ASPB News

THE NEWSLETTER OF THE AMERICAN SOCIETY OF PLANT BIOLOGISTS

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Tuan-hua David Ho Assumes Presidency October 1

Tuan-hua David Ho

Tuan-hua David Ho, professor at Washington University in St. Louis, is ASPB's new president. He succeeds Sally Assmann, Penn State University, who became immediate past president on October 1. The Society's new president-elect is Nick Carpita, Purdue University.

Tuan-hua David obtained his PhD in biochemistry from the DOE Plant Research Laboratory at Michigan State University in 1976. After two years as a Jane Coffin Childs postdoctoral fellow in the Department of Biology at the Massachusetts Institute of Technology, he took a position as assistant professor in the Department of Plant Biology, University of Illinois at Urbana–Champaign. In 1984, he moved to Washington University, where he is currently a professor in the Department of Biology. From 2003 to 2008, he also served as the director of the Institute of Plant and Microbial Biology, Academia Sinica, Taipei.

Tuan-hua David's research concentrates on the hormonal regulation of seed germination and on plant responses to environmental stresses. His early work contributed to the understanding of the physiological role of cereal aleurone layers during seedling growth. Several key hydrolytic enzymes involved in this process have been studied, purified, and cloned in his laboratory. In recent years, his work has been centered on hormonal regulation of gene expression and programmed cell death and the role of stress-induced proteins. His group played a major role in defining the *cis*-acting promoter sequences necessary and sufficient for GA- and ABA-regulated gene transcription. His work also addresses the role of protein kinases and phosphatases, transcription factors, and other components in signal transduction pathways mediating the antagonism between GA and ABA. More recently, he has become interested in biofuel-related problems, especially microbial enzymes capable of hydrolyzing lignocellulosic materials.

Tuan-hua David is a fellow of AAAS (American Association for the Advancement of Science; 2004), a member of TWAS (Academy for the Developing World; 2004), and a member of Academia Sinica (Taipei; 2002). He was also recognized as an ISI most-cited researcher in Animal and Plant Sciences in 2003, the Burris Distinguished Lecturer at South Dakota State University in 1993, and a UNESCO Professor at Peking University in 1994. He served as director of the Plant Biology Program at Washington University from 1987 to 1989. He was an editor of the *Journal of Plant Growth Regulation* from 1989 to 2001 and a member of the editorial board for *Developmental Genetics* from 1984 to 1990. He has served on various government research panels, including the NSF Developmental Biology Program

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ASPB Executive Committee & Staff

ASPB News

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(1993–1994), USDA–NRI Genetic Mechanism Program (1981–1983), Stress Biology Program (1985–1986), and Special Grant Program (1994). He was manager of the USDA Plant Responses to the Environment Program in 1993. Recently, he chaired the review panel of USDA National Program 302: Plant Biological and Molecular Processes.

Tuan-hua David joined ASPB in 1973. He served on the Program Committee from 1994 to 1997, the International Committee from 2003 to 2007, and as chair of the Corresponding Membership Committee from 2001 to 2003. He was the Society's representative to AAAS from 1992 to 1994 in the sections of Biological Sciences and Agriculture, Food, and Renewable Resources. From 1982 to 1993, he was on the editorial board of *Plant Physiology* and was a monitoring editor from 1995 to 2001.

As a long-time member of ASPB, Tuan-hua David has been interested in promoting the role of the Society in the international arena. In addition to emphasizing outreach, education, academic publication, and public affairs, he also would like to see ASPB play a major role in bridging academic and industrial interests. Furthermore, he believes right now is the best opportunity for ASPB to emphasize the important contributions of plant biology to solving problems related to food, energy, environment, and sustainability.

Sally Assmann

President's Letter

ASPB: An International Society

The first letter that I wrote as president of ASPB was about the hopes for science in the new administration of U.S. President Barack Obama. That letter was of particular relevance to U.S. members of ASPB. So it is perhaps fitting that in this, my last letter as ASPB president, I address some of the work that ASPB is doing to promote plant science internationally. That I do so is quite appropriate, given the fact that approximately 40% of our membership resides outside the United States. Indeed, the 2009 ASPB meeting in Honolulu, Hawaii, had scientists from 46 nations in attendance, illustrating the fact that we are truly an international society. As such, ASPB has the opportunity and the responsibility to further plant biology worldwide. Over the past year, I and other ASPB leaders have undertaken several new initiatives that speak to this goal.

As many of you are no doubt aware, ASPB has its own International Committee (IC). A turnover in IC membership in 2008 offered the opportunity for a re-visioning of this committee's focus. As you can imagine, there is a vast diversity of activities that such a committee could undertake in the quest to support plant biology in every corner of the globe. I discussed various options with the other ASPB presidents, and we settled on the idea that the committee would focus for the immediate future on outreach to other countries in the Americas and to Africa. The new committee chair, Leon Kochian, is leading this effort. In addition, the committee will continue to entertain proposals from other organizations seeking small amounts of funding to facilitate interactions between ASPB members and plant scientists in other nations.

Another new initiative developed in Honolulu this past summer. Before the start of Plant Biology 2009, ASPB sponsored a first-ever summit of leaders of plant science societies from around the world. The two-day summit met at the Hilton Hawaiian Village and was led by ASPB Membership Committee chair Mel Oliver. In attendance were 21 leaders of 13 different plant science societies representing all geographic regions. Discussions were held on the ways that plant scientists and plant science societies can contribute toward solving some of the major challenges facing humankind, including climate change, environmental degradation, and world hunger. The summit culminated in the formation of a Global Plant Council. This unifying body will facilitate the ability of plant scientists from around the world to address global issues that involve plant biology and to provide policy makers with the scientific information necessary to make informed decisions on these topics. The Global Plant Council is currently expanding its membership to include societies not present at the initial summit. The next meeting of the Global Plant Council will be sponsored by the Canadian Society of Plant Physiologists/Société Canadienne de Physiologie Végétale (CSPP/SCPV) and will be held in 2010 in Montreal, in conjunction with the joint ASPB/CSPP meeting.

I am also pleased to report another new venture that will occur at Plant Biology 2010. As plant biologists, we know that plants and human health are inextricably linked, most directly by plant-based foods and medicines. Still today, it is estimated that over 10% of the major clinical drugs are solely of plant origin (1). One of my personal goals for my presidential year was to work toward strengthening ties between plant biologists and the main U.S. agency that funds research on medicine and human health, the U.S. National Institutes of Health (NIH). To date I have met with NIH program officers in the National Institute of General Medical Sciences, the National Center for Complementary and Alternative Medicine, and the National Cancer Institute. One outcome of these meetings is that NIH program staff plan to join us at Plant Biology 2010 to provide information on NIH programs and to learn more about the relevance of plant biology research to the mission of NIH. It is particularly fitting that one of the major symposia topics at ASPB/CSPP2010 will be the impact of plant biology on human health. This symposium will be organized by the aforementioned Global Plant Council and thus represents another forum through which ASPB is expanding its international horizons.

Finally, in the 21st century, there is one aspect of any organization that is immediately international, and that is its web presence. Upon becoming president, one major goal that I had was a revamping and modernization of the ASPB website. This has been a step-by-step process to which many people have made significant contributions. The ASPB Executive Committee participated in an initial survey late in 2008 concerning web design, from which a number of recommendations arose. The survey was then sent out to a wider swath of ASPB membership early in 2009. More than 200 members responded to the specific survey questions, and over 70 additional suggestions were provided in the write-in boxes. An ad hoc committee on web revision was then formed, with representation from all membership categories, including undergraduate, graduate, postdoctoral, academic, government, and industry scientists. In recognition of the international nature of our Society, about 30% of the committee is from abroad. The web redesign committee has met virtually via (lengthy!) conference calls to make recommendations and push the website revision forward, and I would like to personally thank the committee members for their insights, hard work, and enthusiasm for this project. Currently, all of the ASPB leadership committees are working on revisions of their committee's web content, and the new website is projected to debut this winter.

One person whom I'd especially like to thank regarding the website revision is our webmaster, Wendy Sahli, who is providing the technical expertise and knowledge of web design that will allow this project to come to fruition. Jean Rosenberg, ASPB director of meetings, marketing, and membership,

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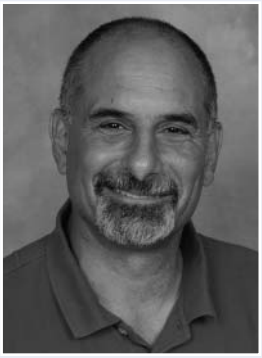

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has also provided guidance to this endeavor. ASPB members may know Wendy and Jean better as ASPB's "meeting divas"—the ASPB professional staff who, along with the Program Committee, make our annual meeting such a success each year. As you might imagine, organizing such a large meeting, jam-packed with scientific and educational content, requires a sustained year-round effort. This year's annual meeting was one of the largest ever, with over 1,700 scientists in attendance. More information about PB2009, along with photographs from the meeting, can be found on pages 10–25 of this newsletter issue and on the ASPB website.

As my presidential year draws to a close, it is time for other thank-yous as well. Over this past year, I could expect to see e-mails from one or more of the ASPB staff arriving in my inbox at any time between 6 a.m. and 11 p.m. This was particularly true of our executive director, Crispin Taylor, who worked especially long hours this past year due to the departure of our Public Affairs director, Brian Hyps. We truly have a wise, dedicated, and highly professional staff at ASPB headquarters in Rockville, and I would like to take this opportunity to publicly thank them for all they do so well. ASPB's managers are (in alphabetical order) Suzanne Cholwek, subscriptions manager; Donna Gordon, executive and governance affairs manager; Kim Kimnach, associate director of finance and administration; John Long, managing editor; Jean Rosenberg, director of meetings, marketing, and membership; Wendy Sahli, manager of marketing and web services; Crispin Taylor, executive director; and Nancy Winchester, director of publications. Please take a look at their photographs at the end of this article, and, when you see any of these individuals or other ASPB staff at PB2010 in Montreal next year, take a minute to thank them for all that they do for you, for our superlative journals, *Plant Physiology* and *The Plant Cell*, and for the support and promotion of plant biology.

I would also like to take this occasion of my last President's Letter to thank those ASPB members who serve on ASPB committees. These are all volunteer positions, yet committee members put a huge amount of

time and effort into committee projects, just a small fraction of which I have highlighted in my letters this past year (more information can be found on our website and in past and present newsletter articles). Although there is not space here to name every committee member, the least I can do is include photographs of the chairs of our leadership committees. Thank you, chairs—it's been great working with you!

The ASPB presidents serve as a triumvirate (president-elect, president, and immediate past president), and so at this point I would like to thank Past President Rob McClung, for his thoughtful, dedicated, and articulate leadership over the past three years. When Rob rotates off on October 1, 2009, I will become immediate past president, and from that vantage point I'll look forward to the opportunity to continue work on the initiatives described above. On October 1 we will welcome Tuan-hua David Ho as our next president. From 2003 to 2008 Tuan-hua David was the director of the Institute of Plant and Microbial Biology at the Academia Sinica in Taiwan; he has since resumed his full-time position at Washington University in St. Louis. I also welcome Nick Carpita as president-elect. Nick has previously served the Society as secretary, was a driving force behind the ASPB-sponsored Pan American Congress on Plants and BioEnergy held in Mérida, Mexico, in June 2008, and is one of the lead organizers for the second conference on this topic, which will be held in São Paulo, Brazil, in 2010 (see http://www.aspb.org/meetings/PCPB2010.pdf). Tuan-hua David and Nick are thus perfectly positioned to further promote both the U.S. and the international missions of ASPB.

In closing, my final thank you goes out to you, the membership of ASPB. I am deeply grateful for the opportunity you have given me to serve your Society. Aloha to Honolulu and Bienvenue to Montreal!

Sally Assmann
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Reference

1. Raskin, I. et al. (2002). Plants and human health in the twenty-first century. *Trends in Biotechnology.* 20: 522–531.

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Nick Carpita Elected to Lead ASPB in 2010–2011


Nick Carpita

Nicholas Carpita became president-elect October 1 and is slated to become ASPB president next October for the 2010–2011 term.

Nick is recognized for his expertise in the biology of the plant cell wall, from the structures of individual molecules and their biosynthesis, to the distinctive architectures of the cell walls of grass species, to the thousands of genes required for wall biogenesis and remodeling and the regulation of their expression. He is professor of plant biology at Purdue University and heads a Purdue initiative called the Midwest Center for Bioenergy that aims to provide a national resource of research and education for the improvement of crops used in biofuels production, taking discoveries in plant biology into agronomic practice in a sustainable and environmentally sound way. He grew up near Clearwater, Fla., where he became seriously interested in plant sciences his first year in high school. He obtained his degree in biological sciences at Purdue University in 1972 and a PhD in plant physiology at Colorado State University in 1977. His postdoctoral work from 1977 to 1979 with Dr. Deborah Delmer at the Department of Energy's Plant Research Laboratory at Michigan State University first kindled his interest in the biosynthesis of cellulose. He returned to Purdue University in 1979 as an assistant professor in the Department of Botany & Plant Pathology and became full professor in 1989. He was also a visiting professor in the Plant Biology Institute in Zürich, Switzerland, 1986–1987, returning as a guest professor in 1994, and he has been guest professor at the Botanical Institute of São Paulo, Brazil.

Nick's research interest is primarily the dynamic structure and function of the unique cell walls of grasses and related species, and he conducts research on the biochemical mechanism of synthesis of cellulose and other β-glucans. He established that flowering plants make two structurally distinct types of primary walls, and his genome-wide analyses of grasses and Arabidopsis revealed the genetic bases for these distinctions. His recent work revealed the natural regulation of primary wall synthesis by small interfering RNAs from antisense transcripts of cellulose synthase genes. Translating these discoveries into improvements in lignocellulosic biomass as a feedstock for biofuels production has become a focus of his lab. He is recognized by ISI as a highly cited author in Plant and Animal Sciences. He teaches an undergraduate course called Plants and Civilization, which traces the history of agriculture and the broad impacts plants have on human civilization. He also teaches a graduate course on plant carbohydrate chemistry and various methods courses and research workshops for undergraduate honors students.

Nick has been a member of ASPB since 1976. He served on the editorial board of *Plant Physiology* from 1987 to 1992 and as monitoring editor from 1998 to 2001. He also served as elected member of the Executive Committee (2002–2005) and as secretary (2005–2007), and he continues to serve on the Program Committee. He is an avid promoter of the role of ASPB in international plant biology, education, and public awareness of the impact of plants on society and economic stability. He was responsible for initiating the Fellows of ASPB Award, inaugurated in 2007, and for co-organizing the first Pan American Congress on Plants and BioEnergy in Mérida, Mexico, in 2008. In 2003, he served as vice chair for the Gordon Research Conference on Cell Walls and as chair for the 2006 conference, and he has served on international steering committees for the International Cell Wall meetings. He also served on the editorial boards of *Planta, Methods in Cell Science,* and the *Brazilian Journal of Plant Physiology,* and he has been named to the editorial advisory panel for the new journal *Biofuels.* He has served on several competitive grants panels, USDA-NRI and DOE's Energy Biosciences, and was a panel member and panel head for BARD's Cell and Molecular Biology section from 1993 to 1998.

NOTICE

We were saddened to learn that Chris Lamb died suddenly on Thursday, August 20, 2009. A full appreciation of his life and accomplishments will be published in the November/December issue of the *ASPB News.* In the meantime, a brief announcement is available on the John Innes Centre website at http://www.jic.ac.uk/centenary/memorybank/index.htm.

ASPB also learned of Mike Gale's death on July 18, 2009. An obituary will be published in the January/February 2010 issue of the *ASPB News.* An announcement can be found on the John Innes website at http://www.jic.ac.uk/staff/mike-gale/.

Photos courtesy of the John Innes Centre.

Judy Callis Elected Secretary


Judy Callis

Judy Callis became ASPB secretary on October 1 and will serve for the next two years. The secretary is also chair of the Program Committee.

Judy is a faculty member in the Department of Molecular and Cellular Biology and a member of the PhD graduate programs in plant biology, biochemistry and molecular biology, and genetics at the University of California at Davis. She was born in Ohio but grew up in St. Louis, Mo., and received her AB degree from Washington University in St. Louis in 1977. She is grateful for excellent mentorship as a student and postdoc. As an undergraduate Judy had the privilege of working in the laboratory of then–assistant professor Virginia Walbot, which started her long research interest in plant biology. After several years as a research technician at University of Wisconsin–Madison, she received an MS in botany in 1981 from the University of Illinois, where she worked with Tuan-hua David Ho on α-amylase isozymes. From there, she moved to Stanford University, where she received a PhD in biology in 1987. During this time, she became interested in the post-transcriptional regulation of gene expression. Following that theme, she worked on aspects of ubiquitin-mediated proteolysis with Richard Vierstra at UW–Madison from 1987 to 1989. At the end of 1989 (on Halloween, to be precise), she joined the faculty at UC Davis's then Department of Biochemistry and Biophysics. Judy is now a full professor and serves as vice chair for academic personnel in the Department of Molecular and Cellular Biology.

Judy's main research interests are in the area of regulated proteolysis, with a focus on the ubiquitin pathway. Combining genetics, biochemistry, and molecular biology, her laboratory is working to understand the specificity of modification of proteins by ubiquitin and the physiological consequence of this change. In addition, her laboratory has studied the *cis*-acting signals on the Aux/IAA proteins, short-lived repressors of auxin signaling, and defined the residues required for their rapid and auxin-regulated degradation.

Judy has taught metabolism to more than 200 students a year for more than 15 years and co-taught a course in plant biochemistry (that is not quite as big a class). She also enjoys leading a discussion of research literature for undergraduates and supervising both graduate and undergraduates in research. Her service to ASPB includes membership since 1979, member of the Publications Committee 1994–1999 (chair, 1998), member of the ad hoc Web Site Committee 1996–1997, monitoring editor for *Plant Physiology,* 2000–2006, member of the review panel for summer undergraduate research awards in 2001 and 2003, member of the Corresponding Membership Award Committee 2003–2007, and member of the Program Committee 2006–2010. In 2009, she joined *The Plant Cell* editorial board. Other professional activities include service on grant review panels for NIH, NSF, USDA, and DOE and serving as an ad hoc reviewer for several journals. She was elected as a fellow of the American Association for the Advancement of Science in 2002 and from 2005 to 2010 serves as Ruth R. and Paul K. Stumpf Endowed Chair in Plant Biochemistry.

Rita Varagona Elected to Executive Committee


Rita Varagona

Marguerite (Rita) Varagona joined the ASPB Executive Committee as an elected member on October 1.

Rita earned a BA degree in botany in 1980 and an MS degree in botany in 1983 from the University of Tennessee, Knoxville. She obtained a PhD in botany in 1989 from the University of Georgia, Athens. From 1989 to 1993, she was a postdoctoral fellow in the Department of Energy Plant Research laboratory at Michigan State University. She was assistant professor from 1993 to 1998 in the biology department at New Mexico State University. Since 1998, Rita has been with the Monsanto Company. She served as genomics leader from 1998 to 1999, Quality Traits Project/Platform lead from 2000 to 2006, and Vector Strategy lead from 2006 to present.

