ASPB News

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Inside This Issue

President's Letter

Globalization of Plant Biology and ASPB

Tuan-hua David Ho

When the American Society of Plant Physiologists (ASPP) was formed as a unit of the Botanical Society of America in 1924, under the leadership of Dr. Charles A. Shull, there were probably no more than a few dozen members (1). Almost a century later, the Society's membership has reached almost 5,000, with about 40% residing outside the United States. The Society is now an international organization, and our missions are also globally oriented. In addition, the Society has assumed a new name, the American Society of Plant Biologists (ASPB), to reflect the broader interests of our members.

In my first letter as president, I would like to expand on the important message of the global interests of Society members included in the last letter to the membership by our past president, Dr. Sally Assmann (2). Indeed, ASPB has been operating as an international society as evidenced by joint annual meetings with our international counterparts. This year's meeting in Hawaii, jointly sponsored by several plant science societies in the Asian-Pacific region, drew a near-record number of attendees. The Canadian Society of Plant Physiologists and ASPB will hold a joint annual meeting in Montreal in 2010. We publish two highly visible journals, *Plant Physiology* and *The Plant Cell,* with readers, authors, reviewers, and editors in every corner of the world, and an increasing number of international members are serving on editorial boards and committees governing various functions of the Society. ASPB has also established an International Committee that focuses on plant biology-related development and outreach work in Africa and Central and South America.

The science ASPB represents has always been global, but probably more so now than before. Many important initial discoveries in plant growth and development were made in Europe and followed up elsewhere. The phytohormone, gibberellin, was first isolated by Japanese scientists working in Taiwan prior to WWII (3) and is now studied globally. The New World crops—maize, tomato, and potato—are now being grown and studied in many venues outside the Americas. The use of Arabidopsis as a model plant has provided opportunities for plant scientists from all over the world to network, collaborate, and share resources. Genomic research has significantly changed the landscape of plant biology in recent years. Almost all genome-sequencing projects, from moss to poplar, have resulted from extensive international collaborations. If one marks on a world map the affiliations of the many authors involved in genome project publications, large areas of the globe will be highlighted. Probably the most far-reaching global effort in plant biology research is the dialogues and collaborations established between plant scientists in developing and developed regions. A case in point is the research on cassava, which is a major staple food in Africa. A global research effort is currently under way, supported by several inter-

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The *ASPB News* is delivered online as well as in print. Members will be alerted by e-mail when a new issue is posted. The *ASPB News* welcomes member feedback. Contact the editor at nancyw@aspb.org.

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Deadline for March/April 2010 *ASPB News:* February 5, 2010

ASPB Executive Committee & Staff

ASPB News

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national agencies and nongovernmental organizations, to achieve significant improvements in productivity, disease and stress tolerance, and nutrient value. Hopefully, this global effort in plant research will contribute to alleviating widespread famines in Africa. On an even broader scale, the impact of global climate change and the role of plant scientists in formulating responses aimed at mitigating the impacts of this problem have led to renewed interests in photosynthesis, cell wall structure, and lipid biosynthesis as the foundation for enhanced biomass production and biofuel production. Suffice it to say, it has been recognized that plant biology plays a central role in many key areas that would impact global population, including food security, alternative energy, environmental quality, human nutrition, and sustainable development.

Plant-based biotechnology has a global reach as well. Ever since agriculture emerged about 10,000 years ago, farmers in different regions have been sharing their knowledge about plants (and animals) and trading products from their farms. Many modern-day agriculture biotechnology companies have strategic plans for marketing their products globally. Furthermore, they have set up R&D units in different locations to tap into the local talent pool in each region and to work on problems unique to that area. In a recent one-day visit to a biotech company on the East Coast of the United States, I met about 20 scientists representing at least a dozen ethnicities, countries of origin, and cultural backgrounds. Apparently, being able to recruit scientists with diverse backgrounds has contributed to global success in the biotech industry. The future of a sustainable agriculture is very much dependent on being able to breed for better crops, either following the traditional approach or via genetic engineering (4). The issues related to genetically modified (GM) crops have certainly caught world attention; this technology is being adopted, debated, or rejected by people on every continent. It is intriguing to note that the *Agrobacterium*-based plant transformation technique, which is so widely used in producing GM crops, was developed simultaneously by several labs in North America and Europe. The *Agrobacterium* system was initially studied as a basic research problem in an academic environment, yet it took only a decade to be developed into a powerful tool for biotechnology. The line dividing basic and applied research has indeed become blurred and the global impact of both is substantial and growing.

Challenges facing plant biology are mounting on the global scale. The Green Revolution, ushered in by the late Nobel Laureate Dr. Norman Borlaug, ameliorated the problem of food shortage in many developing countries for decades. However, the problem in front of us now is multidimensional. As *New York Times* journalist Tom Friedman (5), an expert on globalization issues, pointed out, global warming and rapidly growing population lead to the convergence of an even more challenging problem of a "hot, flat and crowded" world. The term "flat" refers to the global reach of problems; that is, no region or people is going to be immune from the pending challenge. On the other hand, it also means a global challenge can effectively be tackled only by a global approach, and the solution has to be multidimensional as well. Both basic and applied plant research are essential components of the needed response, with support from both public and private sectors.

What is the function of ASPB in this process? Dr. William H. Danforth, chancellor emeritus of Washington University, in his special lecture at the 2009 Plant Biology meeting in Honolulu, encouraged all of us to participate and be proactive. Being an M.D. with no experience working with plants, he has nonetheless been instrumental in creating the new National Institute of Food and Agriculture (http://www.csrees.usda.gov/). ASPB needs to continue serving as a strong advocate for the plant biology community. We are in the middle of strengthening our Public Affairs Department so that we will have effective communication with the government and the general public. In the global arena, the Global Plant Council (GPC) formed this past summer will allow ASPB and its partner societies around the world to form a unified agenda in tackling problems of common interest.

