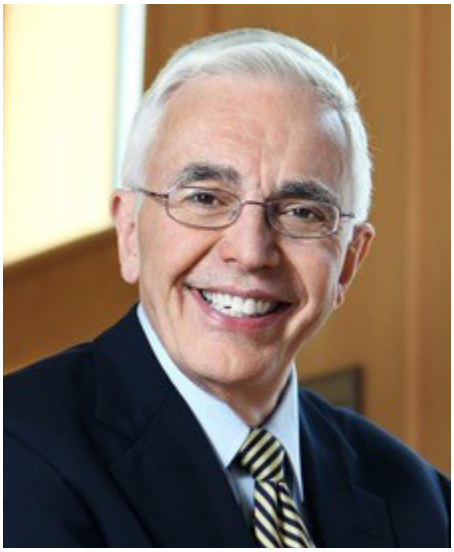
Ralph S. Quatrano



How did you spend your career?

I completed my PhD in the Department of Biology at Yale University in 1968. My dissertation research centered around classic studies of the marine alga *Fucus,* in which fertilization of the egg establishes the apical–basal polarity of the entire plant as the result of the first division of the zygote. I developed this as a synchronously developing, sterile experimental system to study the early stages of embryogenesis, which mimicked, morphologically, the early stages of angiosperm embryos.

I used this system in my first academic position at Oregon State University (OSU) as an assistant professor in the Department of Botany and Plant Pathology, where I rose through the ranks to full professor. Not many tools were available at that time, but I used biochemistry, "specific" inhibitors of metabolic processes, and electron and fluorescent microscopy to probe mechanisms. I showed in the early 1970s that this initial polarity was dependent on actin microfilaments, which serve as tracks to localize cell-specific "receptors" in the plasma membrane to the basal pole. Our working model was that transmembrane proteins, with links between microfilaments and cell wall components, stabilized the plasma membrane asymmetry, setting up a stable apical–basal polarity for the entire plant.

In the late 1970s and early 1980s, I applied the new tools of recombinant DNA technology to the study of late embryogenesis of angiosperms, specifically the acquisition of dehydration tolerance of wheat embryos triggered by abscisic acid (ABA). While on leave from OSU to Dupont, I helped develop a protoplast system to identify the ABA response elements in the Em promoter, an embryo-specific, ABA-responsive gene.

I started a position in the Department of Biology at the University of North Carolina at Chapel Hill (UNC) in 1988 and while there isolated the wheat b-ZIP transcription factor that binds to this element. While at UNC, I began a long relationship with David Cove (Leeds, U.K.) to use the moss *Physcomitrella patens* to study both polarity and desiccation tolerance during embryogenesis by using homologous recombination to target genes for insertion and/or removal, a unique attribute of moss. Moss cells are extremely drought tolerant, and like maize and wheat embryos, they require both ABA and the conserved transcription regulator ABI3 to survive water loss.

I continued these studies with moss in a new position in the Biology Department at Washington University in St. Louis (WUSTL) and led an international group of investigators to sequence the moss genome through a DOE grant (2008). From this initial sequence data, we isolated and characterized the highly conserved DEK1 from moss, which in maize is an embryo lethal gene required for proper orientation of cell divisions to form the aleurone layer. Deletion of this transmembrane protein in moss also resulted in abnormal planes of cell divisions in the formation of a three-dimensional "leafy" bud from a two-dimension filament.

While at WUSTL, I was given the opportunity to take leadership roles as chair of biology (1998–2008), dean of arts and sciences (2008), and dean of engineering (2010–15). In these roles, I hired more than 40 faculty in biology and engineering, many with joint interests across the fields of engineering and the medical and life sciences. My lab closed in 2017, I retired in 2018, and publications with my collaborators will terminate in ~2020.