Rita's research interests are in metabolic engineering (amino acids and protein), protein targeting, gene expression, post-transcriptional processes, functional genomics, plant transposons, and germination physiology.

Her professional activities and awards are many. She is a Dupont Fellow for Excellence in Graduate Research UGA (1987, 1989). Her NMSU lab is funded by USDA–ARS and NIH–MBRS. She graduated three MS students and mentored 18 undergraduates. Rita has served on grant review panels for the USDA and DOE. She has reviewed papers for *Plant Physiology* and *Plant Molecular Biology.* In 2005, she actively participated as lead in Diversity and Recruiting teams/efforts for Monsanto Biotechnology. From 2004 to 2006, Rita sponsored undergraduate summer interns. She was invited speaker for career workshops and discussions at several universities. She was mentor for (Monsanto) Technology Mentoring Program in 2005, 2006, and 2008.

Rita has been a member of ASPB since 1982. She participated in conferences through her own or her colleagues' presentations in her lab/teams. In 1998, she chaired a session on protein targeting. Rita is looking forward to serving the plant biology community.

Aloha from Hawaii!

Plant Biology 2009 Meeting Report

JOINT ANNUAL MEETINGS OF THE AMERICAN SOCIETY OF PLANT BIOLOGISTS and the PHYCOLOGICAL SOCIETY OF AMERICA

Phytophiles and phycophiles alike converged on Honolulu, Hawaii, July 18–22, to participate in Plant Biology 2009, the joint annual meetings of the American Society of Plant Biologists and the Phycological Society of America. The weather was perfect, the setting delightful, and the camaraderie in high gear as ASPB president Sally Assmann welcomed more than 1,700 participants from 46 countries to share research results, ideas, questions, and visions. In addition, Honolulu provided a central location to welcome members of ASPB sister societies from across the Pacific: Australia, China, Japan, Korea, and New Zealand.

Sally began the opening address by announcing the creation of the Global Plant Council earlier that week in Honolulu, as members representing 13 plant science societies participated in an international summit organized by ASPB. Its mission was to define and engage in coordinating strategies to positively impact the most critical issues facing mankind, encouraging a shared vision to address problems of world hunger, energy self-sufficiency, climate change, environmental protection, and sustainability.

She then presided over the annual ASPB awards ceremony, which honored outstanding graduate students, young scientists, and long-term members from the United States and abroad for innovative research, groundbreaking contributions, lifelong service to ASPB, and fundamental advances in plant biology research and education. She presented a new award, the Women in Plant Biology Travel Grant, to seven deserving scientists and honored recipients of the Minority Affairs Committee Travel Award and the Education Foundation Grant Award Program. Details about each of these honorees and their awards can be found in a companion article later in this issue.

Charles Albert Schull Award Winner Lecture

Following the awards ceremony, Sheng Luan, of UC Berkeley, was the featured speaker at the Charles Albert Schull Award winner lecture. This award recognizes an outstanding young scientist under the age of 40 and is given in honor of Dr. Schull, who was instrumental in the founding of ASPB. Sheng described his research, focusing on the complex mechanisms by which calcium can relay endogenous and exogenous signals such as light, hormones, and nutrient availability.

Calcium signals lead to a diverse set of physiological responses including guard cell movement, egg fertilization and pollen tube growth, cell wall metabolism, and response to pathogens. In addressing the deceptively simple question, "How can a single cation impact so many diverse responses in plant physiology?" Sheng described how these responses could result from multidimensional sensing—not only of calcium concentration but also the spatial and temporal occurrence of Ca^{2+} ions, calcium-binding proteins, and interacting protein kinases. He presented a model in which individual members of a family of

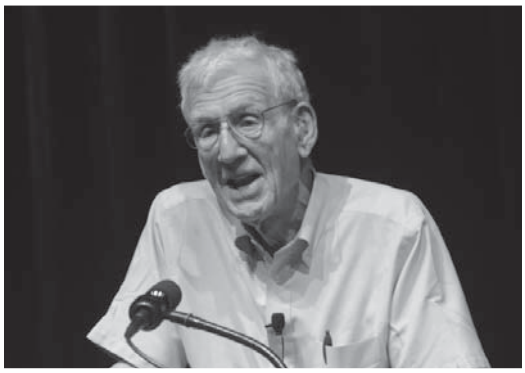
calcium binding proteins interact with certain members of a protein kinase family to modulate very specific protein responses.

As an example, he described in more detail how specific calcium-dependent protein–protein interactions result from sensing of low external potassium. This results in the recruitment of a specific protein kinase to the plasma membrane of root hair cells, where calcium-dependent phosphorylation and activation of a specific voltage-gated potassium channel modulates its activity to alter potassium movement into cells.

Perspectives of Science Leaders Lecture

Dr. William H. Danforth II was the recipient of the 2009 ASPB Leadership in Science Public Service Award, acknowledging a lifelong commitment to improving global human welfare through plant science research. In his lecture, Dr. Danforth, who was trained as a biochemist and medical doctor, recalled how over 30 years ago he envisioned that the same type of basic biological research used to develop the polio vaccine could be used by plant biologists to combat human hunger and malnutrition.

Toward this end, he helped found the Donald Danforth Plant Science Center in St. Louis, attracting top-notch scientists to address three critical challenges: to promote continuing innovations in agriculture in order to produce new and better products with fewer inputs, to improve nutrition for combating hunger and famine, and to preserve our environment so that "our grandchildren will inherit a productive and livable world." He then recalled the Green Revolution of the 1970s, which tripled agricultural productivity and saved countless lives, but also noted its heavy reliance on water and fertilizer inputs. He suggested that we now need an "Evergreen Revolution," which can allow our land to produce adequate food for an expanding population generation after generation. He



Dr. William Danforth was the recipient of this year's ASPB Leadership in Science Public Service Award.

believes that "our greatest challenges will not be limited by geographic borders" and will be solved by international cooperation among scientists who will become involved not only in research but also in making decisions involving scientific policy. He added his hope that we will work together for "a larger pie for all rather than trying to keep the largest piece" for some.

Following his lecture was a very lively and thought-provoking question-and-answer session addressing topics such as the National Institute of Food and Agriculture within the USDA, the conflict between use of government money for commodity price supports versus basic research, and the public perception of biotechnology as applied to our food supply.

"Green Animals" and Other Algal Surprises

Mary Rumpho (University of Maine) delighted the audience at the joint ASPB/PSA symposium on Sunday with stunning videos of a sea slug dining on algal chloroplasts. After showing the animal sucking the chloroplasts out of an algal filament much like drinking from a straw, Mary explained the process of kleptoplastidy (plastid stealing) in the sea slug, first described as a green animal in the 1880s. The ingested chloroplasts remain active and allow the animal to survive for months on only air, sunlight, and minerals. She went on to summarize her research involving proposed mechanisms of horizontal transfer of genes from the algal nucleus to the sea slug host and speculated on how "symbiosis drives nuclear genome evolution."

In related work highlighting the interdependence of algal and plant biology research, Debashish Bhattacharya (University of Iowa) presented his genomic research as applied to endosymbiotic gene transfer in diatoms. He described the "greening of the tree of life" by explaining how the nuclear genome retains a memory of multiple ancestral symbiotic events that led to the wide variety of plant and algal species known today. Sabeeha Merchant (UCLA) discussed some groundbreaking RNA sequencing work, the goal of which is to understand the biology of the copper-responsive transcriptome in *Chlamydomonas*. Her work provided a welcome complement to genome sequencing, as approximately 50% of the sequenced RNAs do not correspond to any known gene model in the current annotated *Chlamydomonas* genome.

Noting that the world's oceans account for 50% of global photosynthesis, Chris Bowler (CNRS, Paris) described the discovery of a functional urea cycle in diatoms, the first time this process has been found in a photosynthetic cell. He also described a unique mechanism whereby the Calvin cycle is turned off during iron limitation, but photosystems I and II remain active and transfer electrons to mitochondria to enable ATP production in the absence of iron. Simon Prochnik (DOE Joint Genome Institute) then presented a comparative genome analysis of *Chlamydomonas* and *Volvox*, noting that, despite a large amount of genomic rearrangements between the two species, there was little difference in gene content.

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Porphyra: Modern Genetics Meets an Ancient Food from the Sea

A second joint symposium among ASPB, PSA, and an NSF Research Coordination Network highlighted the biology of *Porphyra* species. Susan Brawley (University of Maine) described the historical and current use of these algae in aquaculture as a source of nori, which contains up to 40% protein dry weight and is high in vitamins B_{12} and C and minerals. She also discussed their potential as bioremediation agents and introduced the new *Porphyra* genome-sequencing project. Mariana Cabral de Oliveira (University of São Paulo) introduced the audience to her work with "mobilomics," the study of DNA moving in and between genomes, as she discussed the discovery of self-splicing introns in *Porphyra*.

Koji Mikami (University of Hokkaido, Japan) described his pioneering work to develop methods for efficient and reproducible transient gene expression in *Porphyra,* and Arthur Grossman (Carnegie Institute at Stanford) introduced emulsion PCR and delivered a detailed comparative analysis of current high-throughput sequencing technologies. Not only will this work advance the biology and genetics of *Porphyra,* it also should allow identification of salt- and desiccation-tolerance genes from this species.

John Stiller (East Carolina University) discussed the developmental evolution of *Porphyra* and its use as a model for early (>1 billion years ago) multicellular development, highlighting in particular scaffold proteins used during transcription by RNA polymerase II. He then requested input from all attendees for the "*Porphyra* Sourcebook," a global compilation of *Porphyra* research. Juliet Brodie, of the Natural History Museum in London, described her work investigating *Porphyra* modern systematics and finished her presentation with a profound video of the Chilean seacoast, noting "we are very insignificant as humans, and the sea will continue to roll in long after humans are gone." In summary, she noted how the study of this ancient one-cell-thick organism could tell us a great deal of what life is all about.

Shedding Light on Plant Photomorphogenesis

Winslow Briggs (Carnegie Institute at Stanford University) then presented an especially "illuminating" talk as he described his lab's recent work to elucidate the mechanism of action of the plant phototropin proteins. These blue light-sensing photoreceptors contain LOV domains that are not found in animals but are present in ferns, green algae, bacteria, and Archaea. Demonstrating how plant biology research can lead to advances in other fields, he showed how knocking out an LOV domain/histidine kinase protein in *Brucella* bacteria, which cause undulant fever, reduced their virulence by 90% as light-activated autophosphorylation was abolished. This light photoperception could explain the diurnal fluctuations in body temperature that give this disease its name. Winslow's role as an eminent scientist and mentor was evident as several of the speakers in this photomorphogenesis symposium made special note of how they trained with him or with former members of his lab.

One of the highlights of this year's meeting came later in this session when Rick Vierstra (University of Wisconsin–Madison) formally presented for the first time the three-dimensional structure of the active P_{fr} form of the red light photoreceptor phytochrome bound to its bilin chromophore. His elegant approach used a *Synechococcus* cyanobacterial phytochrome, a protein short enough to use for two-dimensional NMR. He developed an innovative method for sequential irradiation of purified phytochrome with red and far-red light while in the NMR magnetic field. In addition to his novel determination of the structure of P_{fr}, he showed how the orientation of the light-absorbing chromophore changes reversibly upon irradiation with red or far-red light, "overturning the textbook model" from the 1970s.

Modulation of plant responses to blue and red light involves not only the activation of the respective photoreceptors and interacting factors in the light, but also the release from repression in the dark as seedlings emerge from the soil. Mannie Liscum (University of Missouri) discussed the role of ubiquitylation and proteasome degradation of phototropin in modulating the response to blue light. Peter Quail (UC Berkeley) showed how several phytochrome-interacting factors act collectively to repress photomorphogenesis in the dark, but are rapidly deactivated following

phytochrome-induced phosphorylation and degradation in the light. Xing Wang Deng (Yale University) finished the session by describing his work with specific protein–protein complexes that induce degradation of photomorphogenesis-promoting factors in the dark.

From Sea Urchins to Soybeans to Synchrotrons

At the annual Women in Plant Biology luncheon, featured speaker Mary Lou Guerinot (Dartmouth College) gave a wonderfully engaging presentation describing the evolution of her career interests from aspiring diver to marine biologist to plant scientist to university administrator and then back to her beloved research. Her talk, titled "Just Do It," was an inspiring real-life look at how our careers often take unexpected turns rather than fulfilling our preconceived expectations.

Noting how she "thrives on adversity," she described her experiences, opportunities, challenges, and successes in developing a personally satisfying and service-oriented career. Her studies ranged from bacterial symbiosis in the sea urchin–lobster–kelp ecosystem to the interaction of *Bradyrhizobium* and soybean, to advanced X-ray imaging studies of iron localization in plant cell vacuoles. Noting that approximately 3 billion people worldwide suffer from iron deficiency, she described her work and the goal of breeding crops for better nutrition to combat this fundamental problem.

She finished her presentation with a summary of a recent report from the National Academies, titled "Gender Differences at Critical Transitions in the Careers of Science, Engineering, and Mathematics Faculty," pointing out in particular the value to female junior faculty of having a scientific mentor to help them achieve their full potential. And, on a more personal note, she reiterated "science is fun—if it weren't, I wouldn't still be doing it!"

Beware the "Good" Answer

Clifton Poodry (UC Santa Cruz), the director of the Division of Minority Opportunities and Research at the NIH, was the sponsored speaker at the annual Minority Affairs Dinner. He delivered a powerful address stressing how "passing civilization along from one generation to the next" ought to be one of our highest priorities. He described how, as a high school student, he had written a letter to Melvin Calvin regarding photosynthetic carbon fixation, which, at the time, was one of the great unsolved mysteries of biology. He was thrilled to receive a personal reply from the world-famous scientist along with a progress report from a recent grant and marveled, "What is the chance that Melvin Calvin would write to a high school student

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"I'm glad I came to Plant Biology 2009 because…"

"I heard a lot of great talks and met a lot of old friends."
—Ping He, Texas A&M University

"of the opportunity to get people together to cross boundaries. The diversity of algal groups and genomic studies provided interesting comparisons to higher plants."
—Richard McCourt
PSA member, Academy of Natural Sciences, Philadelphia

"I need to update myself and it's nice to meet old friends."
—Bob Buchanan, UC Berkeley

"I enjoyed the company of nice persons and learning about new research. People were very open to share results—that is very important and not all meetings have that."
—Maria Valderrama-Chairez
Universidad de Guadalajara

"it's always stimulating to come to meetings where you can meet the person after you read their work."
—Youngsook Lee, Pohang University of Science and Technology, Korea

"it was so nice to receive feedback from people who are not only at the top of their field but also are willing to invest the time to listen to and comment on my undergraduate work."
—Alyssa DeLeon
State University of New York

"I learned an enormous amount about underlying mechanisms responsible for traits I'm intrerested in."
—Leonie Moyle, Indiana University

"I learned that we can't operate in isolation and can always benefit from those in other fields."
—University of Minnesota student studying invasive plants

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on the reservation?" of the Seneca Nation in New York.

Clifton discussed other important mentors in his life, noting that one learns "only when new information comes along that conflicts with your existing information." He emphasized the importance of an unbiased, fresh approach to unknown questions, cautioning us that "there is nothing like a good answer to stifle learning!"

Incorporating his experience as a teacher and an artisan in woodturning, he noted that understanding students' misconceptions is often the key to their progress in learning. He stressed the importance of risk-taking in the path to learning, as well as the need to provide a challenging yet doable path toward objectives, commenting that "practice makes permanent, be it either good or bad habits." He presented an especially insightful perspective on diversity, noting that "when we all think alike, no one needs to think at all" and finished the engaging presentation by stating, "Hopefully I've left you with more questions than answers."

Learning by Doing

In a minisymposium devoted to biology education outreach, Erin Dolan (Virginia Tech) reiterated the positive value of mentoring as she described PREP-U, the Partnership for Research and Education in Plants for Undergraduates. This program engages students in research and promotes learning based on guided discovery, rather than mere transmission of information. Kabi Neupane (Leeward Community College, Hawaii) discussed the Advances in Bioscience Education program for community college students and faculty. They work for three weeks in participating research labs completing an intensive, state-of-the-art training in molecular biology techniques, including DNA isolation and cloning, genomics and bioinformatics, Southern and Western blotting, and fluorescence and electron microscopy.

Christina Reynaga-Pena, working in association with Universidad de Guadalajara, provided one of the more innovative examples of peer mentoring. In her DVDs produced for distribution to elementary school students in rural Mexico, the teachers in the videos are grade school students themselves. They explain and demonstrate to other students simple but instructive biology experiments in topics ranging from seed germination to photosynthesis, all using inexpensive, locally available materials. She also noted her participation in work creating educational materials for blind students, which is designed to take advantage of their use of alternate senses en route to learning and discovery.

Other Symposium Highlights

Rob Last (Michigan State University) organized a seminar highlighting the incredible diversity of plant natural products, the evolution of metabolic enzymes, recent progress in metabolite profiling, and advances in the study of soil-borne pathogen resistance conferred by secondary metabolites. He also announced an advanced lab course, titled "Molecular Techniques in Plant Science," to be given at Cold Spring Harbor, N.Y., in July 2010.

A joint symposium between ASPB and the Chinese Society for Plant Physiology was co-organized by Jeff Bennetzen (University of Georgia) and Xiao-Ya Chen (Shanghai Institute of Biological Sciences). Topics included cotton genomics, transformation, and bioinformatics; the Rice Mutant Database, a new global resource for rice researchers; the Rice 2020 Project, describing long-term goals of rice genomics; "Green Super Rice," a breeding program to create superior quality strains with high, stable yields requiring less pesticide, fertilizer, and irrigation inputs; the comparative analysis of grass genomes and their transposable elements; and the new *Medicago* "Hap Map" project, which will provide a global repository for legume genetics research and bioinformatics.

At the symposium titled "Darwin's Legacy: Evolution and Plant Biology," organized by Barbara Schall (Washington University, St. Louis), Charles himself likely would have taken a front row seat to survey the incredible advances since he published *The Origin of Species*. Michael Purugganan (New York University) discussed an example of adaptive radiation and gene evolu-

tion involving the Hawaiin silversword, one of the outstanding successes in native plant restoration. Other topics included the role of transposable elements in genome evolution; the challenges of genomics in nonmodel systems such as *Miscanthus;* and the genetics of reproductive isolation and origin of *Solanum* species in Ecuador, Peru, and the Galapagos islands.

Cathie Martin, editor-in-chief of *The Plant Cell,* presided over *The Plant Cell* 20th Anniversary Symposium, which featured authors of several of the most important papers ever published in *The Plant Cell.* Kazuo Shinozaki presented and updated his pioneering work with the DREB transcription factors that modulate responses to drought and low temperature in Arabidopsis, and Karen Schumacher discussed her work with the vacuolar H^+ ATPase that helps to regulate protein sorting in the endomembrane system. John Ryals gave a wonderful historical overview of the role of salicylic acid in systemic acquired resistance to viral pathogens, after which Rick Amasino nicely summarized his work cloning and characterizing Flowering Locus C in Arabidopsis. Cathie and senior members of *The Plant Cell* staff led a cake-cutting ceremony in honor of all the authors who have made *The Plant Cell* such a successful journal.