As the new president of ASPB, I am committed to strengthening the international and multidisciplinary reach of our Society. I hope that many members will find ways to contribute to this important effort.

Tuan-hua David Ho
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ASPB Officers Assume Posts for 2009–2010

New ASPB officers and committee members assumed their responsibilities October 1.

Board of Trustees
Mary Lou Guerinot (11), *chair*
Jonathan D. Monroe(12), *treasurer*
Edgar P. Spalding (10)
Mary L. Tierney (11)

Committee on Public Affairs
Gary Stacey (10), *chair*
Sarah M. Assmann (10), *immediate past president*
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Pamela Ronald (10)
Sally A. Mackenzie (11)
James N. Siedow (11)
Richard T. Sayre (12)
Patrick S. Schnable (12)
Elizabeth E. Hood (13)

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Tobias Isaac Baskin (11)

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Erin Dolan (13), *chair*
Jane Ellis (10), *adjunct member*
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Chad V. Jordan (11)
George Ude (13)

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Eduardo Blumwald (10)
Patricia Meija Leon (10)
Jurandir Magalhaes (10)
Samuel Gudu (11)
Matthew E. Hudson (11)
Thomas W. Okita (12)

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Colleen Doherty (11)
David P. Horvath (11)
Priyamvada Voothuluru (11)
Frank G. Dohleman (13)

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Adán Colon-Carmona (10)
John J. Harada (10)
Eleanore Wurtzel (10)
Anthony L. DePass (11), *adjunct member*
Michele B. Garrett (11)
Linda Different Cloud Jones (12)
Beronda L. Montgomery (12)

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Nicholas C. Carpita (10), *chair, president-elect*
Tuan-hua David Ho (10), *president*
Sarah M. Assmann (10), *immediate past president*

Program Committee
Judy Callis (11), *chair/secretary*
Nicholas C. Carpita (10), *president-elect*
Danny J. Schnell (11), *past secretary*
Janet Braam (11)
Georg Jander (11)
Todd C. Mockler (12)
Jeffrey F. Harper (13)

Publications Committee
Sally A. Mackenzie (11), *chair*
Stephen P. Long (10)
Caren Chang (11)
Laurie G. Smith (11)
Neil E. Olszewski (12)

Women in Plant Biology Committee
Judy A. Brusslan (10), *chair*
John Z. Kiss (10)
Yuh-Ru Lee (11)
Diane C. Bassham (12)
Marta Laskowski (12)
Michael M. Neff (12)

EXECUTIVE COMMITTEE
Tuan-hua David Ho (10), *president*
Nicholas C. Carpita (10), *president-elect*
Sarah M. Assmann (10), *immediate past president*
Judy Callis (11), *secretary*
Jonathan D. Moore (12), *treasurer*

Elected Members
Alan M. Jones (10)
Katherine W. Osteryoung (11)
Marguerite J. Varagona (12)

Sectional Representatives
Robert P. Donaldson (10), Mid-Atlantic
John Z. Kiss (10), Midwestern
Estelle M. Hrabak (12), Northeastern
Timothy D. Sherman (11), Southern
Anireddy S. N. Reddy (10), Western

2009–2010 Awards Committees

Following is a list of the membership of the ASPB awards committees for 2009–2010 as announced by President Tuan-hua David Ho. Members serve for three award cycles unless otherwise noted.

ASPB–Pioneer Hi-Bred Graduate Student Fellowship
Patricia S. Springer (13), *chair*
A. Mark Cigan (13)
Robert E. Sharp (13)
Elizabeth Vierling (13)
Patrick S. Schnable (13)

Adolph E. Gude, Jr. Award
Julian I. Schroeder (10), *chair*
Winslow R. Briggs (10), *past winner*
Patrick Masson (13)
Barbara J. Baker (16)

Charles Albert Shull Award
Ralph S. Quatrano (12), *chair*
Steven E. Jacobson (10), *past winner*
Richard D. Vierstra (10)
Karen S. Schumaker (11)
David B. Stern (11)

Charles F. Kettering Award
Anthony H. C. Huang (14), *chair*
Robert E. Blankenship (10), *past winner*
Neil R. Baker (10)
Elisabeth Gantt (10)
Keith Alan Mott (10)

Charles Reid Barnes Life Membership Award
Russell L. Jones (10), *chair*
Gretchen Hagen (10), *past winner*
Thomas J. Guilfoyle (10), *past winner*
Mark Estelle (10)
Kathleen Newton (11)
Raoul Ranjeva (11)

Corresponding Membership Awards Committee
Gloria K. Muday (11), *chair*
Chentao Lin (09)
Gayle Lamppa (10)
Patrick Masson (11)
Bo Liu (12)
Shiv Tiwari (13)

Dennis R. Hoagland Award
Jan E. Leach (12), *chair*
Jorge Dubcovsky (12), *past winner*
C. Robin Buell (15)
Kendal D. Hirschi (15)
Elizabeth E. Hood (15)

Early Career Award
Mary K. Simmons (12), *chair*
Siobhan M. Brady (10), *past winner*
Tai Ping Sun (10)
William (Ned) Friedman (11)
Michael G. Palmgren (11)

Excellence in Education Award
(Excellence in Teaching until 2009)
Jeffrey S. Coker (12), *chair*
Roger P. Hangarter (10), *past winner*
Amy M. Clore (13)
Sharman D. O'Neill (13)
T. Kaye Peterman (13)

Fellow of ASPB Award
Wendy Boss (12), *chair*
Pamela Jill Green (10), *past winner*
Donald R. Ort (10)
Heven Sze (11)
Neil R. Baker (12)

Lawrence Bogorad Award for Excellence in Plant Biology Research
Jen Sheen (14), *chair*
Steven C. Huber (10), *past winner*
Marinus Pilon (10)
Elizabeth A. Ainsworth (12)
Daniel P. Schachtman (14)

Martin Gibbs Medal
Steven C. Huber (13), *chair*
John B. Ohlrogge (11), *past winner*
John A. Browse (11)
Sally A. Mackenzie (11)
Neelima Sinha (13)

Stephen Hales Prize
Steven C. Huber (12), *chair*
Jeffery Dangl (10), *past winner*
Simon Gilroy (10)
Pamela Ronald (10)
Sheila McCormick (12)

2010 Awards—Get Ready to Nominate!

Is There a Fellow Plant Scientist Who You Would Like to See Recognized?

