorn had put on a meeting in Chicago in 1984 for the small group that was working on the molecular biology of cyanobac-

continued on next page

teria. It was an exciting gathering, and I felt that the experience needed to be continued so we could generate a real community. When I saw that the ASPB annual meeting would be held in St. Louis, I asked if we could establish an affiliated meeting on cyanobacteria, and this suggestion was approved. I was still in Columbia, Missouri, and Himadri Pakrasi, my former student who had been a postdoc with Charlie Arnzten, had just started as an assistant professor at Washington University. Another cyanobacteriologist, Terry Thiel, was at the University of Missouri–St. Louis, so I figured that we would make a good organizing committee. The meeting ultimately attracted about 110 participants, some from overseas—a surprisingly large number, and one that indicated we indeed had a community. The next meeting was also held in conjunction with ASPP, and we then went off on our own. The 13th triennial meeting was held in 2019, and our community continues to grow and expand.

But that was just the appetizer. In November 1994, the Republicans took control of Congress, and one of their stated goals was to abolish DOE (they knew about climate and biofuels at DOE, but not about nuclear weapons!). I had been involved with public affairs committees within all my societies, and I stated at the 1995 Biophysical Society meeting that I wanted to concentrate my efforts on the plant-related agencies, DOE, NSF, and USDA, rather than NIH. Within a week, I was contacted by ASPB representatives to join the nascent Public Affairs Committee, chaired at that time by Ralph Quatrano at Washington University, and then by me. At Purdue, I was in a good position—our congressman, John Myers, was chair of the House Appropriations Subcommittee for Energy and Water Development (DOE funding for photosynthesis), and our senators were Richard Lugar (USDA) and Dan Coats (NSF). Rep. Myers had a popcorn machine in his office that was always making popcorn (did I mention Indiana?), and I would often stop in his office at the end of a day when I was on the Hill. As luck would have it, another popcorn fan was the head of the Corn Growers Association, and we introduced ourselves over bowls of popcorn. We realized quickly that we had similar goals—sequencing of the maize genome, so that Monsanto wouldn't have all the information, as he put it. Many formal contacts by many ASPB representatives followed, and we ultimately explained to this group the complexity of the maize genome and why it was essential to initiate a long-term program that began with a model organism like Arabidopsis.

This group was very influential in ensuring that we received a cordial welcome when we visited members and their staff in both the House and the Senate. Sen. Lugar advised us that trying to start a new basic science program in USDA was a nonstarter because of the bad reputation that USDA had developed in Congress. He suggested NSF as a logical home, and here is where we really had some luck. Rita Colwell had been appointed head of NSF, and she was a Purdue graduate and a very accomplished scientist. She could readily understand the justification for the program and the reason why NSF was the best home for this new initiative. The most important person in the Senate to make this happen was Sen. Kit Bond of Missouri, and we were fortunate to have some key ASPB members in the state, especially Doug Randall at the University of Missouri. Doug was the coordinator of our interactions with Sen. Bond and his staff, and the idea became a reality. The program began in fiscal year 1998 at the level of $40 million, ultimately rising to $105 million. This was a large effort by many people, and ASPB members should be proud of the Society's accomplishments.

After I stepped down as head of this committee, I was asked to serve on the ASPB board of trustees. Once again, this was a seminal time, and we made significant changes to the way in which our endowment was invested—all for the good, as time has indicated. But I think my most lasting accomplishment turned out to be involvement in the hiring of the current chief executive officer, Crispin Taylor. He should be getting close to his 20th anniversary in that position, and I'll let members decide how valuable a legacy this might be!

All of this progress was wonderful, but if we review the rest of this narrative, you'll see why I broke most of my ties to ASPB about 2005. I was now working on microarrays to study everything about cyanobacteria, and I realized how little I knew about other bacte-

continued on next page

rial functions and systems. So I became more of a microbiologist, in teaching as well as in research. At the same time, all the other ASPB members were learning tons of new stuff about plants, and I realized that I was no longer very well educated in plant sciences. So goes the world of science! Nonetheless, I cherish all of the time I spent on ASPB affairs, and I consider it to be among the most important of all life sciences societies. Thus, joining the Legacy Society was a no-brainer—I consider ASPB to be a critically important scientific society and one well worth supporting.

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

I think that the lesson from the above anecdotes is that a society like ASPB can be your friend! You may not know me or any of the names mentioned above, but you are the beneficiary of our communal activities. So join ASPB for the long run and become an active member. This should be one step in establishing your own scientific community—a far better idea than remaining isolated. Working in collaboration with others is helpful, and the ASPB meetings can be a great place to meet those who are working in related, but not identical, fields. Finally, I have always found that the advice of the established leaders in a field can be suspect, so listen to others, assimilate the information, and then set your own path.

Academic Family Tree
https://academictree.org/plantbio/tree.php?pid=806739