Unfortunately, all good things must pass, and the conference drew to a close on Wednesday. In the final symposium, Sally Assmann (Penn State University) presided over the President's Symposium on Biological Networks. Anyone frustrated by manipulating and organizing large-scale data sets found welcome information to help decipher mind-boggling amounts of data generated by microarray analyses and *in silico* bioinformatic studies. As an example of cutting-edge analysis, Nick Provart (University of Toronto) presented the new online ePlant resource. It allows users to view current information about a specific gene or protein at virtually any level in biology, from genetic variation in an ecosystem, to tissue and subcellular localization, to molecular interactions and three-dimensional protein structures.

And Lots More

It is impossible to relay all the excitement and cover all the events and innovative research presented at such a diverse conference in this short article. In addition to the major symposia and events discussed above, participants enjoyed any of 30 mini-symposia and hundreds of posters, including an undergraduate networking poster session. Numerous well-attended workshops presented topics such as career options, grant writing, digital art preparation, and NSF international collaboration programs. In addition, there were TAIR Arabidopsis workshops, the small colleges networking breakfast, and receptions for USDA scientists and ASPB fellows.

The spirit of international cooperation promoted by Dr. Danforth earlier in the conference and evident in the creation of the Global Plant Council was restated eloquently by Dr. Mary Clutter, assistant director for Biological Science at the National Science Foundation. She envisions a new 21st-century biology in the Internet age where we are all connected more than ever, and encouraged us "to be part of an international effort as borders between disciplines and countries are fading away," ushering in a "new way of thinking where there are no borders and barriers." ASPB President-elect Tuan-hua David Ho echoed this sentiment, stating that "this is the opportunity for plant scientists, not just for the United States, but for the whole world."

For more information, abstracts of presentations can be found online at http://abstracts.aspb.org/pb2009/public. To really experience the excitement of plant biology and the spirit of cooperation in the plant science community, be sure to come to Montreal, Quebec, for Plant Biology 2010 and become a part of science in the making. As the popular Hawaiian singer Israel Kamakawiwo'ole reminded us: "Remember the past but do not dwell there. Face the future where all our hopes stand" (1).

Gregory Bertoni

Reference

1. Source CD: "Facing Future" by Israel Kamakawiwo'ole. Copyright 1993; Big Boy Record Company.

Aloha from Hawaii!

Award Honorees at Plant Biology 2009

Congratulations to the winners of this year's ASPB awards. The following presentations were made during the Saturday, July 18, ASPB Awards Ceremony in Honolulu, Hawaii.

2009 award winners (from left): Justin Walley, Justin McGrath, Tom Guilfoyle, Gretchen Hagen, Steven Jacobsen, Siobhàn Brady, and Jorge Dubcovsky.

ASPB–Pioneer Hi-Bred International Graduate Student Prize

Three outstanding graduate students were awarded the ASPB–Pioneer Hi-Bred International Graduate Student Prize for 2009. The awards committee was extremely impressed by the excellence of all the nominees. The award winners have demonstrated an impressive array of research accomplishments and show tremendous promise as future leaders of the plant biology community. The winners are, in alphabetical order:

Elliot Heffner

Elliot Heffner is a PhD student in the plant breeding program at Cornell University in the laboratory of Mark Sorrells. He is also pursuing minor areas of study in business management and international agriculture and rural development. Elliot's dissertation research focuses on evaluation of plant breeding methodologies. He is using material in the Cornell Soft White Winter Wheat Breeding Program to test the efficacy of genomic selection, a relatively new plant breeding method. His research will compare results achieved with genomic selection to those obtained from more traditional marker-assisted and phenotypic selection approaches. Elliot has already published a review article on genomic selection in the journal *Crop Science*, and he is the first author on a publication resulting from a rotation project he conducted. At Cornell, Elliot was a recipient of a USDA National Needs Fellowship and several other awards. He has accumulated an impressive record of service. While president in 2008 of "Synapsis," the Cornell Plant Breeding and Genetics Graduate Group, Elliot raised funds from industry to finance a trip for Cornell graduate students to attend the National Plant Breeding conference and visit industry field stations. Elliot also has a passion for teaching and is currently teaching genetics to inmates at a local prison. He plans for a career in plant breeding in the private sector.

Justin McGrath

Justin McGrath is a PhD student in plant biology at the University of Illinois at Urbana–Champaign, in the lab of Lisa Ainsworth. His research is focused on understanding how plants respond to changes in carbon dioxide and ozone levels, with a goal of predicting how future climate change will affect the growth, development, and productivity of crop plants. His research uses the free area concentration enrichment (FACE) facilities and has investigated responses in both aspen trees and soybean. Justin monitored a large number of different parameters and has found that elevated carbon dioxide and ozone concentrations affect leaf size, leaf number, and photosynthetic capacity. His research has revealed complex species- and cultivar-specific effects. Justin has been an active participant in the UIUC SoyFACE research group and is a valued collaborator, as demonstrated by his coauthorship on several publications. He has also been an active member of the Plant Biology Association of Graduate Students. Justin wants to continue research on climate change, with the goal of defining how crop plants respond and ultimately using that knowledge to improve crop productivity and quality.

Justin Walley

Justin Walley is a PhD student in plant biology at the University of California, Davis, in the laboratory of Katie Dehesh. His research focuses on plant responses to stress and he ultimately hopes to identify genes that can be manipulated to confer broad-spectrum stress tolerance in crop plants. Justin performed microarray experiments to characterize changes in the Arabidopsis transcriptome after 5 minutes of wounding. He then compared his data with those from microarray studies done on other stress treatments and determined that there was a significant overlap between transcripts showing a rapid wound response (RWR) and transcripts altered by other stress treatments. Justin identified a *cis*-regulatory element in the promoters of *RWR* genes and showed that this motif is sufficient to confer a response to many diverse biotic and abiotic stresses. His research has also revealed a role for chromatin remodeling and mRNA turnover in the plant stress response. Justin's research has resulted in first-author publications in *PLoS Pathogens* and *PLoS Genetics,* and he also contributed to a publication in *Plant Physiology.* He is now beginning to move his research into crop plants. Justin has been an active member of the Plant Biology Graduate Group at UC Davis—he served as president of its Graduate Student Association, as graduate student recruitment organizer, and as a representative on faculty search and seminar committees. Justin hopes to continue his career in plant-stress research either in academia or in the private sector.

Charles Albert Shull Award

Steven E. Jacobsen

Steve Jacobsen is this year's recipient of the Charles A. Shull Award for his pioneering research in critical areas of plant genetics, development, cell biology, and biochemistry. As a graduate student, Steve investigated the role of gibberellins in flower development and cloned *SPINDLY,* which encodes an O-linked N-acetylglucosamine transferase that negatively regulates gibberellin signaling. This was a key discovery that laid the foundation for much of the current work in this area. Steve then moved into the field of DNA methylation and epigenetic regulation of gene expression as a postdoctoral fellow in the Meyerowitz laboratory. There he studied mutations that affect the Arabidopsis flower development gene *SUPERMAN.* The *CLARK KENT* mutation he identified was relatively stable, but not stable enough for fine mapping, and as a result, traditional approaches for identifying the gene involved were not suitable. Steve's acute observations of the unusual nature of the mutation led him to show that the *CLARK KENT* mutations were epigenetic variants of the *SUPERMAN* gene that were inactivated by hypermethylation. As a result of this pioneering work, other epialleles of other genes were also identified. Steve started his own lab at UCLA in 1998, and there went on to discover and characterize other genes involved in methylation of DNA and histones, including *CHROMOMETHYLASE3* and *KRYPTONITE.* His group also discovered that *ARGONAUTE4,* which was known to play a role in RNA interference, was involved with small RNAs to target specific genes for methylation. In short, Steve and his colleagues have developed many of the tools required to study epigenetic regulation and have used them to uncover many aspects of the complex interactions among DNA methylation, histone modification, and siRNA function in Arabidopsis. In large part as a result of Steve's work, the field of epigenetics is exploding and plants have been at center stage. In addition to research, Steve is also very active in teaching and mentoring as well as service to the scientific community through production of genetic resources and service on many editorial boards, grant panels, and committees.

Charles Reid Barnes Life Membership Award

Tom Guilfoyle and Gretchen Hagen

Tom Guilfoyle and Gretchen Hagen are co-recipients of the Barnes Award for 2009. The year 2009 represents an exciting moment in the 84-year history of the Barnes Award, as it is the first time that this award has recognized a highly successful team of researchers.

Tom received his PhD from the University of Illinois, Urbana, in 1974. After a three-year NIH postdoctoral at the University of Georgia with Joe Key, he was appointed assistant professor in the Department of Botany at the University of Minnesota, St. Paul, and promoted to professor in 1984. Gretchen received her PhD in 1978 from the University of Minnesota. After a two-year postdoctoral, she joined Tom's lab as an NIH postdoctoral fellow and was promoted to research associate in 1983. Tom and Gretchen both joined the faculty of the Department of Biochemistry at the University of Missouri in 1986 as part of the new, state-funded Food for the 21st Century program.

Gretchen and Tom are best known for their seminal work on the mechanism of auxin action, especially their discoveries relating to transcriptional regulation of auxin-regulated genes. Their work led to the identification of auxin response elements and auxin response factors, discoveries that were key to understanding how auxin works in plants. Gretchen and Tom have also made important contributions to cauliflower mosaic virus transcription and replication and to an analysis of the plant RNA polymerase complex.

Gretchen and Tom have contributed to the success of plant biology by their activities at Missouri, nationally, and though their contributions to our Society. At Missouri they were founding members of the important Food for the 21st Century program. Gretchen has served on several ASPB committees, most notably the Committee on the Status of Women in Plant

Physiology (since renamed the Women in Plant Biology Committee). She has also served on numerous NSF and USDA grant panels. Tom has served as associate editor of *Plant Physiology* and coeditor of *The Plant Cell* and has served the community through membership on NASA, NSF, and USDA grant panels.

Corresponding Membership Award

Murray Ronald Badger

Murray Ronald Badger is a professor at the Australian National University and has been one of the most influential scientists in the field of photosynthesis for over 30 years. His work spans several disciplines in plant biology including biochemistry, physiology, molecular biology, and genomics. In addition, Murray has worked on a broad array of organisms and ecosystems, ranging from cyanobacteria to higher plants and from marine systems to deserts. He has also authored or coauthored a number of classic papers. Murray's earliest work focused on Rubisco and its in vivo activation. In a series of elegant studies spanning 25 years, Murray and his collaborators have provided insight into how cyanobacteria take up bicarbonate and convert it to CO_2 in the carboxysome. More recently Murray has applied both bioinformatics and genomics to his studies and is well known for the development of mass spectrometric approaches to measuring gas fluxes in plants.

Murray received his undergraduate degree from Sydney University and his PhD from the Australian National University. He was a CSIRO postdoctoral fellow at the Carnegie Institution of Washington at Stanford University. He has also served as a visiting fellow at the Universität Würzburg, Würzburg, Germany, and the Department of Plant Physiology, University of Umeå, Umeå, Sweden. He is a professor at the Australian National University and head of the Molecular Plant Physiology Group, deputy director of the ARC Centre of Excellence in Plant Energy Biology, and coordinator of the Plant Sciences Research Theme at the Australian National University.

In addition to his contributions to the photosynthesis field, Murray has contributed greatly to the infrastructure of plant science by hosting scientific meetings, refereeing manuscripts and proposals, and collaborating with scientists from around the world. He has hosted a large number of scientists in his laboratory over the years. In the past 30 years, Murray has hosted an estimated 20 visiting scientists, helping make Canberra a "Mecca" for plant scientists. Besides reviewing for a large number of journals, Murray has also been on the editorial boards of *Photosynthesis Research* and *Functional Plant Biology.* While considered by all a distinguished "senior" member of the scientific community, Murray remains friendly and accessible to younger scientists. He often provides excellent ideas for future research approaches, no doubt helping many scientists with their work over the years.

William J. Davies

William J. Davies has been a faculty member at the University of Lancaster, U.K., for more than 30 years. He is a leading authority on chemical communication between roots and shoots. It has long been recognized that plant growth regulators produced in roots influence the growth of shoots, and mutants of root-synthesized regulators such as ABA or cytokinins clearly influence stomatal behavior and shoot growth. Bill has demonstrated the action of these hormones in the whole plant under natural conditions. He has manipulated root conditions without altering shoot conditions and shown that stomatal behavior and leaf growth change, consistent with root to shoot signaling. This basic research has practical applications that are being adopted in agriculture with global impacts.

Bill received his BS in horticultural science from Reading University in 1970 and his PhD in forestry and botany from the University of Wisconsin–Madison in 1974. He completed postdoctoral research at Duke University before joining the faculty at the University of Lancaster. Much of his research was accomplished while he served as director of the Environment Centre at the University of Lancaster and editor-in-chief of the *Journal of Experimental Botany.* During these years, numerous scientists have visited his lab and institution and many students have been trained. During his tenure at the *Journal of Experimental Botany,* Bill arranged for the journal to host symposia at annual meetings of the Society for Experimental Biology and to support other international symposia. Bill is an excellent lecturer revered by his students and colleagues, with whom he continues to publish widely.

Dennis R. Hoagland Award

Jorge Dubcovsky

Jorge Dubcovsky is recognized for his pioneering work on the genetics and physiology of vernalization responses in temperate cereals, his contribution to the advancement of cereal genomics, and the deployment of cereal genomics in wheat breeding. By focusing his research on wheat, Jorge's accomplishments impact one of the most important human food sources and advance human welfare on the global scale. His lab isolated and characterized a number of important wheat genes, including genes involved in vernalization, frost tolerance, high grain protein content, and recently, a slow rusting resistance gene.

A central theme of Jorge's research is the regulation of flowering in temperate cereals. His group demonstrated molecular communication between the vernalization and photoperiod pathways and discovered the existence of a complex feedback regulatory loop that contributes to the irreversible initiation of reproductive development in wheat. Another key advance by Jorge's team was the cloning of the *GPC1* QTL (for Grain Protein Content) from wheat. Transgenic lines with reduced transcripts of this gene mature several weeks later than

the control plants and had 30 percent less grain protein, zinc, and iron than the non-transgenic controls. Interestingly, almost all commercial pasta and bread wheat varieties have a non-functional copy of *GPC-B1*, suggesting that this gene was lost during wheat domestication. Therefore, the reintroduction of the functional gene from the wild species into commercial wheat varieties has the potential to increase grain protein and micronutrient contents significantly. The first varieties including *GPC-B1* are being released.

Fellow of ASPB Award

Peter Albersheim (1957)

University of Georgia

Peter is recognized for his seminal work on the chemistry of cell wall structure and function and for recognizing the role of the cell wall in cell signaling and pathogen interactions. In the late 1980s and early 1990s, Peter helped organize trips to Washington, D.C., to bring political awareness of the importance of plant biology research. These efforts were the beginnings of what became a focused commitment on the part of ASPB for public outreach and resulted in the hiring of a dedicated staff member and establishment of the ASPB Committee on Public Affairs.

Richard Amasino (1978)

University of Wisconsin

Rick is internationally recognized for his pioneering research on the regulation of flowering and vernalization. Rick's discovery of the FLC gene and molecular mechanisms regulating flowering is now an integral part of plant biology curriculum. To students of plant biology he is also known for his textbook photo reaching to the top of a Maryland Mammoth tobacco plant growing under long days. Rick served as president of ASPB in 2007 and wrote scholarly letters in the *ASPB News* challenging the membership to become actively engaged in energy conservation and teaching the public about science and evolution. Rick has also served on the editorial board of *Plant Physiology* since 1997 and is currently an associate editor.

Clanton Black (1957)

University of Georgia

Clanton is well recognized for his seminal work on C_4 photosynthesis. His research team was the first to separate bundle sheath and mesophyll cells and study their metabolism. This innovation was critical for understanding C_4 metabolism. Clanton worked at the biochemical level but understood and collaborated with others on plant research at higher levels. He served the Society, then known as the American Society of Plant Physiologists, as secretary, vice president, and president (1979). He served for nearly 10 years as a monitoring editor and was also an associate editor of *Plant Physiology.*

Hans Bohnert (1975)

University of Illinois

Hans is internationally recognized for his research on plant molecular and genetic reactions to environmental stress, especially high salinity. He is a pioneer in the utilization of genomics to further the understanding of salinity and drought responses of plants and in the use of the halophyte *Mesembryanthemum crystallinum* (ice plant) as a model species. His numerous publications have had a huge impact on the field of environmental stress, and as such, he is an ISI highly cited researcher. Hans served as an associate editor for *Plant Physiology* from 1988 to 1992 and initiated the Plant Gene Register.

Rebecca Boston (1987)

North Carolina State University

Becky is an internationally recognized expert on the biochemistry and cell biology of maize seed proteins. Her work on protein misfolding revealed molecular mechanisms underlying the phenotype of several maize endosperm mutants. Becky served the Society as a member of the Dennis Robert Hoagland Award Selection Committee (1994–1997), the Search Committee for Executive Director (1998), the Committee on the Status of Women in Plant Physiology (1998–2001), the Executive Committee (elected member, 1999–2002), and the Board of Trustees (2003–2007; chair, 2005–2006). She has been active in mentoring young scientists through service in organizing, building participation, and making presentations on Letters of Recommendation in the Plant Biology Career Development Workshops.

Robert Harza Burris (1948)

University of Wisconsin

Bob is best known for his research on biological nitrogen fixing, particularly on the enzyme nitrogenase, but he also investigated other aspects of plant biology including peroxidases and CAM metabolism. His lab developed many of the techniques for measuring nitrogen fixation in vivo. Bob served as president of ASPP in 1960 and has been a strong proponent of plant biology. He served on the editorial board of *Plant Physiology* for a number of years (1962–1966; 1972–1984) as well as on the editorial board of the ASPB Monograph series (1972–1974).

Nick Carpita (1975)

Purdue University

Nick has contributed wide-ranging discoveries to the field of plant cell walls. Taking a genome-wide approach, he has used non-invasive spectroscopy methods to identify and characterize mutants with impaired cell wall deposition. Recently he showed that small interfering RNAs were involved in the developmental regulation of cellulose synthase genes. Nick coauthored with Maureen McCann a comprehensive and elegant description of plant cell wall in the book *Biochemistry & Molecular Biology of Plants.* He has served the Society in multiple capacities, including as secretary, chair of the Program Committee, member of the Executive Committee, and monitoring editor of *Plant Physiology.* He also initiated the idea of, and then organized, a Pan American Congress on Plants and BioEnergy in Mérida, Mexico, in 2008.