The 2010 Call for ASPB Award Nominations will be sent to all members on January 4. Nominations are due by Monday, March 1.

ASPB encourages you to participate in the 2010 awards program by nominating deserving individuals. Please watch for the Call for Nominations in your mailbox and on our website (http://www.aspb.org/awards/nominate.cfm). In the meantime, please visit ASPB's awards pages (start at http://www.aspb.org/awards/) so that you may see who among your colleagues has received these awards in the past—and determine who else may be deserving in the future.

PLEASE NOTE: The nomination process has been streamlined. Letters of recommendation are no longer required for any awards **except the ASPB–Pioneer Hi-Bred Graduate Student Fellowship.** All that is required to make a nomination for all other awards is a one- to two-page letter of nomination and a detailed CV of the nominee. However, nomination committees may go back to the nominator and ask for more information if they feel it necessary.

Nominations are submitted electronically as a single PDF file at http://www.aspb.org/awards/nominate.cfm.

The names of the award recipients will be announced at the beginning of April, via e-mail broadcast to ASPB members. These awards, which recognize the major scientific contributions of recipients, will be presented at Plant Biology 2010 in Montreal, Canada. Most of the awards are monetary and, with the exception of the Fellow of ASPB Award, winners also will be reimbursed up to $1,000 for travel expenses to Montreal.

Awards to Be Given in 2010

Adolph E. Gude, Jr. Award

This monetary award honors the Gude family, who made possible the establishment of the Gude Plant Science Center. The award, established by the Society and first given in 1983, is to be made triennially to a scientist or lay person in recognition of outstanding service to the science of plant biology. Membership in the Society is not a requirement for the award.

ASPB–Pioneer Hi-Bred Graduate Student Fellowship

This award, made possible by the generosity of Pioneer Hi-Bred International (http://www.pioneer.com), recognizes and encourages innovative graduate research and innovation in areas of plant biology that relate to important commodity crops including corn, soybeans, rice, wheat, or canola. One $22,000 fellowship will be given annually from 2010 through 2013, with an additional $1,000 awarded for the recipient to attend the ASPB annual meeting in the year of their award. Each nominee must attend a U.S.-accredited college or university and must demonstrate interest in the study of plant biology or a related discipline. Each nominee must be a PhD candidate (have successfully passed their preliminary examinations), must demonstrate an excellent academic record (example, have achieved undergraduate and graduate GPAs of 3.5 or greater), and must be a member of ASPB. An individual may receive this fellowship only once.

Charles Albert Shull Award

Created in 1971 to honor the Society's founding father and the first editor-in-chief of *Plant Physiology,* the Charles Albert Shull Award is designed to recognize young researchers. It is a monetary award made annually and is given for outstanding investigations in the field of plant biology by a scientist who is under 45 years of age on January 1 of the year of presentation, or who is fewer than 10 years from the granting of the doctoral degree. The 2010 recipient will be invited to address the Society at the 2011 annual meeting.

Charles F. Kettering Award

This award was established by an endowment from the Kettering Foundation in 1962 to recognize excellence in the field of photosynthesis. It is a monetary award to be given in even-numbered years.

Charles Reid Barnes Life Membership

The Charles Reid Barnes Life Membership is ASPB's oldest award, established in 1925 at the first annual meeting of the Society through the generosity of Dr. Charles A. Shull. It honors Dr. Charles Reid Barnes, the first professor of plant physiology at the University of Chicago. It is an annual award for meritorious work in plant biology that provides a life membership in the Society to an individual who is at least 60 years old. Membership is not a requirement for the award, and, if appropriate, every fifth award should be made to an outstanding plant biologist from outside the United States.

Corresponding Membership

The Corresponding Membership honor, initially given in 1932, provides life membership and Society publications to distinguished plant biologists from outside the United States. The honor is conferred by election on the annual ballot. The committee selects no more than three candidates, and these are placed on the ballot for approval of the corresponding membership by majority vote. The president notifies successful candidates of their election. Election of a corresponding member is to be considered each year and held if warranted, provided the election would not increase the proportion of corresponding members beyond 2% of the dues-paying membership.

Early Career Award

The Early Career Award was instituted by the Society's Executive Committee in 2005 to recognize outstanding research by scientists at the beginning of their career. This is a monetary award made annually for exceptionally creative, independent contributions by a member of the Society who, on January 1 of the year of the presentation, is not more than five years post-PhD.

The Excellence in Education Award (Excellence in Teaching until 2009)

This award, initiated in 1988, recognizes outstanding teaching, mentoring, and/or

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AAAS/ASPB Mass Media Fellow Reports In

Mandy Kendrick is the sixth AAAS/ASPB Mass Media Science and Engineering Fellow

I sat in panic, staring at a blank Word document and the clock in the bottom right-hand corner of my computer screen. How would I ever learn enough about the growing global diabetes crisis to type up a blog within the next two hours?

It was my second day as the 2009 ASPB-sponsored AAAS mass media fellow at *Scientific American* (SciAm) magazine. The web editor was short on writers—one person out on maternity leave and another on paternity leave—so he had no problem encouraging me to jump right in and pen for the Internet audience.

Thirty minutes past his deadline, I turned in my piece, "Diabetes rates on the rise, developing countries seek solution." A half-hour later, he returned the article to me, with more than a few marks.

From that moment through the remaining nine and one-half weeks, my writing began a transformation process. I said goodbye to the journalistic writing style I had grown accustomed to over the previous six months when documenting everything I researched about ethylene signaling in my dissertation.

