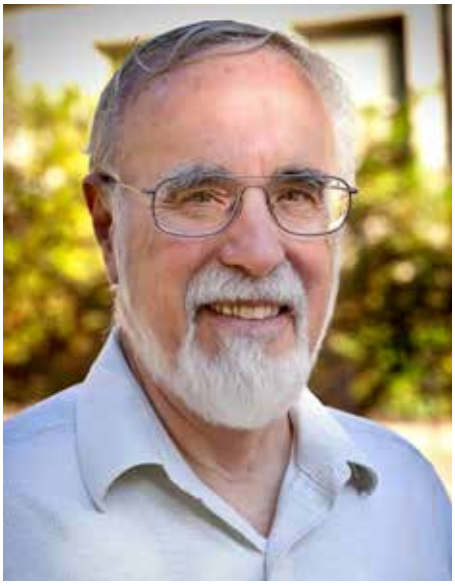
Stan Roux



How did you spend your career?

After getting a BA in biology and philosophy (double major) at Spring Hill College in Mobile, Alabama, I received an MS in biology at Loyola University in New Orleans in 1968. There, my research, which was mentored by Jack McHale, was a study of the ultrastructural changes that occur in senescing leaves of tomato. My documentation of the sequence of organelle breakdowns that occurred as the leaves senesced was published in *Phyton*—my first publication!

The chairman of the department at Loyola knew Ian Sussex at Yale University quite well, and he convinced me to apply for the biology PhD program there. I was accepted and attended Yale with the support of an NSF graduate fellowship. During my first year at Yale, I worked in Ben Bouck's lab to better document the ultrastructural changes that occur during leaf senescence. The following summer I went to Woods Hole, Massachusetts, to take the course in plant development, which was taught primarily by Bill Hillman. Bill directed my research on a project to use biochemical approaches to study the conformational changes that occur in purified phytochrome when it is activated by red light. My initial results were so promising that Bill suggested I turn the project into my PhD dissertation, which I did, carrying out virtually all my research in Bill's lab at Brookhaven National Laboratory. This unusual arrangement would not have been possible without the advocacy of Art Galston, who agreed to be my nominal Yale adviser while I was working at Brookhaven. My dissertation, "Chemical Approaches to the Structural Properties of Phytochrome," solidified my love of protein chemistry and phytochrome research, and this love influenced all the research I did for the next 45+ years, through to today.

An NIH postdoctoral fellowship gave me the opportunity to work with Fred Richards and Lubert Stryer in the Department of Biophysics at Yale University, but this time my research was actually on the Yale campus. Lubert and his senior team member, Juan Yguerabide, were trying to understand how light influenced the interaction of rhodopsin with model lipid bilayers, and their expertise helped guide my research on the light-dependent interaction of phytochrome with artificial membranes. Two publications later, I was ready to apply for a faculty position, and in 1973 I began my faculty career in the Biology Department at the University of Pittsburgh.

Five years later, my department considered me for promotion to associate professor with tenure. Although my publication and grant support records were quite good, I was a bit nervous about the tenure decision, since the department that hired me had been reorganized and the new chairman did not know me at all. I decided to enter the job market, and when I was offered an assistant professorship without tenure at the University of Texas (UT), Austin, I had a hard decision to make, because the University of Pittsburgh decided to offer me promotion to associate professor *with* tenure. I chose to leave my Pittsburgh department, where I was the only plant biologist on a faculty of 50, and join the Botany Department at UT, which at that time was ranked the best in the country. Two years later I was promoted to associate professor with tenure, and eight years later I became chair of the Plant Biology Department at UT.

During my first two decades at UT, my research focused primarily on light- and calcium-regulated protein kinases, protein phosphatases, and apyrases (NTPDases) that function in the nucleus of Arabidopsis and pea seedlings. This research wedded my dual interests in protein chemistry and phytochrome signaling. It was generously funded by both NSF and NASA. My research took an unexpected turn in the late 1990s, when I discov-

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ered that the nuclear apyrase I was studying could also function on the plasma membrane, where its role was to limit the concentration of extracellular ATP (eATP). Ever since then, I have been pioneering research to clarify the role of eATP and apyrase in regulating plant growth and development, including development that was controlled by phytochrome and by gravity.

About 10 years ago, I made another unexpected discovery: the constitutive expression of apyrase in Arabidopsis promoted auxin transport and, in parallel, an expanded root system architecture (RSA) and increased seed yield. A local biotech company funded my lab to test whether the constitutive expression of apyrase could promote an expanded RSA and seed yield in crop plants such as soybean and corn. These tests turned out to be very positive in both greenhouse and field trials. Now, for the first time in my life, my basic research seems to have some promise of being used to address the issue of food security and to benefit people! I am continuing this research with a focus on discovering the molecular mechanisms by which apyrase expression promotes auxin transport, plant growth, and seed yield.

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

When I was selected as a fellow of ASPB and of AAAS, these organizations noted that this recognition was primarily for my work on the role of eATP and apyrases in regulating plant growth and development. I would agree with that judgment, although my pioneering publications on calcium signaling and on the functions of the calcium-binding proteins calmodulin, calcium-dependent protein kinase, and annexin have also been highly cited. My lab's annexin work was led by my long-term associate Greg Clark, who remains an internationally recognized leader in this field and is currently a co-PI of my funded research.

Beyond my research, I consider my teaching plant biology courses to undergraduates and graduate students to be an important contribution to plant science. Course reviews by more than 3,000 students who took my courses in Plant Growth and Development, Plant Sensing, Discovery Laboratory, and Hidden Treasures of Plants indicate that they gained a new appreciation of the value of plants in society, an appreciation too often missing in biology courses offered in universities that do not have agricultural programs. I consider my 2015 Excellence in Education Award from ASPB among my highest honors.

When did you become a member of ASPP/ASPB?

I joined in the late 1960s during my PhD studies. I started going to the annual meetings at that time, and I have attended regularly since then.

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

The annual meetings sponsored by ASPP/ASPB were for me and my lab group the best events to learn about the latest breakthroughs in plant biology and to present and get feedback on our research. Conversations at those meetings generated ideas that led to successful experiments and grant proposals. Beyond the major impact of the meetings on my research and teaching, the Society also benefited my career through effective lobbying efforts in support of federal funding for plant biology, and my gratitude for this advocacy role of ASPB was a main motivation for my becoming a Founding Member of the Legacy Society.

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

Attend meetings and present your work often, because this will enhance your visibility and provide opportunities for feedback on your discoveries. Be receptive to criticism and generous in your praise of quality research in your field, for the more you encourage that quality, the more your field will prosper. Be ready and willing to let your unexpected discoveries lead your research in new directions. As a speaker and teacher, strive to convince your audience that plant biology is exciting and worthy of public support. Invest quality time with your family and friends and in pursuing joie de vivre, for happy scientists make better discoverers.