Vicki Chandler (1990)
University of Arizona
Vicki is internationally recognized for her pioneering work on epigenetic control of gene expression. Her research has led to a new understanding of chromatin structure and revealed an underlying mechanism involved in paramutation. She served ASPB as a member of the editorial board of *Plant Physiology* (1995–2001), member of the ASPB Executive Committee (1998–2001), and president (2002). Her strong leadership was essential as the Society considered name changes for the journal *Plant Physiology,* digitized the entire archive of both *Plant Physiology* and *The Plant Cell,* and pushed forward with the *The Arabidopsis Book,* ASPB's online-only, free-access compendium.

Eric Conn (1951)
University of California
Eric is recognized for his seminal work in secondary plant metabolism. His discovery of phenylalanine ammonia-lyase laid the foundation for our current understanding of the phenylpropenoid pathway. In addition, his research on the metabolism and localization of cyanogenic glycosides is internationally recognized. Along with Paul Stumpf, Eric wrote the textbook *Outlines in Biochemistry* and edited 16 volumes of *The Biochemistry of Plants,* a comprehensive treatise, from 1980 to 1990. Eric has been a member of ASPB since 1951 and served as assistant editor of *Plant Physiology* from 1968 to 1972, as an editorial board member of *Plant Physiology* from 1980 to 1983, and as president 1987.

Roland Douce (1976)
DBMS/PCV
Roland has made seminal contributions to our understanding of the structure and function of plant mitochondria and also of the chloroplast envelope. He has served and supported ASPB in several significant ways. These include service as a monitoring editor of *Plant Physiology* from 1980 to 1990, collaborating with young and established scientists around the world, and being a strong leader and mentor to many young scientists. His efforts have attracted international young scientists to the field of plant biology and to membership in ASPB.

Pamela Green (1989)
University of Delaware
Pam is a pioneer in the field of RNA metabolism. Her research has made a significant impact in the areas of gene regulation and RNA stability in plants. She used genetic and biochemical approaches to study the control of mRNA decay in plants, laying the foundation for understanding post-transcriptional gene regulation. This research led to new insights into plant siRNAs and microRNAs and their targets. Pam served ASPB from 1996 to 2001 as a member of the Publications Committee and as a member of the Program Committee from 1993 to 1996.

Mary Lou Guerinot (1991)
Dartmouth College
Mary Lou pioneered approaches to study the molecular mechanisms of iron and zinc transport in plants and continues to lay the foundation for the development of crops that offer sustainable solutions to metal malnutrition. She is also leading and coordinating collaborative research efforts to study ionomics in Arabidopsis and rice and to identify gene networks that control the mineral ion content of plants. She has served ASPB as president (2003–2004), member of the Program Committee, Executive Committee, Board of Trustees, and ASPB Education Foundation.

Alan Jones (1982)
University of North Carolina
Alan is recognized for his work in plant signal transduction, starting with studies to identify auxin-binding proteins to his recent work on the role of heterotrimeric G-proteins in sugar, hormonal, and stress signaling. At ASPB, he served seven years as a monitoring editor and since 2005 as an associate editor of *Plant Physiology*. He has also served on the Program Committee and the ASPB Bylaws Committee. He is currently a member of the Executive Committee.

Robert Last (1989)
Michigan State University
Rob is recognized for his use of genetic approaches to characterize amino acid biosynthetic pathways and their roles in stress responses in plants. His work has made the tryptophan pathway the most extensively genetically characterized amino acid biosynthetic pathway in plants. Rob served ASPB as a monitoring editor of *Plant Physiology* in 1994 and as an associate editor since 1999. He has organized and coedited several special issues and series of the journal and was also on the ad hoc committee considering a genomics journal from 1998 to 2000. He is the editor-in-chief of *The Arabidopsis Book,* ASPB's free-access, online-only compendium. He has been a strong advocate for plant biology and is currently a member of the Committee on Public Affairs.

Peggy G. Lemaux (1984)
University of California
Peggy is recognized as a leader in cereal transformation. She developed user-friendly transformation protocols, which are widely used for developing transgenic crops. Peggy is an internationally recognized spokesperson for plant biotechnology and is committed to increasing public understanding of biotechnology and the potential benefits to the Society. Her commitment to public outreach and education is demonstrated in her service to ASPB. She served as chair and member of the Committee on Public Affairs from 1997 to 2003, during a time when there were many debates about genetically modified organisms. In addition, she has served as a member of the ASPB Education Foundation since 2003.

Carl Leopold (1948)
Cornell University
Carl has had a long and distinguished career in plant physiology, both as a

research scientist and as an administrator and promoter of plant biology. In research he has made major contributions in the areas of gravity sensing, seed dormancy, ion physiology, and the synthesis and action of plant growth regulators (auxin, ethylene, abscisic acid). He is the author of the book *Plant Growth and Development*. He served as president of the Society, then known as the American Society of Plant Physiologists, from 1965 to 1966 and as vice president from 1958 to 1959. He served on the editorial board of *Plant Physiology* from 1956 to 1974. Carl is active in the Leopold Foundation, the Finger Lakes Land Trust, and the Tropical Forestry Initiative, an ongoing project aimed at reclaiming rain forest habitat in Costa Rica.

Stephen Long (1999)

University of Illinois

Steve's research has provided the scaffolding for connecting the environmental responses of plants in the field to the basic mechanisms of photosynthesis, most notably in the plant responses to rising carbon dioxide and tropospheric ozone. His work in this area has led to new understanding of how major crop plants will respond to these future environmental challenges. He has also been a champion of the use of *Miscanthus x giganteus,* a high-biomass, cold-tolerant C_4 species, as a bioenergy crop. Steve has served on both the Publications and Program Committees. He was a lead organizer for two ASPB-sponsored meetings, the Biology of Transpiration (2006) and the PanAmerican Congress on Plants and BioEnergy (2008), and for two global change symposia at ASPB annual meetings.

C. Robertson McClung (1989)

Dartmouth College

Rob is recognized for his fundamental research to unravel the circuits that make up the circadian clock in Arabidopsis and cyanobacteria. His work has provided key insights into the roles of temperature and light in setting the clock and how natural regulation of the clock affects plant fitness. He was a member of the Committee on the Status of Women in Plant Physiology (since renamed the Women in Plant Biology Committee) from 1997 to 2000. He served as member and chair of the Publications Committee from 2002 to 2007 and has been a member of the Executive Committee since 2003. He served ASPB as president in 2008. He is also on the editorial board of *The Arabidopsis Book*.

John Ohlrogge (1979)

Michigan State University

John's research on fatty acid synthesis and lipid metabolic pathways has earned him an international reputation as an authority in the field of plant lipid metabolism. His holistic approach including biochemistry and genomics has led to seminal discoveries critical to the understanding of the lipid system, including lipid polymers such as cutin and suberin, and the regulation of metabolic flux. John has served ASPB as a monitoring editor of *Plant Physiology* from 1984 to 1992 and from 1995 to 1996 and as an associate editor since 2005.

Mel Oliver (1986)

USDA–ARS, Plant Genetics Research Unit, University of Missouri

Mel has pioneered research into the underlying mechanisms of vegetative desiccation tolerance and its importance in the evolution of the land plants. His studies with *Tortula ruralis,* the vegetative desiccation-tolerant bryophyte model, and comparative work with more complex species have demonstrated the importance of rehydration in the evolutionary pathways for desiccation and drought tolerance. Mel was very active in the ASPB Southern Section, including serving as chair in 1999. At the national level, Mel served on the Executive Committee and was chair of the Membership Committee from 2002 to 2009. In addition, he is an organizer of the First Global Strategic Summit of Plant Science Societies, to be held in 2009.

Federico Sanchez (1998)

Instituto De Biotecnología, Universidad Nacional Autónoma de México

Federico is one of the leaders of plant molecular biology in Mexico. His research centers on nitrogen metabolism, nodulin gene expression, and *Rhizobium* inoculation-induced effects on the plant cytoskeleton in the *Rhizobium-Phaseolus* (bean) symbiosis. Bean is an important crop for Mexico, but was not considered to be a very good experimental system because it, like most legumes, is recalcitrant to agro-transformation. Federico and his colleagues developed a root transformation system that overcame this difficulty. He has organized symposia at past ASPB meetings, and with other Mexican colleagues also organized the 2008 meeting of ASPB and the Sociedad Mexicana de Bioquímica in Mérida, Mexico.

Lawrence Schrader (1964)

Washington State University

Larry is recognized for his early research on nitrogen metabolism, which revealed the interdependence of carbon and nitrogen assimilation in crop plants, and for his more recent work that has resulted in new methods to improve the postharvest physiology of fruit crops. He served as secretary of ASPB from 1983 to 1985 and as a member of the editorial board of *Plant Physiology* from 1979 to 1980 and 1983 to 1987. Larry served as president of ASPB in 1987, the year that planning for *The Plant Cell* commenced.

Edgar Spalding (1987)

University of Wisconsin

Edgar is recognized for his research in the fields of photobiology, electrophysiology, and growth analysis. Through rigorous analysis of the kinetics of growth, Edgar has defined the contributions of molecular regulators and produced comprehensive data describing the roles of various photoreceptors in photomorphogenesis. Edgar's contributions to ASPB are numerous, including roles on the Membership Committee (2000–

2003), on the Program Committee (2003–2007), and as secretary (2003–2005). He is currently serving on the Board of Trustees. Edgar also has been a monitoring editor for *Plant Physiology* (2003–2008) and has organized numerous minisymposia at the annual meeting.

Michael Thomashow (1987)

Michigan State University

Although Mike's early work was on tumor formation in plants by *Agrobacterium tumefaciens*, he is most recognized for his groundbreaking work in the elucidation of the CFB cold response pathway in Arabidopsis, which has a key role in cold acclimation and freezing tolerance. His scientific contributions to the area of cold acclimation and freezing tolerance have stood the test of time. Mike has had an active role in ASPB, serving on the *Plant Physiology* editorial board (1988–1992; 1999–2005), as a member of many committees, and as ASPB president (2005–2006).

Mary Tierney (1987)

University of Vermont

Mary is well known for her research on cell wall structural proteins, especially proline-rich proteins, and investigates their expression in root hairs and stomata. She has organized several scientific meetings dealing with the cell wall and is a strong advocate for her area of study. Mary has been active in ASPB, having served as chair of the Women in Plant Biology Committee and as a section delegate to the Executive Committee. She is currently a member of the Board of Trustees (2007–2011). Mary was a monitoring editor for *Plant Physiology* (2002–2007) and also helped organize ASPB's Lab Leadership Workshop held at the annual meeting in 2007.

Carroll Vance (1976)

USDA–ARS, Agronomy Plant Genetics, University of Minnesota

Carroll has been one of the leaders in studying the development and physiology of indeterminate nodules from a genetics perspective, beginning with his pioneering work on alfalfa (*Medicago sativa*), which is an outcrossing, tetraploid legume, and continuing with the diploid model legume *Medicago truncatula*. His work contributed to the physiology, biochemistry, and functional genomics of both plant–microbe interactions and plant adaptation to P stress. Carroll has been a member of ASPB since 1976 and has been active in ASPB both in an editorial capacity and as a participant in meetings. He served as monitoring editor of *Plant Physiology* from 1985 to 1992 and from 1995 to present. He was reappointed monitoring editor in 2005 and is still serving in that capacity.

Katherine VandenBosch (1981)

University of Minnesota

Kate is recognized for her research on plant defensins as well as genes expressed in nitrogen-fixing nodules. She has been actively involved in developing resources for the *Medicago* community and also has contributed by organizing workshops and research teams for funding opportunities. Along with Carroll Vance, Kate has been one of the leaders in advancing the cause of *Medicago truncatula* as a model legume for the study of symbiotic nitrogen fixation and for plant pathogenic interactions. She served as monitoring editor (2002–2005) and is currently an associate editor (2007 to present) for *Plant Physiology*. In addition, she was a guest editor for two issues on legumes (March 2003 and April 2005).

Larry N. Vandenhoef (1966)

University of California

Larry built his reputation in plant physiology on his work on auxin biology and its regulation of plant growth and development. He eventually moved into academic leadership, culminating in an appointment as the chancellor of UC Davis, where he served for 15 years. Despite his absence from the laboratory, Larry maintained an active interest in plant biology throughout his leadership service and remained involved in ASPB, including serving as secretary/treasurer of the Midwest Section (1979–1980) and as ASPB treasurer (1982–1987). His service was manifold, but his greatest impact came during his leadership on the Board of Trustees, where he was instrumental in launching *The Plant Cell* and securing its success.

Martin Gibbs Medal

John Ohlrogge

John's research program is focused primarily on understanding fatty acid metabolism in plant cells. He attached many fundamental problems such as determining the biochemical pathways that lead to the synthesis of common and unusual fatty acids in plants and dissecting the regulatory mechanisms controlling these pathways. He elucidated some of the mechanisms by which fatty acids are incorporated into membrane lipids or sequestered in oil bodies in seeds. More recently, he has also turned his attention to understanding the metabolism of waxes and long chain fatty acids found in the cuticle on the outer surfaces of the plant. In addition, he has maintained a long-standing interest in applying new information derived from his research to practical purposes. For example, he has worked toward creating plants that make different oils that are more beneficial to human health or that are better suited to fuel our vehicles or that can serve as the starting materials for making chemicals currently produced from petroleum.

In addition to his outstanding research program, John is known as an exemplary citizen and mentor of graduate students and postdoctoral associates who have gone on to have their own successful careers. He has a reputation for creating a vibrant laboratory research setting that makes graduate and postgraduate study an enjoyable and stimulating experience. Among many exemplary leadership activities in the scientific community, John helped found and initially directed the National Plant Lipid Cooperative that advances research on plant lipids by improving interaction and communication between scientists in this field.

Stephen Hales Prize

Jeffery Dangl

Jeff has played a key role in developing the concepts and elucidating the fundamental mechanisms that govern plant–pathogen interactions. In doing so, he has displayed a rare combination of intellectual leadership and scientific acumen. Jeffery initiated his studies on the plant immune system while a postdoctoral fellow at the Max Planck Institute in Cologne, Germany, bringing to bear his knowledge of mammalian immunology acquired while a PhD student at Stanford University. He continues these studies today in his position as the John N. Couch Distinguished Professor at the University of North Carolina, Chapel Hill. Jeffery has mentored numerous scientists, served on national scientific panels and editorial boards, and acted as an effective proponent for plant research initiatives worldwide. He was elected a member of the National Academy of Sciences in 2007.

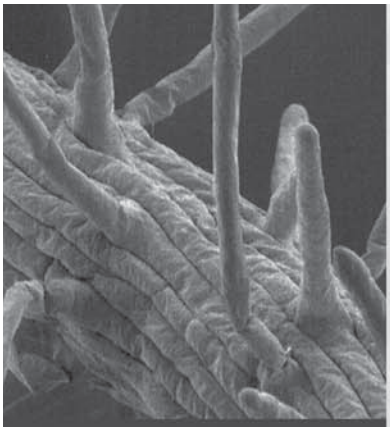
Jeffery's work was pivotal in the development of Arabidopsis as a model system in which to study the plant immune responses. As part of his initial studies, he characterized the genetic interaction between Arabidopsis and *Pseudomonas* bacteria, demonstrating that these displayed the same well-known gene-for-gene relationship found in crop immune responses to pathogens. These genetic studies led to his identification of resistance (R) genes in Arabidopsis, the impact of this work spreading far beyond Arabidopsis, beyond even crop plants, for similar genes were later found to regulate human innate immunity.

Subsequently, Jeffery was instrumental in developing the "Guard Hypothesis" to explain the ability of plant R proteins to protect against pathogens, a protective mechanism that need not require direct interaction between the R protein and the pathogen protein. Instead, many R proteins monitor the integrity of cellular proteins targeted by the pathogens. Jeffery's work is not restricted to the plant side of this molecular arms race, and he has recently been on the front line in the development of genomic approaches to identify the repertoire of pathogen effector molecules.

Early Career Award

Siobhán Brady

Siobhán, an assistant professor at the University of California Genome Center and Section of Plant Biology, is recognized as "a rising star in the area of plant systems biological research" and as having "a rare combination" of qualities "that truly deserves to be recognized." Siobhán obtained her PhD working with Professor Peter McCourt at the University of Toronto, Canada, on abscisic acid signaling. Not only had she mastered a strong background in hormone signaling during this early period of her training, she was also quick to realize the power of systems biology in the dissection of regulatory networks in Arabidopsis. It was at the University of Toronto that Siobhán made significant contribution in the bioinformatics of *cis*-element identification for tissue-specific transcriptional regulatory networks in Arabidopsis. She was awarded a prestigious and highly competitive postdoctoral fellowship from the Canadian government. In her postdoctoral work in Professor Philip Benfey's laboratory at Duke University, Siobhán took on what her mentor referred to as "the greatest challenge" in determining the expression profiles of all the cell types in the root. She examined individual roots so as to achieve profiling of all the developmental stages along the longitudinal axis of the root. For this work, she had to develop new software tools to accomplish analysis of data along both the radial and longitudinal axes of the root. It is her ability to identify and work with the right people that further distinguishes her accomplishments from those of her peers. The result is a seminal paper in *Science* that revealed a high-resolution spatiotemporal expression map for root development. Dr. Benfey referred to Siobhán as "fearless" in adopting new techniques and as "a leader in scientific discussions and in lab organization." Siobhán had mentored many younger students in the Benfey laboratory. In addition, she also took on a leadership role in running a Duke summer undergraduate research program that had a combined focus on mathematical modeling and biology. She was recognized by Duke University and named "Outstanding Postdoc" in 2007.



AAAS/ASPB 2010 Mass Media Science & Engineering Fellows Program

Are you interested in science writing?

Do you want to help people understand complex scientific issues?

Apply for the AAAS/ASPB Mass Media Science & Engineering Fellows Program and learn how to increase public understanding of science and technology. Fellows in the 10-week 2010 summer program will work as reporters, researchers, and production assistants in mass media organizations nationwide. Deadline: January 15, 2010.

Former host sites include:

- Chicago Tribune
- The Los Angeles Times
- Newsweek
- National Public Radio
- Popular Science

Visit http://www.aaas.org/programs/education/MassMedia/index.shtml for more details and to download an application brochure, or call 202-326-6441 for more information.

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Christine Flanagan Receives 2009 National Odum Ecology Education Award

United States Botanic Garden (USBG; www.usbg.gov) Public Programs manager and ASPB Education Foundation board member Christine Flanagan has been named the Ecological Society of America's (ESA's) 2009 Odum Ecology Education Award winner. The Eugene P. Odum Award recognizes an ecologist for outstanding work in education. ESA awards individuals who "through teaching, outreach, and mentoring activities . . . have demonstrated their ability to relate basic ecological principles to human affairs." Christine has been actively building and growing public programs to support the USBG's educational mission of inspiring people about the importance of plants to humankind.