This foreign style of writing required taking the introduction, materials and methods, results, and discussion sections of the average manuscript and turning them upside down. To keep the average reader interested, the punch line must come first. As I learned while writing "Changing a chromosome makes mice autistic," giving the take-home message—chromosome abnormalities play a role in autism—without an introduction is a challenge.

Other topics are advanced to the point that the take-home message needs minimal work. One morning I was blindly searching the Internet for blog ideas and stumbled across a device called the BrainPort. This machine restores pixilated vision to blind people through an electrode array that sits on the tongue. A technology that allows the blind to see is pretty easy to present to the general public.

Additionally, I was able to test the BrainPort myself at Lighthouse International, a nonprofit vision health care and research organization—allowing me to dabble in field reporting and write a detailed story that other websites picked up thereafter. The magazine's news editor even chose the piece to use as a "news scan" story for the October 2009 issue.

During her stay in Manhattan, Mandy checked out many sites, including the Empire State building, where she was momentarily taken captive by King Kong.

From covering the BrainPort to racial discrepancies in cancer rates to potential leukemia treatments to controversial anti-aging treatments, I learned a lot of information in a very short time and had the opportunity to speak with many interesting people, including American Cancer Society Chief Medical Officer Otis Brawley; Irving Weissman, director of the Institute of Stem Cell Biology at Stanford University; and telomere biologist Bill Andrews, whose life motto is "live forever or die trying."

I arrived back from the 10-week New York City internship in August and am currently a postdoc in Kerry Pedley's lab within the Foreign Disease–Weed Science Research Unit of the USDA in Frederick, Md., with the hopes of continuing to grow in my understanding and effective communication of basic science.

Mandy Kendrick
mkendrick20@gmail.com

Nominate!
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educational outreach in plant biology. It is a monetary award to be made annually in recognition of excellence in teaching, leadership in curricular development, or authorship of effective teaching materials in the science of plant biology.

Fellow of ASPB Award

Established in 2007, the Fellow of ASPB Award may be granted to current members in recognition of direct service to the Society and distinguished and long-term contributions to plant biology. Areas of contribution may include education, mentoring, outreach, research, and professional and public service. Examples of relevant Society service include, but are not restricted to, service on editorial boards of ASPB journals and active involvement in ASPB meetings. Current members of ASPB who have contributed to the Society for at least 10 years are eligible for nomination. Recipients of the Fellow of ASPB honor, which may be granted to no more than 0.2% of the current membership each year, receive a certificate of distinction and a lapel pin.

Lawrence Bogorad Award for Excellence in Plant Biology Research

The Lawrence Bogorad Award for Excellence in Plant Biology Research was instituted by the Society's Executive Committee in 2006 to honor Dr. Bogorad's many contributions to plant biology, including his influential efforts to bring the techniques of molecular biology to bear on problems in plant biology; his groundbreaking research on chloroplast genetics, bio-genesis, structure, and function; and his inspired teaching and mentoring. The Lawrence Bogorad Award for Excellence in Plant Biology is a monetary award made biennially to a plant scientist whose work both illuminates the present and suggests paths to enlighten the future.

Stephen Hales Prize

This award honors the Reverend Stephen Hales for his pioneering work in plant biology published in his 1727 book *Vegetable Staticks*. It is a monetary award established in 1927 for a scientist, whether or not a member of the Society, who has served the science of plant biology in some noteworthy manner. The award is made annually. The recipient of the 2009 award is invited to address the Society on a subject in plant biology at the 2010 annual meeting in Montreal.

Please contact Donna Gordon with any awards questions or comments at dgordon@aspb.org or 301-251-0560, ext. 131.

Thank you for participating in our 2010 awards program!

Teaching Tools IN PLANT BIOLOGY

Ideas to grow on

- New Free Subscriber Feature in *The Plant Cell*
- Customizable "off-the-shelf" modules
- Unrestricted use of materials
- Peer reviewed by leaders in the field
- Updated as new developments arise

The Plant Cell is initiating a new online-only feature called "Teaching Tools in Plant Biology." Each month, beginning in October 2009, a new set of teaching materials on a different theme—such as Leaf Development or Epigenetics—will be added to the journal website. Each Teaching Tool will include a short essay introducing the topic, a PowerPoint lecture with notes, and suggested further readings. Tools will be "off-the-shelf" modules but easily customizable by the instructor. They are designed with an audience of upper-level undergraduates in mind, but subsets of slides can be incorporated into lectures designed for introductory biology courses, public lectures, or even graduate-level courses. We will be creating most of the artwork ourselves to allow subscribers unrestricted use of the materials.

The materials will be peer reviewed by leaders in the field to ensure accuracy, like all the material in *The Plant Cell.* Unlike a conventional teaching textbook, these electronic lectures will be regularly updated as new developments arise. We will also solicit contributions from researchers and teachers that we will format and edit for continuity.

We hope that these resources help plant biologists teach and communicate about plant biology. Look for Teaching Tools at www.plantcell.org/teachingtools/. The tools are being released monthly, beginning in October 2009. The first six are free, but after that Teaching Tools will be available only as part of your subscription to *The Plant Cell.*

This resource is being developed by Mary Williams, PhD, who taught plant biology to undergraduates at Harvey Mudd College. Feedback to mwilliams@aspb.org is appreciated.

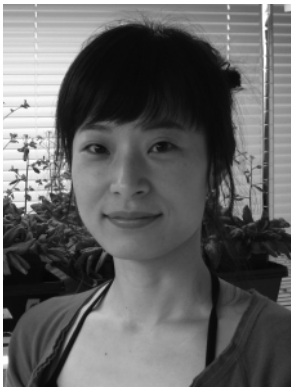
Check Out Teaching Tools at www.plantcell.org

ASPB Sponsors Poster Awards at Gordon Conference

A graduate research seminar was recently held as part of the 2009 Plant Metabolic Engineering Gordon Research Conference in New Hampshire. This unique venue provided young scientists (PhD students and postdoctoral fellows) an opportunity to present their research in a relaxed setting. During the meeting, invited speakers and section chairs evaluated students' posters, giving awards for the best. ASPB provided two copies of *Plants, Genes and Crop Biotechnology* by Maarteen Chrispeels and one copy of *Biochemistry & Molecular Biology of Plants* by Bob Buchanan, Wilhelm Gruissem, and Russell Jones. Winners were also awarded an 18-month membership in ASPB. Below the winners talk about the research they are doing.