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

My contributions to plant science can be summarized in research, teaching, and service. In my research, I mostly focused on the use of model systems (*Fucus* and *Physcomitrella*) and wheat embryos to probe mechanisms of some

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basic problems of plant cell biology: how directional signals (e.g., light) are perceived, translated, and stabilized into oriented cell growth and divisions; how localized plasma membrane proteins (e.g., DEK1) direct the plane of cell divisions and morphogenesis; how hormones (ABA) and transcriptional regulators (ABI3) control gene sets that lead to embryo arrest in seeds and tolerance to desiccation. More details can be found on my web page at https://biology.wustl.edu/people/ralph-quatrano.

Most of my teaching was during my tenure at OSU (large intro classes of biology [joint], plant biology, plant physiology, and developmental biology [joint]) and at UNC (cell and developmental biology). In non-plant-specific courses, I was responsible for incorporating plant-specific examples that fit into the biology curriculum of the course. In such arrangements, I felt that I had an opportunity and challenge to promote interest in and enthusiasm for plant biology. Whereas OSU was an agricultural university, UNC and WUSTL had biology departments where, as chairman in both departments, I promoted plant programs and research and supported plant faculty hires. In all of these roles, I tried to promote plant science without compromising the importance of having a unified biology department and programs within which plant biology was visible and strong.

I served on research panels and study sections at USDA, NSF (cell and developmental panels), and NIH, where I helped evaluate and support excellent plant proposals. Also, as a member of the board of reviewing editors of *Science,* I championed plant biology submissions for review and publication. I was a reviewer for many journals over my 35 years, but my most important contribution was as founding associate editor (1998–2008) and editor-in-chief (1998–2003) of *The Plant Cell*. This was a strong commitment, along with Brian Larkins and Founding Editor Bob Goldberg, to make *The Plant Cell* the premier journal in the field.

In recognition of all these efforts, ASPB honored me with the Adolf E. Gude, Jr. Award "in recognition of outstanding service to the science of plant biology." These activities constitute my "giving back" to the community of plant biology, which has given me so many opportunities.

When did you become a member of ASPP/ASPB?

I first learned about ASPP when I was a graduate student, when I attended the Northeast regional ASPP meetings and presented oral and poster presentations. I joined ASPP during the last year of my PhD (1968) and have been a member ever since. I did not always attend ASPP annual meetings, as I also was a member and attended annual meetings of the Societies of Developmental Biology and Cell Biology. However, in the 1990s and 2000s I was at ASPP/ASPB meetings yearly as president (1992) and in my role in *The Plant Cell*. During this period, I learned about and saw the tremendous impact ASPB had on plant science education and training and on exposing and engaging the next generation of plant biologists in our community.

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

ASPB has been an integral part of my education, my life as a plant biologist, and my connections with many colleagues and friends whom I have enjoyed and continue to value. I have also benefited by having the best journals in plant biology available to publish our research. The meetings ASPB organizes have been critically important for sharing the research results from my lab. Both the journals and the annual meetings have also been critical for the maintenance of an active plant biology community for all our graduate students and postdoctoral fellows, the next generation of teachers and researchers of plant biology.

I saw firsthand in my roles in ASPB that to maintain such an active and useful Society, all members need to give back in some form, with their time and/or philanthropy. I felt that I could contribute and give back what ASPB has provided for me and my students by starting and developing an endowment to help secure the future of our journals, meetings, and other good works.

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

Take advantage of seminars and symposiums, and not just those in your immediate field. Develop friendships within the community. Talk to other first-year students

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about their interests and yours, to senior colleagues in your department, and to other professors (your instructors) about your and their interests. Work closely with and watch senior graduate students and postdocs in your lab. There are many avenues to developing a career as a researcher (university, corporate, government) and teacher (elementary through high school, small liberal arts college, university), or couple your interest and degrees with law or business. Attend annual meetings to present some of your early interests and research results, find individuals in all of these roles, and become aware of their contributions that might be of interest to you. Finally, I encourage all to take advantage of what the plant community and ASPB have to offer and to become a member of ASPB.

Academic Family Tree
https://academictree.org/cellbio/tree.php?pid=655362