Ecology and the environment have been a major focus of Christine's publications, presentations, and exhibitions. For example, "Our Nation's Crown Jewels," a 2003 exhibit, was a collaboration she developed with Kauai's Native Plant Society that showcased Hawaii's rare and endangered plants. In February 2005, Christine became an active participant in ASPB education outreach efforts and helped the Society achieve access to public venues for its plant science education programs. Specifically, she was instrumental in supporting the exhibition of the ASPB-sponsored program, s*L*owlife (http://plantsinmotion.bio.indiana.edu/usbg/intro.htm), created by ASPB member Roger Hangarter. Christine was drawn to Roger's project because it presents high science in an art gallery style, thus challenging many of the commonly held attitudes about plants while showcasing their beauty and connection to humans. Roger had combined the initial funding from the ASPB Education Foundation Grant Awards Program (GAP; http://aspb.org/education/foundation/gap.cfm) with resources from the National Science Foundation, the Chicago Botanic Garden, the U.S. Botanic Garden, and Indiana University to fully develop the exhibit. With Christine's guidance and support, s*L*owlife was installed at the U.S. Botanic Garden, in Washington, D.C., from November 1, 2005, to March 26, 2006. More recently, Christine cocurated 2008's "One Planet—Ours" exhibition, which partnered 43 U.S. organizations that demonstrated ways to build sustainable societies. Christine also developed the U.S. Botanic Garden's well-regarded junior botanist program for children.

Christine Flanagan, award-winning plant science educator.

Christine's work extends to supporting the outreach efforts of ASPB's member scientists. She is an active participant of the Education Foundation board, a group that consults on the viability of GAP applications the Society funds each year. She also has been a contributor to the Education Forum of this newsletter. An article she wrote for the May/June 2006 issue, "Talking Science to John Q. Public: Is It All Just Geek to Him?" (http://www.aspb.org/newsletter/mayjun06/26johnq.cfm), exhorts plant biologists to communicate their work to a lay audience despite the handicap that plant anatomy, life histories, photosynthesis, and other aspects of plant biology often feel alien to our human, "mammal-centric" worldview. Her article describes some of her other outreach projects and includes the critical reminder that "whether it is in the grocery store, the garden, or the pharmacy, advances in plant sciences quickly manifest themselves in ways that affect every life. It is understandable that people sometimes feel victimized by change they didn't ask for and don't understand. In making their work accessible, scientists can share the excitement of discovery and soothe unease while building public support for research."

Christine is certainly doing her part to help develop general understanding of and appreciation for the wonders of plant biology. ASPB is honored that she is involved with our Society's initiatives and pleased that she has been recognized through the 2009 Odum Ecology Education Award for all of her ongoing accomplishments in outreach and education.

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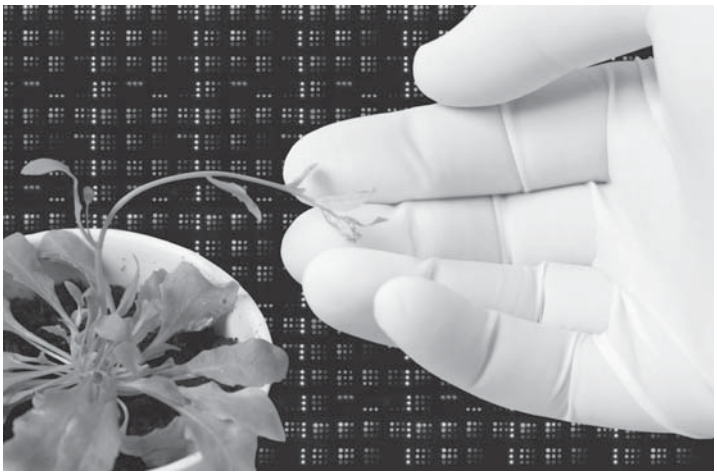
Christine shares fascinating details of plant biology with USBG visitors.

You have the gene... now what does it do?



Now you can easily add physiology measurements to your assay toolkit.

You know the reasons that make *Arabidopsis thaliana* an excellent model for gene expression studies (short generation time, sequenced genome, mutant collection, ease of cultivation, etc.). It is essential to add physiological assessment of *in situ* function to validate regulatory or functional genes identified by genomic, molecular or bioinformatics results. Regulation or loss/gain of function effects on photosynthetic and/or respiratory pathways can be measured through gas exchange with the LI-6400XT Portable Photosynthesis System and the new 6400-17 Whole Plant Arabidopsis Chamber. Gas exchange measurements are rapid, non-destructive and repeatable over the life span of the plant.

To learn more about the 6400-17 and 6400-18, go to

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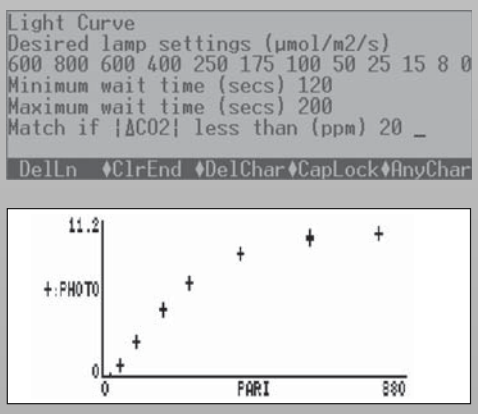
The 6400-17 can be combined with the new 6400-18 RGB Light Source to form a powerful tool for measuring whole plant gas exchange and light response on Arabidopsis or other plants with small growth habits.



Membership Corner

ASPB members share a common goal of promoting the growth, development, and outreach of plant biology as a pure and applied science. This column features some of the dedicated and innovative members of ASPB who believe that membership in our Society is crucial to the future of plant biology. If you are interested in contributing to this feature, please contact ASPB Membership at info@aspb.org.

Name: Dan Tennessen
Title: New Technologies and Data Management Lead
Place of Work or School: Monsanto Company
Research Area: Crop Biotechnology Field Research
Member since: 1991

1. **Why has being a member of ASPB been important to you?**
   It keeps me connected with high-quality science and a great network of scientists from around the world, and reminds me to focus on the basics of biology as a critical component of my decision making in the industry.

2. **Was someone instrumental in getting you to join ASPB?**
   Thomas Sharkey.

3. **What would you tell colleagues to encourage them to join?**
   If you are involved in life science work, you need to be a member of some collegial science community because the interaction will enrich, strengthen, and accelerate your productivity. My interest in ASPB is that it brings high-quality researchers together in an organized and efficient way (the journal, the annual meetings, and the web page). Equally important is that ASPB is broader in basic science than it used to be. This is important because the tools we use, and the collaboration required for today's science, require broad basic science skills and backgrounds.

4. **Have you enhanced your career using ASPB job postings or through networking at an ASPB function?**
   I have posted positions on ASPB's web page, and I have from time to time scanned positions to find out who is hiring and what kind of skill and talent is being looked for by the best organizations hiring scientists. It helps me understand what is going on in academic and industrial research planning.

5. **Have you had any success at finding candidates as a result of a job posting at the meeting or via our online Job Bank?**
   In our research pipeline, and in our field research, needs are very specific and so it is always a challenge to find the right candidate with a combination of work ethic, integrity, potential for leadership, basic scientific skills, and key technical skills for the task at hand. In particular, the basic science skills and key technical skills can frequently be found in candidates from the Job Bank. I would like to see a greater understanding of leadership and project management out of all graduates.

6. **Do you read print journals? If so, where do you usually read them?**
   I read journals mostly online because of the convenience and for environmental reasons, but my preference is the printed page when I can find one. When I have a bit of time, I seek out libraries to read a paper copy.

7. **What do you think is the next "big thing" in plant biology?**
   Biological electronics/circuits.

8. **What person, living or deceased, do you most admire?**
   Mohandas Karamchand Gandhi.

9. **What are you reading these days?**
   The Last Lecture, The Omnivore's Dilemma, Please Understand Me II, The Goal, Early Warning, and *Crops & Environmental Change.*

10. **What are your hobbies?**
    Writing, my vineyard, and rediscovering art and life sciences with my six- and eight-year-olds.

11. **What is your most treasured possession?**
    Freedom of thought.

12. **What do you still have left to learn?**
    How to lead above the fray.

People
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Christine received her PhD in ecology and evolutionary biology from the University of Arizona. She first worked as an assistant curator for education at the Orland E. White Arboretum in Boyce, Va. She has served the U.S. Botanic Garden since 1996, first as public programs coordinator and, beginning in 2002, as public programs manager. For more information about Christine and her accomplishments, contact Sally Bourrie at (202) 226-4145 or sbourrie@aoc.gov.

CALL FOR APPLICATIONS

American Philosophical Society Research Programs

All information and forms for all of the Society's programs can be downloaded from our website, http://www.amphilsoc.org. Click on the "Fellowships and Research Grants" tab at the top of the home page.

Information About All Programs

Purpose, Scope

Awards are made for non-commercial research only. The Society makes no grants for academic study or classroom presentation, for travel to conferences, for non-scholarly projects, for assistance with translation, or for the preparation of materials for use by students. The Society does not pay overhead or indirect costs to any institution or costs of publication.

Eligibility

Applicants may be residents of the United States or American citizens resident abroad. Foreign nationals whose research can only be carried out in the United States are eligible. Grants are made to individuals; institutions are not eligible to apply. Requirements for each program vary.

Tax information

Grants and fellowships are taxable income, but the Society is not required to report payments. It is recommended that grant and fellowship recipients discuss their reporting obligations with their tax advisors.

Contact information

Questions concerning the FRANKLIN and LEWIS AND CLARK programs should be directed to Linda Musumeci, Research Administrator, at LMusumeci@amphilsoc.org or 215-440-3429.

Brief Information About Individual Programs

Franklin Research Grants

Scope

This is a program of small grants to scholars intended to support the cost of research leading to publication in all areas of knowledge. The Franklin program is particularly designed to help meet the cost of travel to libraries and archives for research purposes; the purchase of microfilm, photocopies, or equivalent research materials; the costs associated with fieldwork; or laboratory research expenses.

Eligibility

Applicants are expected to have a doctorate or to have published work of doctoral character and quality. Pre-doctoral graduate students are not eligible, but the Society is especially interested in supporting the work of young scholars who have recently received the doctorate.

Award

From $1,000 to $6,000.
Deadlines
October 1, December 1; notification in February and April.

Lewis and Clark Fund for Exploration and Field Research

Scope

The Lewis and Clark Fund encourages exploratory field studies for the collection of specimens and data and to provide the imaginative stimulus that accompanies direct observation. Applications are invited from disciplines with a large dependence on field studies, such as archeology, anthropology, biology, ecology, geography, geology, linguistics, and paleontology, but grants will not be restricted to these fields.

Eligibility

Grants will be available to doctoral students who wish to participate in field studies for their dissertations or for other purposes. Master's candidates, undergraduates, and postdoctoral fellows are not eligible.

Award

Grants will depend on travel costs but will ordinarily be in the range of several hundred dollars to about $5,000.

Deadline

February 15; notification in May.
Information updated July 2009.

2009 Grant Awards Program (GAP) Winners

Plant Science Education: Artistic Views, News You Can Use, and State-of-the-Art Overviews

The ASPB Grant Awards Program (GAP), http://www.aspb.org/education/foundation/gap.cfm, was created and sponsored by ASPB's Education Foundation in 2004. Since that inaugural year, GAP has afforded the Foundation many interesting opportunities to promote an understanding of plant biology concepts to educators, students, and the general public in a wide variety of settings.

GAP awards are granted to ASPB members who have developed effective teaching ideas and widely appealing outreach activities that explain or highlight interesting discoveries in plant science. Of the 13 applicants who submitted for GAP 2009, five were awarded funds. This translates to a 39% funding rate.

This year's winning projects will excite interest through state-of-the-art technology, inquiry-based teaching, and multimedia professional development presentations. The Foundation Board appreciates the impressive level of individual expertise and creativity each project adds to the Society's outreach efforts.

ChloroFilms: A Competition for New Plant Biology Videos on YouTube

Daniel Cosgrove
Department of Biology, Penn State University

GAP support was granted for Year 2 of this novel project that engages plant biologists and artists in producing plant biology videos with universal access on YouTube. The project extends ChloroFilms' resources for where to find and how to make plant biology videos (http://www.ChloroFilms.org).

The 2008 contest featured three categories: General, Technical, and Series. This worked quite well and will serve as the basis for the new contest. Feedback from 2008 confirmed that standard lecture-style videos fall flat with the judges (even professional plant biologists), so the 2009 call for videos will emphasize that the judges are looking for creativity, spark, and humor in the videos, as well as interesting science content. Filmmakers will be encouraged to be imaginative and pay attention to the production qualities of the video.


Dan Cosgrove

The 2009 competition also will ask applicants and allow interested parties to:

- Apply to one of two contests, with deadlines of December 1 and April 15—Most applicants come from universities and these dates work well with the academic calendars.
- Promote more international involvement—In 2008, entries came from Canada, Mexico, the United Kingdom, and Germany, as well as the United States. Outreach for 2009 will include the title "international video contest" on the website, and Karl Niklas, the past president of the Botanical Society of America (BSA; another ChloroFilms supporter), will actively promote international involvement. Celia Knight (Leeds, UK) also expressed interest in getting attention in the UK for the contest.
- Involve video classes and filmmakers—Two of the top winners in the 2008 contest were artists rather than plant biologists. More of this crossing of science and art is a good thing. Randy Olson, a scientist turned filmmaker, now will work with the contest advisory board.
- Be aware of the triage system—Some 2008 submissions were too simple or unpolished. Submissions to the 2009 contest will be vetted by a hired group of students. Scores will determine which videos make it to the judges.
- Use the ChloroFilms website—Updates to the site will make it much easier to locate quality videos in plant biology (beyond the winners in this contest) and develop resources and tips for making quality videos.
- Respond to the incentive system for early entries—Last-minute video entries can complicate the judging process. Benefits for early entries will be included in 2009.
- Blog, comment, and exchange information on the ChloroFilms website—People interested in science videos will be able to use the site to create, expand, and apply the clever content of the best plant biology videos.

Growing Public Understanding of Plant Breeding and Genetics

Steven van Nocker
Department of Horticulture, Michigan State University

Norm Lownds
Director, MSU/4H Children's Garden

"Growing Public Understanding of Plant Breeding and Genetics" will create permanent living plant exhibits that illustrate and explain concepts of plant genetics, domestication, and breeding to both K–12 and adult audiences. The exhibits will be based in the Michigan State University (MSU) Horticulture Gardens, http://www.hrt.msu.edu/gardens/, a major tourist attraction in Michigan that draws more than 200,000

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Steven van Nocker

Norm Lownds

GAP Winners
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visitors annually. Currently, there is no existing genetics-related education content in the MSU Horticulture Gardens, and this project appears to be unique among public gardens. The Gardens will support facilitated learning through science field trips and programs (10,000 students annually) and informal learning (general garden visitors). This collection of public gardens includes the 4-H Children's Gardens. Programs at the 4-H Children's Gardens attract an ethnically diverse audience, and admission is free. The exhibit developed by Steven and Norm will offer online components that enhance and expand the garden exhibits and allow wider dissemination.

Steve, project PI, states that "the project will connect one of the most heavily visited public gardens in the United States with a center of excellence in plant breeding and genetics. It is crucial that the public appreciate improvements made to plants through breeding and the value of this process to society. Moreover, public understanding of important issues related to plant biotechnology can be enhanced through increased knowledge of 'classical' genetics, appreciation of the process of domestication, and familiarity with approaches of traditional plant breeding. A better understanding of biology is especially important in Michigan as the state is undergoing change from a traditional industrial economy to one based on biomedical research and bio/renewable energy."

The garden at MSU will feature several side-by-side plantings of domesticated crops with a related wild species. Narration will indicate geographic origin and possible route of domestication, as well as specific traits that have been altered. Through the plant displays, narration, and activities, visitors will gain new understanding and recognize the important roles plant breeding and genetics play in their everyday lives. All exhibits will provide enough background information to be viewed independently, but will be especially informative when viewed in sequence. The featured plants will be:

- Brassica plans will show the incredible variation in growth habit and inflorescence architecture among the six domesticated forms of *Brassica oleracea* most common to our audience (cabbage, Brussels sprouts, cauliflower, broccoli, kohlrabi, and kale) and its variation from a wild accession.
- Tomato plantings will feature the wild, green-fruited species *S. pennellii* juxtaposed with commercial cherry, plum, and beefsteak cultivars to illustrate fruit quality characters.
- Teosinte/corn will show distinct tillering, flowering habit, and cob and kernel traits.
- Wheat will illustrate various phenotypes of the extant species that have the A, B, and D genomes and the tetraploid and modern hexaploids. This exhibit additionally will convey the concept of polyploidization.
- Other plants will convey, through secondary exhibits dispersed throughout the Horticulture Gardens, the concept of domestication. These will take advantage of existing plantings of ornamentals and will involve installation of a wild relative at a proximal location. These include the existing apple/crab apple collection (with a new planting of the Kazakh wild apple, *Malus sieversii*) and the existing Rose Garden (with a new planting of a wild rose, *Rosa rugosa*).

This project will offer web resources on plant genetics, domestication, and breeding including interactive photo and video sharing, a Wonder Wall, age-appropriate games and puzzles, educational activities, and a discussion board (examples can be found at http://4hgarden.msu.edu/kidstour/tour.html and http://4hgarden.msu.edu/kidstour/credits.html#tutorial). The Wonder Wall is a unique online communication tool (http://wonderwall.msu.edu) that is a digital cross between a bulletin board and text messaging with a bit of creative graphics added. Project organizers, including Dr. Lownds, will moderate each Wonder Wall.

The garden and web page development will be carefully documented so that other developers can adopt and apply the model. This information will be distributed statewide and nationally to ASPB members as well as museum, science center, and garden educators and managers. This project will be discussed at conferences, such as ASPB, American Public Gardens Association, Museums and the Web, American Association of Museum's Marketplace of Ideas, and the National Children and Youth Gardening Symposium. To link with formal education, curricula based on state and national science standards will be written and made available on our websites as well as the ASPB Education web pages. The project will be promoted through the Michigan Science Teachers Association, the 4-H Children's Garden, participating schools, and the National Children, Youth & Gardens Network of the American Horticultural Society.

The impact of the project will be assessed through visitor surveys and interviews, both on-site and following up after six months. The assessment goal is to show how this project effectively connects the general public to plant genetics in new and exciting ways

both when they visit the gardens and when they return home.

Biotechnology for Sustainability: Building Resources for Public Education

Kent J. Bradford
Academic Director, Seed Biotechnology Center; Professor, Department of Plant Sciences, University of California, Davis

Jamie Miller
Assistant Director, Seed Biotechnology Center; Discovery Fellow, University of California, Davis

Upon learning of their GAP award, PI Kent Bradford stated, "We are delighted that the ASPB Education Foundation has funded our GAP proposal. In order to sustain food, fiber, and fuel production from plants indefinitely into the future while providing for the anticipated 9 billion people on the earth, we must apply the best science and use all the tools available."

This project is intended to be used as one of these tools. From a scientific perspective, transgenic modification of crops is an extension of thousands of years of crop modification by farmers. Yet, transgenic technology is currently limited commercially to only a few major agronomic crops (corn, cotton, soybean, and canola), while regulatory and marketing issues prevent the commercialization of a large pipeline of beneficial traits and crops. The public controversy over "genetic modification" has made some consumers resistant to eating genetically modified foods. This, in turn, has resulted in relatively limited commercialization of crops developed using biotechnology compared to its demonstrated potential.