Ana Paula Alonso

Shannon Bell



Jung-Hyun Huh

Ana Paula Alonso

My work has been focused on the understanding of plant metabolism. The challenge in studying plant metabolism is that it involves several specific features, such as substrate cycles, pathway duplication, and multiple subcellular compartments, all of which are difficult to tackle and make plant metabolic networks highly complex. I believe that determining the fluxes through central metabolism is important for understanding the biochemistry involved in storage product accumulation and can pave the way for rational genetic engineering of plants such as cereal crops. The approach I have been using for quantifying multiple central metabolic fluxes is steady-state metabolic flux analysis (MFA) using $_{13}$C-labeling with NMR and/or gas chromatography–mass spectrometry (GC-MS) analysis of labeled metabolites combined with computer-aided modeling.

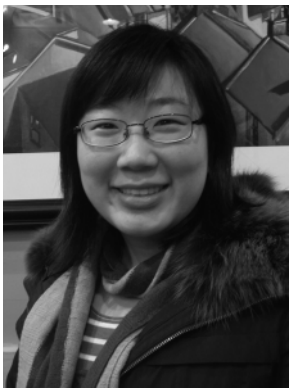
In October 2000, I obtained a graduate student scholarship, "INRA-Région d'Aquitaine" (France), to work with professors Dominique Rolin and Martine Dieuaide-Noubhani. My first scientific achievement with this team involved demonstrating for the first time the occurrence of a new substrate cycle in plants, the glucose-6-phosphate/glucose cycle, and helping to determine its impact in energy expense and carbon partitioning. I came to work with Yair Shachar-Hill (Michigan State University) in February 2004 as a postdoctoral researcher and built three mathematical models describing central metabolism in developing plant seeds (sunflower embryos, maize germ, and endosperm). During this first postdoctoral experience, I also found some time to have a baby girl who, together with my husband, gives me the balance I need to be completely fulfilled. In December 2006, I obtained an "INRA" postdoctoral research fellowship to work with Jean-Charles Portais (France), studying microbial metabolomics and fluxomics. Since January 2008, I have been working for the Great Lakes Bioenergy Research Center in the exciting field of biofuel research. My project involves measuring the metabolic fluxes that support plant cell wall biosynthesis. I am performing kinetic labeling experiments and dynamic flux analysis in order to delineate the metabolic network, determine the effects of transgenic manipulation, and study the regulation of plant cell wall biosynthesis.

During my PhD and various postdoctoral positions, I have always focused on constantly increasing my scientific and technical background in MFA to have a deeper understanding of central metabolism. I participated in several national and international conferences, and I am glad I went to the Gordon Research Seminar and Conference on Plant Metabolic Engineering, which gave me the opportunity to scientifically and socially connect with people in the same field. I would recommend it to postdoctoral researchers and graduate students interested in plant metabolism.

Shannon Bell

I can still remember the way the magenta boxes glowed in the culture room sitting on top the metal shelving, housing tiny clumps of what would become massive poplar trees. Ever since that middle school interview with a researcher working on genetic manipulation of poplar trees, I knew what I wanted to do for the rest of my life: plant metabolic engineering. Of course, it didn't hurt that this was the decade of the Flavr Savr tomato, Dolly, and all the controversy following. I was fortunate to begin my research career in the Crop Science Department at Oregon State University, where Oscar Riera-Lizarazu not only supported my wheat transformation attempts, but also encouraged my participation in an NSF GK–12 program where I was (I hope) able to inspire future scientists at the rural elementary school where I taught science for a year.

Coming to Michigan State University for my doctorate studies was a natural. Here I have been able to draw from my engineering background as well as my applied genetics and biotechnology training to start asking how we might begin predictive genetic manipulation of plants. I was fortunate to receive an NSF Graduate Research Fellowship,



Jeongwoon Kim

Antje Klempien

which has enabled some freedom in my research pursuits. In the lab of Rob Last, I have been given a great opportunity to do real systems biology—making computational models to generate hypotheses I then get to test. It is a truly challenging area that will better prepare me to address the questions of the field—and if the Gordon conference is any indication, we will continue to have more questions requiring a systems biology approach than we will have answers. Hopefully this means a lot of postdoc opportunities!

Jung-Hyun Huh

I was first exposed to biology through a required course at my junior high school. Becoming excited about biological sciences, I began studying biology at Myongji University in South Korea. As an undergraduate research assistant and master's student, I conducted research in the field of microbiology, which resulted in the publication of three research articles. Because I enjoy the process of scientific problem solving and the excitement of scientific discovery, I decided to pursue a PhD. In 2006, I entered the Molecular Plant Science (MPS) graduate program at Virginia Tech, which provides an excellent opportunity for students to explore various research areas ranging from plant genomics to plant pathology and to plant primary and secondary metabolism. Through the MPS program, I joined the research group of Dorothea Tholl in the Department of Biological Sciences. My research project is focused on the question of how and why plants produce volatile metabolites in roots in interaction with soil-borne organisms, and how this knowledge may be applied in the metabolic engineering of volatile signals to develop alternative pest and pathogen controls. Specifically, I study the formation of volatile terpene compounds in Arabidopsis roots in interaction with the root-rot pathogen, *Pythium irregulare.* Research in the Tholl lab has opened many opportunities for scientific discussion and presentations at conferences. In particular, attending the recent Gordon Research Seminar/Conference on Plant Metabolic Engineering in August was a great opportunity to learn about cutting-edge science and state-of-the-art technology in this field. The meeting allowed a great deal of personal communication among peers (at the Gordon Research Seminar) and between students and many influential researchers in the field in a relaxed and beautiful environment. This conference was truly remarkable, and I definitely plan to attend this and other Gordon conferences in the future.

Jeongwoon Kim

I received my BS in applied biology and chemistry from Seoul National University (Korea) in 2006. I joined the Department of Plant Biology and MSU-DOE Plant Research Laboratory at Michigan State University as a PhD student in 2006 and am currently working on a tomato trichome project in Rob Last's lab. Trichomes are specialized epidermal cells that protrude from the surface of various tissues to protect plants against insects and pathogens. In particular, secretory and glandular trichomes (SGTs) produce diverse secondary metabolites, which are helpful for plant defense, not only serving as physical barriers but also producing and secreting specialized metabolites. The goal of this study is to understand what trichome secondary metabolites are produced in tomato and its relatives and to identify biosynthetic pathways involved in the production of the compounds. My graduate work is focused on screening tomato EMS mutants and introgression lines to find interesting variants and novel chemical compounds, and then mapping those features to the tomato genome using a combination of genomic, genetic, and biochemical approaches.

Antje Klempien

Becoming a biologist is not such an obvious choice if your parents are both computer scientists and you grow up playing with computer chips. However, spending almost every summer on a farm learning to appreciate the beauty of nature, as well as having a wonderful fifth-grade biology teacher, determined my future very early. My family's support for my decision to become a scientist kept me on my path, and I began studying biology at Rostock University in Germany. I was given a great opportunity to work on my diploma thesis in the lab of Natalia Dudareva at Purdue University. I enjoyed my project on the benzenoid network in Petunia flowers, as well as my time with my lab mates, and I joined Natalia's lab to continue as a PhD student.

I am now a second-year graduate student in Natalia's lab, and she gave me the amazing chance to be part of the Gordon Research Seminar and the following Gordon Research Conference, presenting my work and sharing my interest in plant metabolism with other graduate students and postdocs as well as professors from all over the world. These two meetings have been a great experience for me, both scientifically and personally. They have given me the wonderful opportunity to meet other researchers working on the same or different areas of plant metabolism, have great scientific discussions, and learn about all the new tools and methods used in their research to understand and take another step forward toward the improvement and engineering of these numerous networks. I really

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Gordon Conference
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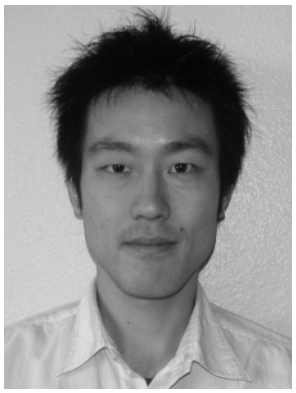
enjoyed my time at the Gordon Conference and Seminar, hearing all the great talks and having time for endless discussions. It was a very motivating experience and I am looking forward to attending as many Gordon Conferences as possible.

Hiroshi Maeda

When I learned about photosynthesis as an undergraduate, I was intrigued by this unique ability of plants, algae, and cyanobacteria to covert CO_2 into organic compounds using sunlight energy, and realized an enormous potential for the use of photosynthetic organisms to achieve petroleum-independent sustainable human society. After obtaining BS and MS degrees with Akio Kobayashi in the Department of Applied Biotechnology at Osaka University, I decided to move to the United States and learn plant physiology and biochemistry while experiencing a different culture. For my PhD thesis, I worked with Dean DellaPenna at Michigan State University and investigated biosynthesis and functions of tocopherols (vitamin E) in both plants and cyanobacteria. As a postdoctoral fellow in Natalia Dudareva's laboratory, I am currently studying the biosynthetic pathway of phenylalanine, an essential amino acid in the human diet as well as a precursor of various plant phenolic compounds that can constitute up to one-third of plant organic matters. Part of this study was presented at the Gordon Research Conference of Plant Metabolic Engineering, where I also had exciting opportunities to interact with many scientists in the field and develop ideas for my own future research program. As highlighted during this conference, we clearly need the second Green Revolution, which will be based on fundamental scientific discoveries. We must further increase yield but also enhance crop values and achieve sustainability of overall agricultural processes. My research will continue to focus on the basic understanding of plant metabolic pathways, which lays the foundation for future rational metabolic engineering of photosynthetic organisms.


Hiroshi Maeda


Wan Song

Wan Song

Being born in a small town in Qinghai province, China, where the altitude is high but vegetation is scarce, I have always wondered how to grow more plants there and make my hometown greener. I went to Beijing Forestry University and completed my college education. In 2003, I left a teaching position at Beijing and came to the United States to pursue a PhD because I wanted to further understand the processes and mechanisms of biological systems and focus on basic research. I joined Dean DellaPenna's laboratory in the Department of Biochemistry and Molecular Biology at Michigan State University in 2004. My thesis is focused on understanding the roles of tocopherols in low temperature adaptation of Arabidopsis. Through forward genetic screening, I characterized three and identified two suppressor loci, and my work has provided new insights in tocopherol functions.

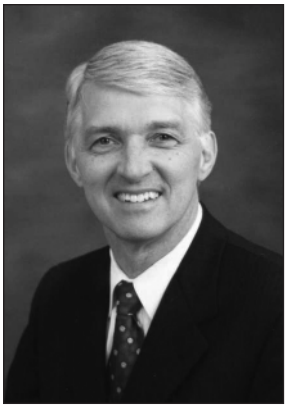
I was pleased to be able to attend the 2009 Gordon Research Seminar and Gordon Research Conference on Plant Metabolic Engineering. The seminar allowed me to interact with other graduate students and postdocs, both during the sessions and the arranged trips to the beautiful Snowy Mountains. The conference format is wonderful because it provides an excellent platform for interactions and discussions. It is exciting to see the potential that basic research in plant metabolism has for industrial applications (biofuels, feedstocks, and pharmaceuticals). The conference also provides many opportunities for getting to know key researchers in the field. I especially enjoyed presenting my poster and the great enthusiasm and encouragement shown by the conferees. The meeting structure is ideal because I can have a little free time in the afternoons to digest the morning talks and prepare for the evening talks. I enjoyed the active and friendly environment of the meetings, and I look forward to future participation at Gordon Research Conferences.