Kent elaborates, "Experience to date with biotech crops has clearly demonstrated their beneficial contributions to reducing pesticide use, promoting conservation tillage, reducing farm fuel use, and increasing yields. Despite this mounting evidence, some groups continue to argue that biotechnology is incompatible with sustainability."


Kent Bradford


Jamie Miller

Therefore, with GAP funding Kent's team will augment current resources of the Seed Biotechnology Center (SBC) at UC Davis (http://sbc.ucdavis.edu) by developing informational materials that promote the concept of "Biotechnology for Sustainability."

Kent and co-PI Jamie Miller have chosen the following five traits to focus on in their initial campaign: decreasing soil erosion through *herbicide tolerance*; reducing pesticide use through *insect resistance*; increased crop survival/yield from *stress tolerance*; decreased fertilizer requirements and global warming gas emissions through *nitrogen use efficiency*; and health benefits through improved *nutritional traits*, particularly in countries with less diversity of and access to food. Jamie will generalize and condense information on these traits into specific case studies, highlighting traits' abilities to contribute to more sustainable agricultural production systems. This will include showing how biotech crops can benefit both developed and developing countries.

Materials describing the five case studies will be widely distributed and a website will be produced to post educational information related to "Biotechnology for Sustainability." A display will be produced and tested, allowing hands-on interaction with consumers to learn more about how biotechnology will help make our food supply more sustainable. These case studies will be used as models for development of additional ones in the future.

Kent and his colleagues are convinced that providing a positive, scientific image of plant biotechnology to students and consumers is critical to counter its portrayal by some groups as being dangerous, unneeded, and of little benefit to humanity (e.g., http://www.foodfirst.org/progs/global/ge/isp/ispreport.pdf). By creating well-documented, clear, and readily accessible case studies, the project will provide resources that can be used by ASPB members and staff to present the economic, health, and agricultural values of biotechnology in various venues. The project's materials and display can be reproduced and used by other groups in their local educational efforts. Kent's long-range goal is to broadly promote the "Biotechnology for Sustainability" concept to create public support for reducing regulatory and marketing hurdles to the utilization of recombinant DNA methods in crop improvement.

Kent explains, "Our project will document in clear terms for diverse audiences the science-based data demonstrating that biotechnology contributes positively to agricultural sustainability. Furthermore, the project will describe projects in the development pipeline that promise even more significant impacts in the future."

Informing the Public About the Science of Agricultural Biotechnology and Environment

Steven H. Strauss, *Professor, Department of Forest Ecosystems & Society*
Director of Outreach in Biotechnology
Oregon State University

GAP funds will be used to continue the Food for Thought (FFT) lecture series (http://agsci.oregonstate.edu/orb/events) at Oregon State University (OSU). The goal of this well-supported lecture series is to bring

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Steven Strauss

Ken Korth

GAP Winners
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leading scholars to present biotechnology and related issues to the public. The GAP funds granted from ASPB to support the public lectures will be supplemented by Oregon State University College of Agricultural Sciences, including videotaping, editing, marketing, and web-hosting services, as well as administrative support and indirect costs underwriting.

FTT's focus for 2009–2011 will be on biotechnology in relation to the environment and sustainability. This focus is motivated by (1) the growing environmental concerns of the public; (2) growing scientific evidence for serious concerns about the long-term sustainability of the global agriculture and food system; (3) increasing power of plant genomics and biotechnology to provide solutions by improved breeding and genetic engineering; (4) abundant misinformation, or highly biased or sensationalized information, that is aggressively marketed to the public from a variety of sources; and (5) public apprehension as reflected in large regulatory and marketplace obstacles throughout the world, both to translational research and application of transgenic biotechnology innovations. Strauss believes there is a pressing need for high-quality plant and biotechnology science to inform this ongoing debate, which ASPB and its members can best provide.

The FTT series has run for four years, hosted 23 speakers, and been very well attended. Graphs that demonstrate FTT's outreach and lecture-related web hits can be viewed at http://www.fsl.orst.edu/tgerc/ASPB_2009/Biotech_Outreach_Graphs.pdf. The large majority of the lecture presentation slides and the videotaped lectures themselves have been edited and put on our Biotechnology Outreach website. A complete list of the impressive speakers and links to their engaging presentations can be found at http://www.fsl.orst.edu/tgerc/ASPB_2009/Prior_FFTL_Lectures.pdf. Speakers under consideration for 2009–2011 are being vetted and scheduled.

In addition to hosting the lectures, FTT developers have produced study guides for each presentation. These guides are intended to help undergraduate and high school teachers use the lectures in teaching, and they will continue to be developed.

Dissemination of FTT starts right on the OSU campus. With intentional support from the lecture series organizers, OSU's introductory biology class teachers have sent many dozens of students to the FTT lectures. The broader public is also an important audience to FTT organizers, and FTT project leaders provide an annual press release, notices on speakers of special interest, and various program advertisements.

It is intended for the FTT series to combat the reality that high-quality plant science often is a minor player and even a pawn in the major public information networks. Large-scale environmental issues, due to their enormous complexity, have been particularly vexing and subject to misrepresentation (1). Strauss and his colleagues have created FTT as one avenue that can help scientists and scientific organizations such as ASPB enhance their public roles. The FTT lecture series, including its broadcast to the country and world via the web, offers a strong voice for scholars whose work deserves regard as scientifically and contextually responsible.

Plant Clippings: Production and Distribution of Web-Based Videos Covering Principles of Plant Biology

Ken Korth, PhD
Department of Plant Pathology, University of Arkansas

Ken responded to winning GAP funds by saying, "I think one of the most important things we can do as scientists is to communicate our enthusiasm for the complex biology at the base of all the important things that plants do on earth. I'm excited about the opportunity to do that, given to us by the ASPB Education Foundation GAP. Developing "Plant Clippings" is a great opportunity for me to work with some really talented teachers and young people, and we look forward to building a quality product."

This "quality product" of web-based videos will support plant biologists who sometimes struggle to communicate the importance of the discipline to the general population. The average person has firsthand experience with needs in medical science, or has observed advances in the exciting world of space exploration. However, many people often take for granted access that they have to cheap and plentiful food, and most rarely give thought to the importance of plant biology or agriculture in their daily lives. This project makes clever use of technology and art to addresses this gap in awareness and information.

"Plant Clippings" is a series of videos with science at the forefront, produced in a way that students will want to watch and, more important, want to learn more about the topic. Each video will be two to five minutes of entertaining plant biology content targeted primarily to an audience of students in grades 7–12, but that will hopefully have an appeal to all ages. The video production team will work with a select group of high

school students to write and produce a series of web-based videos communicating the principles and excitement of plant biology.

Videos will be designed to feature at least one of the 12 Principles of Plant Biology developed by ASPB. These principles can be found at http://www.aspb.org/education/foundation/principles.cfm. One preliminary production idea is "Mutants Surround Us!!" With a healthy dose of 50s-era special effects and haunting music, presented initially in black-and-white to complete the effect, a horror-show–style introduction of plant mutants appears. Of course, the audience would quickly learn exactly what a mutant is, and that mutants can often be good things. An in-hand dwarf variety of rice, deficient in gibberellic acid (GA) production, will be used to demonstrate that plants use hormones. The genetic basis of the mutation will be discussed, as the dwarf phenotype will be rescued via application of GA. This episode directly addresses principle #11, "Plant growth and development are under the control of hormones."

Dissemination of the final productions will be via the web on both general and educational sites, and via DVDs distributed to teachers for use in their classrooms. Additionally, the ASPB Education Foundation has allocated resources to distribute the DVDs at major teaching events such as the National Association of Biology Teachers and the National Science Teachers Association annual meetings.

Further information about the ASPB Education Foundation, established GAP projects, and GAP funding is available at http://aspb.org/education/foundation/.

Reference

1. Lemaux, P.G., (2009). Genetically Engineered Plants and Foods: A Scientist's Analysis of the Issues (Part II). *Annual Review of Plant Biology* 60: 511–559.

University Science Participation in K–12 Education: "Change Is Coming, It Really Is!"

On June 29, ASPB participated in a session of the American Physiological Society's (APS) Seminar Series, "Sharing Strategies in K–12 Education." This session's theme was "Improving University Scientist Participation in K–12 Education." A variety of societies and stakeholders were present, including representatives from NIH, Howard Hughes Medical Institute, and NSF. Full program information is posted at http://www.frontiersinphys.org/pages/page04g.shtml.

The following questions framed the focus of the seminar, including the brief presentations:

- What are your organization's objectives for encouraging scientist participation?
- How are your member scientists involved?
- What are your recruitment methods?
- What are the greatest challenges in improving scientist participation?
- What stakeholders are important in providing support?
- What is your program's measure of effectiveness or impact?
- What resources are produced?
- What/who are your funding sources?

Four seminar speakers addressed these questions and identified strategies that work in their particular spheres of influence.

First, Jennifer B. Presley, PhD, director, Science and Mathematics Education Policy at the Association of Public and Land-grant Universities (APLU; https://www.aplu.org/NetCommunity/Page.aspx?pid=183), had encouraging information about the depth and breadth of K–12 initiatives her association is supporting on many campuses nationwide. Her presentation included specific program highlights as well as objective data on the progress being made. Jennifer underscored the importance of improvements in both official campus policy and peer-to-peer respect for developing faculty interest in K–12 outreach.

Next, Michael J. Dougherty, PhD, director of education for the American Society of Human Genetics (ASHG) presented data on the Geneticist–Educator Network of Alliances (GENA) project. GENA is designed to build a framework of long-term collaborations between educators and scientists within the broad context of genetics. Details about GENA are available at http://www.ashg.org/education/gena_overview.shtml.

Michael also invited all participants to review the ASHG's Statement on the Importance of Participation of Scientists in K–12 Science Education (http://www.ashg.org/education/k12statement.shtml). He stated that ASHG hopes this statement will be "stolen, adapted, and adopted" by other societies as part of the general push to improve K–12 education. In fact, ASPB had already taken these steps and the adapted statement was approved at the July Executive Committee meeting. The statement is available on ASPB's website at http://www.aspb.org/education.

Katie Engen, MEd, the ASPB Education Foundation assistant, outlined how a core of our members are active in improving K–16 teaching techniques, materials, education policy, and campus-led initiatives in education. See the sidebar "ASPB Outreach Options" on page 36 for more details.

The seminar audience showed great interest in how ASPB supports its members' efforts in the K–12 arena. Participants stated plans to test some of ASPB's ideas in their own organizations. ASPB's education-related awards and grants aligned well with what other participants have learned to be moti-

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Change is Coming
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vating and effective. The options ASPB offers to address education at our annual meetings were also well received.

The fourth presenter, Ida Chow, PhD, Executive Officer, Society for Developmental Biology (SDB; http://www.sdbonline.org/index.php?option=com_frontpage&Itemid=1), pointed out that a lot could be done even by societies that don't have a section dedicated to education outreach.

One clever idea from SDB is New Faculty Boot Camp. Experienced boot camp leaders show new university staff great teaching techniques, tenure tricks, networking paths, and career track options. These dynamic boot camp counselors, especially those with some professional cache, make a big difference in promoting K–12 outreach as a rewarding component of any science career. SDB also offers a Re-boot Camp for experienced staff. This version of the camp allows veterans to "delete" inefficiencies, consider "alt" options, and gain "control" of other relevant activities. Both camps strive to convey that overall professional development (the main focus) is greatly enhanced by learning to do effective classroom teaching and outreach.

Seminar organizer Mel Limson, of the APS Education Office, compiled the best practices and innovative strategies into a cross-cutting operational tool for designing, improving, and evaluating how to encourage university scientist participation in K–12 education. This resource can be found at http://www.frontiersinphys.org/pages/page04g.shtml.

Following the presentations, speakers and audience members quickly turned to the critical importance of the science of teaching and learning. Everyone agreed that researchers, educators, policy makers, and funding agencies all need data to show that outreach and direct contact with schools does have a positive impact. These same groups also want data on the specific practices that work the best. In short, while everyone appreciates upbeat case studies of successful teaching or outreach, the group concurred that aggregate results will be the best leverage for funding major changes in education policies on campus and through public outreach. ASPB member Erin Dolan's article, "Publishing Your Teaching Scholarship" in the July/August issue of the *ASPB News* (http://www.aspb.org//newsletter/julaug09/09publish.cfm), offers helpful insight on effective ways to prepare and share such data. This article will be shared with the APS seminar attendees.

As the seminar discussion continued, the group wholeheartedly agreed that not much will happen in terms of activating a large portion of faculty into doing K–12 outreach unless university and department leaders prove that such activity is a valued part of campus tradition and policy. Professional respect, official recognition of outreach activities as part of the tenure-seeking process,

ASPB Outreach Options

Many ASPB members enjoy an active role in K–12 science education. The Society supports their efforts through a variety of programs including:

The Education Foundation

The Foundation's mission includes the goal to: *Improve K–12 curriculum by creating interactive plant science learning resources for classroom use and teacher development.*

- Grant Awards Program—funding innovative public outreach activities on plant biology, http://www.aspb.org/education/foundation/gap.cfm
- The 12 Principles of Plant Biology—basic tenets of any APSB education activity, http://www.aspb.org/education/foundation/principles.cfm
- Free audio, video, and printed materials based on the principles and available for classroom and outreach use at http://www.aspb.org/education/NEWK12.CFM

The Education Committee

This group actively participates in developing the aforementioned materials as well as sponsoring booths and providing volunteer staff to present ASPB education programs at various major teaching conferences throughout the year and at each ASPB annual meeting.

ASPB Annual Meetings

Each event includes a wide variety of education outreach opportunities.

- Education Booth and Exhibit Competition Winners—demos of dynamic teaching options
- Education Workshop—practical ideas for effective outreach
- Education Minisymposia—multiple presenters explain successful outreach programs
- Excellence in Teaching Award (est. 1988) for excellence in teaching, leadership in curricular development, or authorship of effective plant science teaching materials
- Just 5 More Minutes!—session speakers are granted five extra minutes to present outreach ideas related to their research program (2009 pilot proposed).

adjustment of teaching or committee duties, and, of course, financial compensation were noted as potentially effective motivators for increasing university scientist participation in K–12 education. Positive feedback and supportive attitudes from professional peers (both in formal meetings and at the water cooler) were deemed equally critical to individual scientists choosing to become and stay involved in outreach and off-campus education. In other words, K–12 outreach has to seem professionally rational and even "cool." Finally, intentional professional development for improving scientists' general teaching skills was identified as an effective conduit for improving science education efforts both on campus and through outreach. Scientists partnering with the education specialists at their own institutions should develop a confident, well-informed staff of university instructors. Such a staff will not only inspire the campus student body to pursue science, education, or both, this staff also will be prepared to pursue and succeed at more diverse, off-campus teaching opportunities.

The APS seminar concluded with brief consideration of the idea that "nothing" changes without national teaching standards. This notion was quickly overruled by cheerful assertions from most of the group that "change is coming, it really is!"

Transforming Undergraduate Biology Education

AAAS and NSF recently hosted what may have been the most important meeting for undergraduate biology education in over a decade. "Transforming Undergraduate Education in Biology: Mobilizing the Community for Change," which took place July 15–17 in Washington, D.C., brought together several hundred of the nation's leading educators. ASPB members who participated in the conference included MariaElena Zavala (California State–Northridge; MariaElena is on the project's advisory committee), Paul Williams (Wisconsin), Eve Wurtele (Iowa State), and probably others (my apologies). ASPB staff member Katie Engen also attended.

The conference was a key event in a multi-year effort by AAAS and NSF to reform undergraduate biology education. As Alan Leshner (CEO of AAAS) noted, the reform effort involves ALL students, not just science majors. Conversations were held around the country in the two years leading up to this conference, including one at the ASPB/BSA joint meeting in Chicago in 2007 and another in the fall of 2008 that was attended by ASPB Excom members Rob McClung (past president), Mark Brodl (treasurer), and Jane Ellis (Education Committee chair). These smaller group conversations served as brainstorming sessions to set much of the agenda for the seminal meeting in Washington. The Washington meeting was then designed around a series of working groups, each of which submitted reports of their conclusions. AAAS and NSF will issue a final report at some point in the next year.

Below are some of the major findings, with each bullet corresponding to a working group.

- A student working group felt that the most important learning in their biology education involves critical thinking, research experiences, analytical skills, and/or communication skills. Students also felt that the things that excited them the most included academic challenge, two-way conversations between students and faculty, and connecting learning to the "big picture."
- A group focusing on core concepts and competencies was assigned five major concept areas (evolution, energy and matter, information, systems, structure/function) and several "competencies" (i.e., processes of science, interdisciplinary interaction, communication/collaboration, science and society) and asked to generate examples of best practices from around the country for teaching each concept area and competency. This group's final report provided a wealth of examples of high-quality teaching and concluded by stating that existing textbooks are impediments to reform efforts.
- Another group focused on student-centered learning. They agreed that, as much as possible, science should be learned as it is practiced and biology education should be active, outcome-oriented, inquiry-driven, and relevant. Students need ongoing, effective feedback.
- Assessments are often too focused on narrowly defined content and do not reflect what is actually going on in courses. We need data to inform biology education at every level, from individual classroom activities to whole educational programs. Assessments should be aligned with our educational goals, performed with consistency, and used as diagnostic tools to inform instructional decisions and student learning.
- Research experiences should be integrated across biology curricula, and should begin very early in the college career of all students. Students should be

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introduced to all aspects of the scientific process in all biology courses. Specific learning goals related to research experiences should be created and assessed.

- The biology education community needs toolkits to support inquiry, collaboration, content, research experiences, and assessment tools. Ideally, a resource would search like Google, recommend like Amazon, vet like Consumer Reports, and annotate like Wikipedia (which the working group jokingly called "Boogle").
- Implementation of national changes will require engagement and leadership at all levels, especially among faculty. Incentives for faculty and facilities to allow changes are crucial. Assessment of courses and programs is often necessary to gain resources from administration and funding agencies. Assessment tools for student perspectives include Shared E-Resources Understanding (http://www.niso.org/workrooms/seru), National Survey of Student Engagement (http://nsse.iub.edu/index.cfm), Student Assessment of Learning Gains (http://www.salgsite.org/), and Collegiate Learning Assessment (http://www.collegiatelearningassessment.org/).
- Faculty are often limited in their educational/pedagogical training. The entire culture of biology education—including departments, colleges, funding agencies, societies, and so on—requires change to place more value on teaching. Communities of scholars should be developed to create, use, assess, and disseminate effective practices.
- Institutional change requires raising the profile of science education, increasing rewards for high-quality teaching, and increasing opportunities for professional development at all levels.

The momentum of the current reform is likely to lead to notable improvements in undergraduate biology education across the country. If we have the courage to challenge the dogma of outdated approaches and reward quality teaching, then the reform efforts may even push biology education toward a much-needed paradigm shift. Both biology and society will see brighter futures if we all contribute to this effort within our home institutions and through professional societies like ASPB.