Deadlines for *ASPB News*

We invite you to submit articles and letters to the *ASPB News*. Deadlines for submission of copy follow:

Issue	Deadline
March/April 2010	February 5, 2010
May/June 2010	April 5, 2010
July/August 2010	June 5, 2010
September/October 2010	August 5, 2010
November/December 2010	October 5, 2010
January/February 2011	December 5, 2010

Roger Beachy Named Head of National Institute of Food and Agriculture


Roger Beachy

On October 5, 2009, Roger N. Beachy, an ASPB member since 1976 and until very recently director and president of the Donald Danforth Plant Science Center (http://www.danforthcenter.org/) in St. Louis, was appointed by President Obama to head the National Institute of Food and Agriculture (NIFA; http://www.csrees.usda.gov/about/about.html). NIFA replaced the former Cooperative State Research, Education, and Extension Service (CSREES), which had been established in 1994. A key mandate for NIFA will be to significantly upgrade and expand the integration of agricultural science in professional research, policy making, and public education. For more information about the event surrounding the announcement, see "NIFA (and Its First Director, Roger Beachy) Introduced at Gala DC Event" at http://www.aspb.org/publicaffairs/news/nifagala.cfm.

Roger's background in plant biology will suit him well in his new position. First, he is an accomplished research scientist—his laboratory at the Danforth Center studies virus infection in plants, develops methods for controlling diseases from viruses, and discovers ways to use plant viruses as carriers of vaccines. As Gary Stacey, chair of ASPB's Public Affairs Committee, puts it, "As exemplified in the recent National Research Council report, "A New Biology for the 21st Century: Ensuring the United States Leads the Coming Biology Revolution," plant biology, including agricultural research, has much to offer to the future of biology and our nation. I can think of no better person than Roger Beachy to lead NIFA and to ensure the growth and relevance of USDA research as it addresses this 'New Biology.'" Adds ASPB past president, Sally Assmann: "Roger Beachy's scientific vision, leadership qualities, and administrative expertise will be invaluable in guiding NIFA to realize its full potential as an equal with its partner agencies, NIH, NSF, and DOE."

Second, Roger is experienced in supervising and supporting a variety of dynamic research programs, including those at the Danforth Center, which have lead to important developments in biofuels and plant growth in dry climates. Finally, during his 10-year tenure as the science center's first and only president, he has helped to garner more than $75 million in research grants and to establish a $100 million endowment. A full biographical sketch is available at http://www.danforthcenter.org/newsmedia/beachy.asp.

The Danforth Center's positive perspective on Roger's appointment, effective leadership of Danforth, and goals for NIFA are outlined in a September 23 press release from the center, "Roger Beachy to Join Obama Administration—Danforth Center President Appointed First Director of New Agency" (http://www.danforthcenter.org/newsmedia/NewsDetail.asp?nid=176). Danforth Center president, William H. Danforth, is quoted in this press release as saying of NIFA and Roger: "I believe strongly in the NIFA. No one in the world would be a better founding director."

The Honorable Blanche Lincoln (D-Ark.), chairman of the U.S. Senate Committee on Agriculture, Nutrition, and Forestry, also

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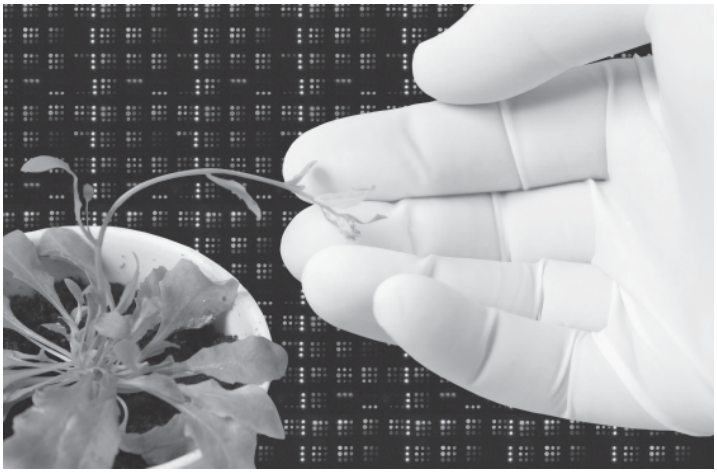
Cohn Receives LSU College of Agriculture Award

Marc Alan Cohn, professor in the LSU Department of Plant Pathology and Crop Physiology, has received the 2009 Sedberry Graduate Teaching Award from the College of Agriculture at Louisiana State University. This award recognizes Marc's outstanding record of excellence and achievement in teaching and mentoring of graduate students. He has been a past recipient of the Seed Science Award from the Crop Science Society of America, a corecipient of the Tipton Award from the LSU AgCenter, and the Distinguished Service Award from the ASPB Southern Section.


Marc Alan Cohn

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.

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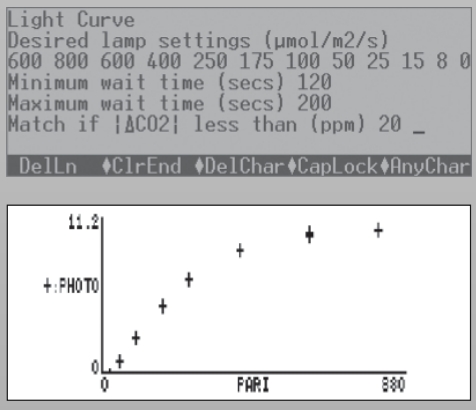
The 6400-17 can be combined with the new 6400-18 RGB Light Source to form a powerful tool for measuring whole plant gas exchange and light response on Arabidopsis or other plants with small growth habits.