Jeffrey S. Coker
Elon University

homeWORK ~ grassroots ideas for cultivating knowledge in your community

Spreading the Word About Careers in Plant Biology

What do you want to be when you grow up? Have you *ever* heard that iconic question answered with *I wanna be a plant biologist?* Why is that? After all, plant biology is integral to everything—food, fiber, fuel, and so on. Still, nobody in elementary or middle school (and beyond) seems to know about this career option.

What can YOU do about this? It's simple. First, save some of the following ASPB Career Day Resources to your laptop or memory stick. Next, offer to visit a local school on career day or during any science-oriented event. Finally, present the videos, handouts, or PowerPoint presentations; add a few anecdotes from your career; and answer questions. As easy as 1-2-3—and you have sown the seeds for future generations of plant biologists.

ASPB Executive Director Crispin Taylor reveals the many layers of a career in plant biology to a rapt group of eighth graders at Robert Frost Middle School in Rockville, Md.

ASPB Career Day Resources

La Bloomba

(http://chlorofilms.org/index.php/crpVideo/display/videoid/5)

Get the party (er…presentation) started by airing *La Bloomba*, a time-lapse video featuring the openings of hundreds of flowers all "choreographed" to dance to the traditional Mexican song, La Bamba. (Check out the rest of the videos at http://chlorofilms.org. You may find something else you'd like to share.)

ASPB Career Day PowerPoint Presentation

(http://aspb.org/education/NEWK12.CFM#anchor4)

Download this ready-made presentation geared toward a middle school audience. Personalize the introductory slide and even add a few of your own if you want to feature your area of expertise.

For additional impact, dress in a layered "costume." For example, if you're often at the bench, wear your lab coat but then take it off to reveal the outdoorsy garb you wear in the field. Alternatively, if you are often in policy or stakeholder meetings working to advance science education or legislative issues, wear a suit under the lab coat instead.

Plants Get Sick Too!

(http://chlorofilms.org/index.php/crpVideo/display/videoid/57)

This video does a great job of explaining one particular career in plant biology—plant doctor.

Careers in Plant Biology Handout

(http://aspb.org/downloads/careersbroch.pdf)

This site offers a one-page summary of plant biology—with eye-catching photos. This straightforward handout includes a list of job titles within the field.

Follow-Up or Previsit Resources

(http:// aspb.org/education/NEWK12.CFM)

A plethora of plant biology multimedia, cross-curricular, K–12 resources are available on the ASPB website. Print copies of handouts you'd like to share, and alert teachers to these free, online resources as well.

Clever Quips

After you've finished, get everyone thinking about plant biology by challenging the class to develop bumper stickers or t-shirt designs that incorporate an amusing quip about the field. The text and graphics should be understandable and user-friendly to the general public while also conveying a plant biology concept accurately.

For extra impact after you've visited a classroom, please share these resources with a youngster, parent, or teacher in your family or community.

Plant Biology 2009

An Englishman in the Sandwich Islands

Education Outreach Collaborations with the SEB Evolve at Plant Biology 2009

The Society for Experimental Biology (SEB; http://www.sebiology.org/education/index.php) is the only society based in the United Kingdom that serves the research community interested in the function of the whole plant at the physiological and molecular level. While plants are integral to the SEB mission, the society's interests range from cellular and molecular biology to animals and systems. Despite this apparently broad remit, the SEB performs a very similar role in the United Kingdom to the ASPB in the United States, in particular with relation to plant biology.

In recent years, there has been successful and developing collaboration between the SEB and ASPB, in particular in the area of public understanding of science and education. For example, the ASPB recently had a presence at the SEB annual meeting in Glasgow, building on collaborations dating back to the 2007 photosynthesis meeting, also held in Glasgow.

To further explore the areas of common interest, and also as part of the Year of Darwin 2009 events (as the Year of Science is called in the United Kingdom), it was suggested that it would be appropriate for someone from the SEB education committee to attend the 2009 ASPB meeting in Hawaii. As thoughts of maidens clad in grass skirts and sun-kissed beaches briefly flashed through my thoughts, I quickly accepted the assignment, however difficult it might prove; after all, I have always felt that you shouldn't expect others to undertake tasks that you're not prepared to do yourself!

There were a number of objectives to the visit: to develop the collaboration between the ASPB and the SEB and to explore the similarities and differences between the current challenges facing experimental scientists in both countries. In addition, as part of the ASPB Year of Science and the UK Year of Darwin, I had been invited to present a talk at the Education Minisymposium on the issues involved in teaching about evolution and also to present and demonstrate resources designed to facilitate the teaching and understanding of evolution. These resources had recently been presented at the SEB annual meeting in Glasgow in the "What would you tell Darwin?" session and the associated teaching evolution workshop. Excitingly, these resources are about to be supplemented with online videos of the keynote speakers from this session. To access these videos, visit http://www.sebiology.org/education/ and follow the link on the right to teachers' resources.

Jeremy Pritchard—an Englishman in the Sandwich Islands

Darwin traveled widely, but never got to Hawaii (at that time called the Sandwich Islands). However, he was very interested in the archipelago, corresponding extensively with Joseph Hooker, the head of Kew Gardens, about the flora of the islands, which provided important information about species isolation, adaptation, and diversification. Darwin mentions the Sandwich Islands in the *Descent of Man,* where he reports correspondence between himself and a whaler's captain who informs Darwin that the body lice of the sailors die if they transfer to the islanders. For Darwin, this was an important piece of evidence informing his belief in the common ancestry of the human species. While the louse is not particularly pleasant or relevant for the ASPB, the diverse flora of the natural laboratories that are the Hawaiian Islands made it an ideal venue for both the ASPB meeting and reflection of Darwin's legacy.

The ASPB Education Committee meeting was a useful orientation. I was immediately struck by the similarity of the issues facing the ASPB and the SEB and the common approaches being undertaken to address these. The SEB has plants as a component of its remit while ASPB focuses solely on this area, and it was surprising to see there are similar concerns in the United States about the lack of plant scientists moving through the education pipeline into research and beyond. As in the UK, it seems that U.S. students struggle to perceive plants as dynamic and having a relevance to 21st-century lives and careers. Similar approaches are being considered to overcome these issues, but perhaps a qualitative difference with the UK is the clear acceptance in the United States that the research scientists of the ASPB need to engage early on in their career path and work with schools. To this end, it was informative to meet with 20 teachers from local schools to discuss issues of plant and evolution education. Unlike the UK, there is not an imposed

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Plant Biology 2009

Honolulu-Based High School and Community College Educators Gain Insight and Resources at ASPB's Annual Meeting

As part of the ASPB Education Committee's outreach to K–16 educators, committee member Larry Griffing organized a special brief professional development program for teachers working in and around Honolulu. The event was held July 19 during Plant Biology 2009. The main purpose of the program was to introduce teachers to inquiry-based programs using plants in high school and community college classrooms and laboratories. Nineteen educators, five from community colleges and twelve from local middle and high schools, were pre-enrolled. The program included a two-hour working group session plus attendance at the Education workshop, "Talking Science in Public," that same evening. It's worth noting that instead of taking the scheduled hour off for dinner, most of the teachers stayed to study research posters or talk with presenters at the Education Booth.

Hawaiian educators participated in discussions and presentations about outreach activities supported by ASPB.

Attendees enjoyed a comprehensive event. After meeting at the registration booth for badges, the educators received the official registration bag of goodies. These bags included a memory stick with digital resources on Darwin and teaching evolution, the 12 Principles of Plant Biology bookmarks, ASPB classroom materials packet for K–16, and an early version of one of the Inquiry Labs on the 12 Principles of Plant Biology.

The group of teachers and speakers gathered at tables and listened to information on the K–16 classroom materials presented by Education Booth organizer Chad Jordan and staff member Katie Engen. This was followed by Larry's detailed presentation of www.PlantingScience.org, the program run by the Botanical Society of America and supported by the ASPB for online mentoring of inquiry-based science in the high school classroom. Larry introduced the two core modules of PlantingScience, Germination and Photosynthesis/Respiration, which are currently online. The teachers also were given an early preview of and a handout describing the new PlantingScience modules that will come online in spring 2010—Variation in Arabidopsis: Genetics and Environment; Variation in Fast Plants: Genetics and Evolution; and Pollination. Participants and presenters discussed the nature of the mentoring experience, how the guidance provided by many ASPB members and ASPB-sponsored Master Plant Science graduate student members is implemented, and emphasized the role of the teacher as the most important scientist–mentor.

Back at the booth, multimedia plant resources took center stage as Dan Cosgrove, the impresario and developer of www.ChloroFilms.org, introduced the plant video contest he created. Next, Jeremy Pritchard of the UK's Society for Experimental Biology described how he brings evolution to the classroom and the public through a series of engaging lectures/demonstrations in the United Kingdom. Jane Ellis outlined the inquiry labs she cowrote with Jeffrey Coker and Mary Williams to teach each of the 12 Principles of Plant Biology. The interactive museum mini-exhibit, "Real Plants, Real Tools, Real Science," displayed by Martha Kerouac, Michael Kerkman, and Rachel Vourlas of the Huntington Gardens, was also a big hit.

In fact, Randyll Warehime, a teacher at Iolani School, exclaimed after seeing the fabulous stomata of *Tradescantia zebrine* in the Huntington Gardens exhibit, "I always judge professional development on whether I walked away with something usable, and I sure did."

After the program, Joan Matsuzaki, a teacher at Roosevelt High School in

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Dan Cosgrove explains how students, educators, scientists, and artists have all contributed to www.ChloroFilms.org.

Honolulu-Based Educators
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Honolulu, noted, "Hawaii's Department of Education will be experiencing budget cutbacks and I think this will [provide] ideal activities to conduct with my freshmen biology students all year long. Thank you for thinking of teachers and helping us open the botanical world to our students."

The Education Committee appreciates the participants for their help in getting plants into the classroom. Special thanks go to Gail Ishimoto, a teacher at the Kamehameha schools (a private college-preparatory institution for those with native-Hawaiian heritage), who did a wonderful job helping recruit teachers for the program, posting the event on local e-bulletin boards, and providing names of potentially interested teachers. Because this special event was so successful, resuming a practice started by Dina Mandoli several years ago of producing a special outreach event for local educators, plans are already under way for a similar program in Montreal 2010, perhaps improving upon this one by offering educators professional development credit for participation. Members who would like to help can contact Larry Griffing at griffing@tamu.edu or Katie Engen at katie@aspb.org.

Larry Griffing
griffing@neo.tamu.edu

Englishman
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curriculum—this is more locally decided—and teachers seemed more willing and able to engage with the resources made available by the ASPB. The SEB-sponsored Evolution Teaching Resources were demonstrated to this group and interestingly, despite the well-reported difference in the reception to Darwin's ideas in the United States, the teachers reported no great problems with the more radical opposition to evolution teaching that conversations with similar groups of UK teachers have revealed.

Throughout the four days of the conference there was a steady stream of visitors to the SEB Teaching Evolution Resources stand. There was a wide range of people, from eminent professors to early careers scientists, and nearly 350 took home the SEB USB flash drives, preloaded with teaching resources.

While visiting the stand, over 80 delegates from a wide range of countries signed up for an e-mail list that will be used to get feedback on the usefulness of these resources and to help develop them further. An interesting distinction between the early career scientists visiting the stand in Honolulu and our experience in the UK was the clear understanding of the U.S.-based scientists that teaching was potentially part of their career development. It is often apparent in the UK that students at the same stage of their career are more focused on developing the research and are either less interested, or more likely less aware, of the future need to develop a more rounded portfolio of skills on their CV. This may reflect a fundamental difference in the U.S. system or be because career opportunities in the UK are perceived as a more linear postgrad–postdoc academic route, rather than a job market that is increasingly more diverse.

While I can report some examination of sun-kissed beaches, the grass-skirted maidens eluded me. It was a great meeting with excellent interaction with our U.S. and other international colleagues with whom there was an extensive exchange of views. There are many similarities where collaboration can strengthen our responses to the changing scientific landscape, but also areas of different experiences that can inform the responses of each society as the education sections provide continued support to the members. Look out for the ASPB Education section at the SEB meeting in Prague in 2010, where the ideas and collaborations identified in the current visit will be continued.

Jeremy Pritchard
University of Birmingham, UK
Chair, Education Section, Society for Experimental Biology (SEB)

A modified version of this article will also appear in the *SEB Bulletin,* September 2009.

Plant Biology 2009

SURFers Catch the Wave of Scientific Progress

Plant Biology 2009 in Honolulu was invaded by SURFers! You don't recall hordes of beach bums walking the halls and attending the symposia? That's because these SURFers actually were the 2008 recipients of the Society's prestigious Summer Undergraduate Research Fellowships (SURF; http://www.aspb.org/education/undergrad.cfm). These excellent students received their fellowships in 2008 (or, in one case, 2007), performed their research over the past year, and presented their findings in posters at the meetings in Honolulu. The students came from large R1 universities as well as smaller, primarily undergraduate institutions located all over the United States and also from Argentina and China.

The young SURFers had a variety of activities designed to make sure they could navigate the many currents of such a large meeting. These activities were led by SURF cochairs Ken Helm and Jon Monroe. Jon, a past cochair, stepped in to assist since Amy Clore, the other SURF cochair, could not attend the meeting. SURF cofounder Mark Brodl was also involved in the fun.

To encourage the undergraduates (SURFers and non-SURFers alike) to meet one another and highlight their remarkable accomplishments, there was an undergraduate networking poster session at the very beginning of the meeting. Students, their mentors, and others interested in undergraduate research attended the session. ASPB past president Rob McClung made a brief and humorous welcoming speech to the students letting them know what to expect at the meeting. He also encouraged them to come back year after year as he has done.

SURFer Kelli Pattavina enjoys one of the many benefits of attending Plant Biology 2009 in Honolulu, Hawaii.

The quality and breadth of the work presented at the poster session was truly impressive. In addition, it appeared the session accomplished the goal of providing a forum for networking and simply getting to know one another before being immersed in the much larger, potentially overwhelming general poster session. Throughout the meeting, the undergraduate students could be found at their posters, chatting with others, and attending the various symposia and minisymposia. Ken had the opportunity to speak with several of them about their experiences, and everyone he talked to found the meetings to be a valuable, enriching, and enjoyable experience. ASPB and SURF organizers certainly hope that the meetings in particular and the research experience in general encourage each of these fine students to pursue careers in plant biology.

Finally, when it was time to wrap up the meetings, the students were presented with perhaps the most daunting task of all: dancing with accomplished professional plant biologists from all over the world to their favorite tunes from the 80s. Our young scholars didn't disappoint us. Quite a number of them could be seen boogying down to hits such as Thriller, YMCA, and, of course, the Electric Slide. May they carry the torch proudly.

Ken Helm
Siena College

Plant Biology 2009

ASPB Education Booth Visitors and Presenters Share the Aloha Spirit Through Education Outreach

The ASPB Education Booth in Honolulu brought together a diverse and exciting array of education initiatives and resources for the plant biology community. Sponsored by both the Education Committee and the Education Foundation and organized by Chad Jordan (North Carolina State University), the booth proved yet again to be a focal point of the annual meeting exhibit hall space and provided a forum for sharing new and innovative educational ideas. This year the committee collected information on booth visitors using name tag scanner technology and found that numerous visitors from more than 85 institutions and organizations interacted at the booth's multiple displays.

The booth featured interactive exhibits from the two winners of the highly competitive 2009 ASPB Education Booth Competition. Martha Kirouac, Mike Kerkman, and Rachel Vourlas from the Huntington Library, Art Collections and Botanical Gardens, presented an interactive exhibit titled "Real Plants, Real Tools, Real Science." The exhibit was a scaled version of a nationally recognized outreach effort developed by Huntington in which elementary and middle school students use real scientific tools to examine plant features while investigating a case of plant theft. Booth visitors used different instruments to examine nectar sugar content, pollen and stomatal morphology, and soil leachate mineral concentrations from four different plants in an effort to solve the case for themselves, and learned how similar outreach approaches could be developed for use at different educational levels.

Daniel Cosgrove, Marcia Buanafina, and Gregory Richter presented a dynamic display on Using YouTube and Animoto to "Engage Students in Plant Biology Classes." The booth featured videos submitted to the first ChloroFilms contest (http://www.chlorofilms.org), which was sponsored in part by the ASPB Education Foundation Grant Awards Program (GAP). Visitors viewed videos on a wide range of botanical topics, and learned how different video production technologies can be used to create eye-catching and informative learning tools for their students. Booth visitors also received information on the next ChloroFilms contest and how they can enter their video creations, as well as the opportunity to provide Cosgrove and colleagues with ideas for new video topics to be featured on the ChloroFilms' YouTube channel (http://www.youtube.com/user/Chlorofilms).

Chad Jordan (right) explains outreach resources to a booth visitor.

Jeremy Pritchard (University of Birmingham, UK), invited presenter and chair of the Education Committee for the Society for Experimental Biology, was on hand to discuss resources and strategies for teaching evolution. Jeremy showcased online resources that included a computer-based exercise that examines how the random processes of evolution can produce complex adaptations. He also provided booth visitors with popular handouts including rulers and USB flash drives packed with evolution teaching resources and activities for the classroom. The resources can also be found online at http://www.biosciences.bham.ac.uk/links/teachers/teachers.htm.

Education Committee Chair Jane Ellis (Presbyterian College) joined committee members Erin Dolan (Virginia Tech), John Cushman (University of Nevada), and Larry Griffing (Texas A&M) to talk with visitors about the displays and numerous education materials developed by the committee and the Education Foundation. This year many of ASPB's popular educational print resources—including a handout on the 12 Principles of Plant Biology, the "Genes in Your Genes" and "Plants in Your Pants" worksheets, a "How to Be a Plant Detective" interview activity, and a new worksheet developed by former committee chair Mary Williams (ASPB) on the evolution of major plant groups—were pre-assembled into packets for easy dissemination. Committee members also handed out countless bookmarks on the 12 Principles, as well as informative baseball cards on DNA, genomics, and biotechnology that were developed by Peggy Lemaux (University of California, Berkeley) through

a GAP-funded project. Information was also made available to college and university faculty on how to become involved as mentors in the Botanical Society of America's Planting Science program, which is sponsored in part by ASPB.

Visitors got hands-on experience with two easy-to-use microscopy tools. Introduced at the 2008 annual meeting, visitors used a handheld digital microscope connected to a laptop computer to get an up-close look at plant morphology and plant-based materials including fabrics and paper, and learned how this technology can be incorporated into classroom teaching. Visitors also assembled inexpensive 5× hand lens necklaces that can be used by younger students to examine the many fascinating features of plants in their surroundings.

For information about the 2010 Education Booth Competition or other education outreach activities in development for the next ASPB annual meeting in Montreal, please contact Katie Engen at katie@aspb.org.

Chad Jordan
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Jeremy Pritchard offers tips on teaching evolution.

Greg Richter shares creative ideas from ChloroFilms.

Martha Kirouac, Rachel Vourlas, and Mike Kerkman present interactive activities from the Huntington.

A handheld digital microscope helps teachers use small details to make a big impact on students.

Plant Biology 2009

Education Workshop—Talking Science in Public: Evolution, GMOs, and Other Challenging Issues

In honor of the Year of Science, the Education Committee dedicated this year's Education Workshop to "Talking Science in Public: Evolution, GMOs, and Other Challenging Issues." More than 50 conferees from high schools, colleges, universities, and other organizations from more than five countries participated in the evening session. Attendees engaged in small- and large-group brainstorming, discussion, and planning about how to teach evolution in a way that clearly relates to students' daily lives.

Workshop leader Erin Dolan listens to input about her prompts on framing tricky topics to create better public discourse.

Attendees enjoy a well-made point about what can happen to the best laid plans (be they based on research or general preconceptions) for talking science in public.

The discussion started with brainstorming of topics that are controversial to teach, from climate change to animal experimentation to sex. Attendees then shared ideas about why these topics are controversial. Not surprisingly, differences in learners' beliefs systems, including politics, culture, and religion were considered a major challenge.

As a context for the discussion, the group learned about two models that are most often proposed to explain why certain scientific ideas and new technologies are controversial: the "knowledge deficit" and "contextual" models. The knowledge deficit model proposes that, if the public knew more or had a better understanding of science, they would be more accepting of scientific ideas (e.g., evolution) and emerging technologies (e.g., stem cell research). Although there are studies that demonstrate small but positive correlations between knowledge and acceptance of scientific ideas, other studies show negative or no correlation, especially with respect to controversial issues.

The basis of the contextualist model is that the public needs an understanding not only of science concepts, but also of its nature and how politics, institutions, and societal and cultural priorities and norms influence scientific practice. Indeed, research has demonstrated that students' understanding of the nature of science (e.g., how scientific ideas change with new evidence, what the scientific definition of a theory is) is positively correlated with acceptance of evolution. Yet, this correlation does not fully explain acceptance of evolution.

The rest of the workshop focused on the idea of framing, which has emerged from the study of public decision making and scientific communication. Grounded in the Nobel Prize–winning work of cognitive psychologists Daniel Kahneman and Amos Tversky, framing organizes discussion from a certain viewpoint by making specific facets of an issue more salient. The premise of framing is that nonexperts cannot comprehend, synthesize, and evaluate all of the information available to make decisions and thus will use "interpretive schemata" to decide to which information they will pay attention. An individual's interpretive schema will be influenced by their personal experiences, beliefs, and worldviews. Through framing, evolution education helps learners develop an understanding of evolution and nature of science, as well as giving them an idea of the applications and implications of evolution for their daily lives.

To practice recognizing frames, the group reviewed a segment of the video, *Secrets of the Plant Genome—Revealed!*, http://www.plantgenomesecrets.org, and the January 11,

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Plant Biology 2009

Education and Outreach Minisymposium

On July 20, speakers from the United Kingdom, Mexico, Hawaii, and Virginia participated in Plant Biology 2009's very successful Education and Outreach Minisymposium titled "Evolution and Innovation in Plant Biology Outreach for Elementary, Community College, Undergraduate, and Professional Science Educators."

Jeremy Pritchard, from the University of Birmingham and chair of the Education Committee for the Society of Experimental Biology (SEB), delivered the keynote presentation, "Simple but Dangerous Ideas: Strategies to Help in Teaching Evolution." Pritchard discussed how describing the historical aspect in the development of Darwin's ideas could be useful pedagogically in the teaching of evolution. He also described resources that he has developed to address evolutionary issues and best practices in the teaching of evolution.

Jeremy Pritchard (right) discusses dangerous ideas with daring attendees!

The second speaker was Cristina G. Reynaga-Pena, from the Centro de Investigacion y de Estudios Avanzados del IPN Unidad Irapuato, who presented "Development and Assessment of Didactic Packages Including DVDs on Plant Biology Experiments for Rural Schools in Mexico." In her presentation, she described efforts to facilitate the first scientific experiences for Mexican children in rural areas through three-day workshops. Her presentation included video clips of the children doing investigations on such topics as photosynthesis and plant cells. As part of the program, DVDs of the workshops will be distributed to other rural schools to enable teachers to implement these investigations with their students.

"Advances in Biosciences Education for Community Colleges: The Journey from Summer Workshop to Year-Round Independent Research Project" was presented by Kabi Neupane, from Hawaii's Leeward Community College. He discussed an NSF-funded project that brought together students and faculty from four community colleges and researchers at the University of Hawaii in hands-on workshops utilizing techniques employed in ongoing research. As part of this grant, workshops were held each summer for four years to provide training in recombinant DNA, molecular biology, genomics, bioinformatics, and fluorescent and electron microcopy that carried over into the academic year, allowing a number of students to characterize and identify more than 600 genes in senescing tissue of *Anthurium adreanum*, an economically important ornamental plant in Hawaii.

The fourth speaker, Erin Dolan, from Virginia Tech, presented "Undergraduate-Level Inquiry: Benefits and Challenges of Engaging in Classroom-Based Research," in which she described student perceptions of the benefits and challenges when participating in classroom-based research. Students designed and conducted their own investigations to study how disabling certain genes in Arabidopsis can affect the plant's interactions with certain herbivores. Results of student interviews indicted the complexity of inquiry-based teaching in the undergraduate classroom and that the extent of instructors' involvement influences students' perceptions of their research. This program was sponsored by the Partnership for Research and Education in Plants for Undergraduates (PREP-U).

In closing, Jane Ellis, moderator of the Education and Outreach Minisymposium, noted the wide variety of topics presented and diversity in the speakers' backgrounds, which added to the symposium's strength and success.

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Plant Biology 2009

Education Posters: Local Research, Far-Reaching Impact

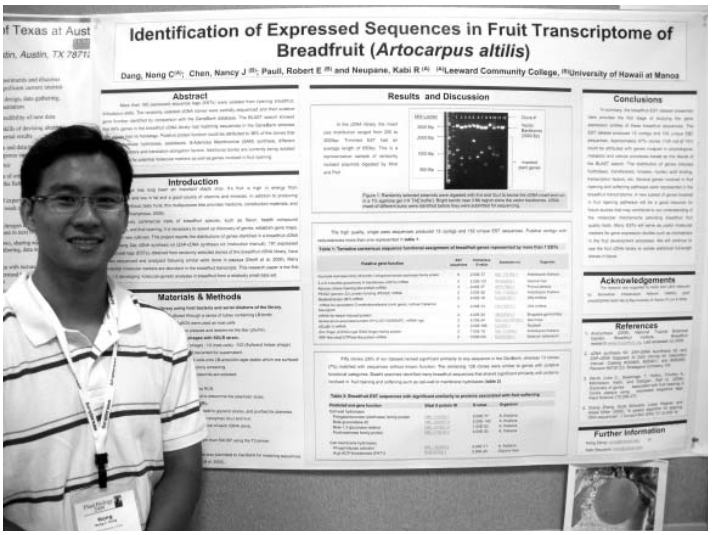
The importance of the scholarship of teaching and learning in the context of quality bench science was supported by the variety of education posters submitted for Plant Biology 2009. Three Hawaii-based researchers, Kabi Neupane, Susan Miyasaka, and Nong Dang, submitted posters about the dynamic work they are doing in various institutions in the state. Local projects such as these are models for how to create widespread positive impact in both the field of plant biology and in the education of plant scientists.

Undergraduate Researcher Investigates Important Hawaiian Staple Crop

Making the move from a community college to a four-year university can sometimes be a daunting transition. However, some students make a smooth transition thanks to astute and motivating mentoring. Nong Dang was comentored by Kabi Neupane, of Leeward Community College (LCC), and Robert Paull, of the University of Hawaii at Manoa (UHM), on a project to investigate the transcriptome of breadfruit, an important staple crop tree that produces abundant, tasty, and nutritious fruits used for food, feed, medicine, and construction materials. This research will provide a valuable resource for future studies examining the fruit quality traits of breadfruit. Following his yearlong involvement in the research project, this second-year LCC student continued working on his research and now attends UHM. His undergraduate research project was funded by an NIH IDeA Network for Biomedical Research Excellence (INBRE) grant #P20 RR016467 awarded to Dr. Lon White.

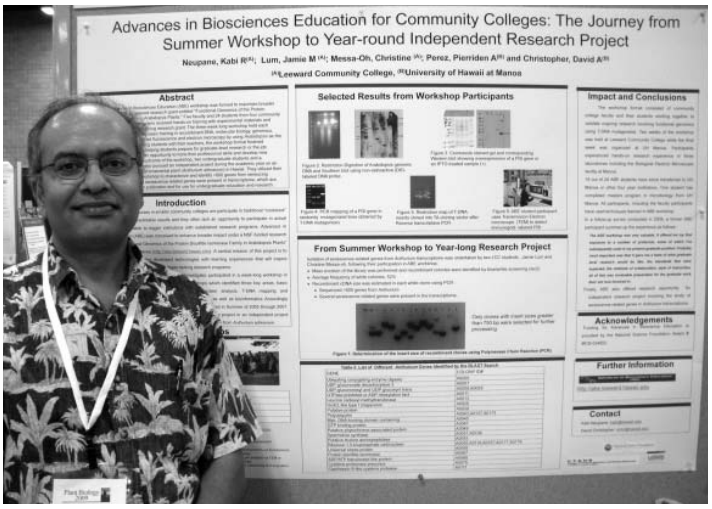
Middle and High School Teacher Outreach in Hawaii

The sustainability of Hawaiian agriculture might be aided by the development of improved resistance to insect pests and microbial diseases. However, recent legislation passed by the County of Hawaii, designed to protect the local taro and coffee industries, makes it unlawful for any person to test, propagate, cultivate, raise, plant, grow, introduce, or release genetically engineered taro or coffee. To better inform and train middle and high school teachers about the issues surrounding local genetically engineered crops, Susan Miyasaka, Ania Wieczorek, Mike Shintaku, Rusty Perry, and Tracie Matsumoto presented an agricultural biotechnology workshop in June 2009. This dedicated team presented a two-week workshop that included basic, hands-on laboratory techniques in molecular cloning and detection of marker genes and field trips to a local papaya farm and packing plant, the Pacific Basin Agricultural Research Center (PBARC), and the Kamehameha Schools Hawaii campus. Their goal was to allow teachers to become better informed about issues surrounding genetic engineering so their students gain a scientific understanding of perceived risks of genetic engineering versus agricultural challenges such as the



Nong Dang, a Leeward Community College and University of Hawaii at Manoa undergraduate student, presented his research poster on the identification of expressed sequence tags in breadfruit, an important staple crop in Hawaii.

Susan Miyasaka presented her poster on informing middle and high school teachers about plant biotechnology through the presentation of a two-week summer Plant Biotechnology Workshop taught by instructors from the University of Hawaii, Manoa and Kamehameha Schools.



Kabi Neupane presented his poster on training community college faculty and students through participation in a three-week "Advances in Biosciences Education" (ABE) summer workshop taught in 2005–2007 by instructors from the Leeward Community College and the University of Hawaii at Manoa.

epidemic of papaya viral ringspot disease. The workshop was funded by the USDA-CSRRES through the University of Hawaii's Agribusiness Education, Training, and Incubator Program under the Alaska Native-Serving and Native Hawaiian-Serving Institutions Education Grants Program.

Hands-on Biosciences Training at Community Colleges in Hawaii

Many laboratory courses taught at community colleges in Hawaii are structured around traditional "cookbook"-style experiences with predictable outcomes. Also, these small colleges have decreased access to sophisticated laboratory equipment and state-of-the-art methods. To bridge the technology gap and enhance the learning experiences of community college faculty and students, Kabi Neupane and David Christopher, from Leeward Community College (LCC) and the University of Hawaii at Manoa (UHM), developed and presented a three-week Advances in Biosciences Education (ABE) workshop during the summers of 2005–2007. The workshops included hands-on laboratory methods such as basic molecular biology techniques in nucleic acid and protein analysis, immunoblotting, T-DNA mapping, fluorescence and electron microscopy, and bioinformatics. Community college faculty and students worked as teams on research problems, which enhanced mentoring and learning outcomes. Graduate students, postdoctoral associates, and faculty also gave lectures. Nearly 80% of workshop participants continued their education and transferred to undergraduate degrees at UHM or other four-year institutions. Faculty participants adapted procedures and lecture materials from the workshop into their courses during the semester. Following their participation in the summer workshop, several LCC students, including Jamie Lum and Christine Messa-Oh, continued working on research projects year-round on the isolation of senescence-related genes from the *Anthurium* transcriptome. Other long-term projects included orchid DNA fingerprinting, microbial ecology, pineapple protease characterization, and monoclonal antibody production. These outreach workshops were funded by an NSF grant (MCB03-48028) awarded to Dr. Christopher. For more information, visit http://abe.leeward.hawaii.edu.

Education Workshop
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2008, episode of the radio show *Sounds of Science,* titled "Science, Evolution, and Creationism." The group was challenged to identify frames and their key features, specifically how particular frames connected with different beliefs, values, and perspectives. For example, in the plant genomics video, conferees recognized both economic and environmental sustainability frames that emphasized the cost-effectiveness and reduced environmental contamination afforded by the use of genetically modified plants versus the application of chemical pesticides. In the radio piece, the conferees identified many frames, including a religious frame (e.g., theologists and scientists are not in conflict about evolutionary theory) and an authority frame (e.g., the inclusion of commentary from experts; the mention of experts' degrees, titles, and high-profile places of employment; and the use of terms and phrases such as "fact," "bedrock," and "abundance of evidence").

Groups of four to eight attendees then selected one or more frames for teaching about evolution and started to develop strategies for using that frame. For example, a group from Hawaii selected authority and environmental conservation frames, emphasizing the factual nature of evolutionary theory as well as how invasive species influence indigenous organisms through the processes of evolution. The discussion ended with an acknowledgment that framing is not likely to convince staunch supporters of particular positions, but it may help reach some of the "wobbly middle" who would otherwise be disengaged.

For more information about the Education Workshop, or to be included in the mailing list for resources, please contact Erin Dolan (edolan@vt.edu / 540-231-2692).

Erin Dolan
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Glenn Ray Noggle

More than a half-century ago, our plant physiology class at the University of Florida was fascinated as Professor Ray Noggle described the control of plant growth with red and far-red light. He had just returned from a national ASPP meeting where he had heard about phytochrome and controlling plant growth with light from the indelible discoveries of Harry A. Borthwick and Sterling B. Hendricks. So it is with considerable sadness that former students and colleagues note the death of Glenn Ray Noggle, 94, on April 1, 2009, at his home in Albermarle, N.C. Education has indeed lost a strong, persistent advocate, for much of Ray's career was quietly devoted to educational efforts. These can be traced from when he was a senior graduate student teaching lab techniques to two young beginning graduate students, Arthur Galston and Martin Gibbs, at the University of Illinois in the early 1940s, to his most recent role—facilitating discussion sessions on current topics for senior adults at Spring Arbor, Albemarle.

Ray graduated from Miami University, Ohio, in 1935, with an AB in chemistry and later entered the University of Illinois during World War II, graduating with a PhD in botany in 1945. He conducted research at the Blandy Experiment Farm, Virginia, 1946–1948; the Oak Ridge National Laboratory, 1948–1952; the Southern Research Institute, Alabama, 1952–1954; and the Charles F. Kettering Foundation (see the photo), where he held a joint appointment as an instructor at Antioch College, Ohio, from 1952 to 1957. His true educational bent was crystallized when he became professor and head of botany at the University of Florida, Gainesville, from 1957 to 1964. He then became the Botany Department head at North Carolina State University, Raleigh, in 1964. He continued on at NCSU as professor long after his retirement in 1977.

As a graduate student at the University of Florida, I fondly recall Professor Noggle's outgoing, helpful nature. In fact, he facilitated my career by personally connecting me with Martin Gibbs. He kept a lively seminar program going; I still vividly recall one regular speaker: Professor F. C. Steward. These memories are made current by the present-day use of a wireless technology termed "Clickers in the Classroom" as a teaching and learning procedure. Professor Noggle arranged an annual visit by Professor Steward as Steward traveled each spring from his winter home in the Caribbean back to Ithaca, N.Y. When Professor Steward lectured, usually on the regeneration of a plant from a single cell, he would *not* ask for slide changes. Rather, he held a child's clicker and simply clicked it as the slide change signal. By the finish you were almost salivating, a true Pavlovian experience for young students. But no "clickers" were available for us to respond!

Ray Noggle's career was about serving and helping others. He did that fairly quietly but with very determined mannerisms. He loved interacting with others, especially in learning experiences, and this character lived through him to age 94. He served ASPP as its executive secretary–treasurer from 1956 to 1960, and at a critical transition time for ASPP, after serving as head of botany at NCSU, he came to the new headquarters in Maryland as the Society's executive director, 1978–1982. Ray's joy of teaching led him to coauthor with George J. Fritz the textbook *Introductory Plant Physiology,* published in 1976, which he used in teaching at Tbilisi State University in the Republic of Georgia, USSR, as a Fulbright-Hays Scholar in 1977. Naturally then, even while in retirement, he continually supported activities such as botanical gardens, educational tours, and other learning experiences, especially for senior adults.

Ray's lifelong quiet determination can be illustrated with one example: his boycott of a nationally known soup because he objected to the company's refusal to hire union laborers. Professor Glenn Ray Noggle is memorialized as a helpful, determined, and lifelong educator.

Clanton Black
University of Georgia

The Arabidopsis Book

New Chapters!

The American Society of Plant Biologists has published *The Arabidopsis Book* (TAB) as a free online compendium since 2002. ASPB is providing funds for the production of TAB as a public service.

Founded by Chris Somerville and Elliot Meyerowitz, TAB now has more than 60 chapters online and receives nearly 100,000 full-text downloads every year.

The current editorial board is working hard to continue TAB's ongoing expansion:

Rob Last *(chair),* Michigan State University
Caren Chang, University of Maryland
Georg Jander, Boyce Thompson Institute
Dan Kliebenstein, University of California, Davis
Rob McClung, Dartmouth College
Harvey Millar, University of Western Australia

The board is overseeing all new content development as well as updates to existing chapters to keep TAB the most comprehensive and current work on Arabidopsis.

New Chapters Recently Posted on BioOne

Peroxisome Biogenesis and Function
Navneet Kaur, Sigrun Reumann, and Jianping Hu,
September 11, 2009

Trehalose Metabolites in Arabidopsis—Elusive, Active and Central
Henriëtte Schluepmann and Matthew Paul
July 14, 2009

Aspartate-Derived Amino Acid Biosynthesis in *Arabidopsis thaliana*
Georg Jander and Vijay Joshi
June 10, 2009

The Arabidopsis Cell Division Cycle
Crisanto Gutierrez
March 18, 2009

Seed Dormancy and Germination
Leónie Bentsink and Maarten Koornneef
December 30, 2008

The Clickable Guard Cell, Version II: Interactive Model of Guard Cell Signal Transduction Mechanisms and Pathways (update)
June M. Kwak, Pascal Mäser, and Julian I. Schroeder
November 26, 2008

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