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: Yan Lu

Title: Postdoctoral Research Associate

Place of Work or School: Michigan State University, Department of Biochemistry and Molecular Biology

Research Area: Plant Metabolism, Plant Physiology, and Systems Biology

Member since: 2003

1. **Why has being a member of ASPB been important to you?**
   As a young scientist, it is necessary to be part of some scientific organizations. For many plant biologists, including myself, ASPB is THE society! This society provides opportunities, mostly through annual meetings, for me to present my research to fellow scientists in the same fields, to receive intellectual feedback from other plant scientists, to learn what other plant biologists are doing, and to understand applications of most recent technologies in plant science.

2. **Was someone instrumental in getting you to join ASPB?**
   Dr. Tom Sharkey encouraged me to join ASPB when I was a graduate student in his laboratory at the University of Wisconsin–Madison.

3. **What would you tell colleagues to encourage them to join?**
   I know a few postdocs and graduate students who haven't join yet. I would tell them that being a member of ASPB is important for their career. There are networking opportunities with other plant scientists through various ASPB functions, and a big discount when they register for the annual meeting!

4. **Have you enhanced your career using ASPB job postings or through networking at an ASPB function?**
   Although I haven't used ASPB job postings yet, I have been actively interacting with other plant scientists at various ASPB functions, such as lunches, dinners, and poster sessions. I believe these activities will enhance my career.

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?**
   I have not yet used job postings or the Job Bank to look for candidates. However, once I have my own research group, hopefully in the next few years, I will certainly use these resources to post jobs.

6. **Do you read print journals? If so, where do you usually read them?**
   I read *Plant Physiology, The Plant Cell,* and *Science* in the computer/coffee room while I am having lunch. When I read something that I should take note of, I print out the articles.

7. **What do you think is the next "big thing" in plant biology?**
   I think applicable biotechnologies for increasing bioenergy and biofuel yield, roles of small RNAs in various plant pathways, and large-scale analyses of gene functions are the "current" big things in plant biology. It is a difficult for me to name the "next" big things, though.

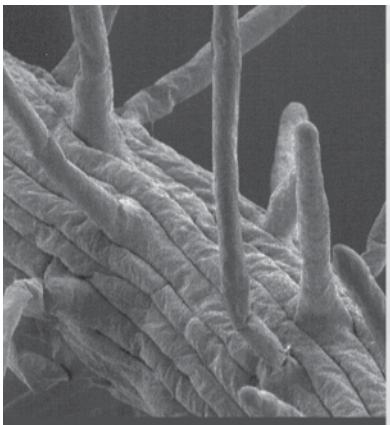
8. **What person, living or deceased, do you most admire?**
   I admire everyone that had or has a positive influence on somebody else; everyone that made or makes this world a better place to live. In the end, personal fame doesn't count; what you have contributed to society counts.

9. **What are you reading these days?**
   I love to read classical Chinese literature.

10. **What are your hobbies?**
    I enjoy biking, playing badminton, and gardening. I cherish every moment with my baby girl, Janelle.

11. **What is your most treasured possession?**
    My baby girl and my husband are my most treasured possessions.

12. **What do you still have left to learn?**
    As a young plant scientist, I need to learn how to write a grant proposal, how to manage a lab, and so on. As a new mother, I need to learn how to be a great parent while having a successful career. As a person, learning is part of my everyday life.



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:

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- The Los Angeles Times
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ASPB Joins Other Leading Scientific Organizations to Reaffirm Consensus on Climate Change in a Letter to Senators

As the U.S. Senate considers climate change legislation, ASPB and other leading scientific organizations have sent a letter (http://www.aaas.org/go/climate_letter) to all senators reaffirming the scientific consensus that climate change is occurring and that greenhouse gases from human activities are the primary driver.

Sent October 21, 2009, and signed by ASPB President Tuan-hua David Ho and his counterparts at 17 other scientific organizations, the letter states in part:

> Observations throughout the world make it clear that climate change is occurring, and rigorous scientific research demonstrates that the greenhouse gases emitted by human activities are the primary driver. These conclusions are based on multiple independent lines of evidence, and contrary assertions are inconsistent with an objective assessment of the vast body of peer-reviewed science. Moreover, there is strong evidence that ongoing climate change will have broad impacts on society, including the global economy and on the environment.

In the United States, these impacts could include sea level rise for coastal states, greater chances of extreme weather, regional water shortages and floods, and wildfires, the letter said. The organizations noted that a dramatic reduction in greenhouse gas emissions will be necessary to avoid such serious impacts and warned that adaptation will be required to address impacts that are already unavoidable. Adaptation methods include improved infrastructure design, sustainable water management initiatives, modified agricultural practices, and improved responses to incidents of hazardous weather. Indeed, as Ho points out in his President's Letter in this issue (see page 1), it is the responsibility of all plant biologists to address the serious issue of climate change in their research and education efforts.

In June 2009, the U.S. House of Representatives passed its version of a climate change bill. The U.S. Senate Environment and Public Works Committee is expected to begin consideration of climate change legislation later this month, the first of several Senate committees to do so.

In addition to ASPB, signatories on the letter include the American Association for the Advancement of Science, American Chemical Society, American Geophysical Union, American Institute of Biological Sciences, American Meteorological Society, American Society of Agronomy, American Statistical Association, Association of Ecosystem Research Centers, Botanical Society of America, Crop Science Society of America, Ecological Society of America, Natural Science Collections Alliance, Organization of Biological Field Stations, Society for Industrial and Applied Mathematics, Society of Systematic Biologists, Soil Science Society of America, and University Corporation for Atmospheric Research.

Update on ARRA Spending

Are you wondering where the billions of dollars devoted to science in the American Recovery and Reinvestment Act (ARRA) have gone? An update, courtesy of ASPB's legislative affairs consultants, Lewis-Burke Associates, follows.

The National Institutes of Health (NIH) and the National Science Foundation (NSF) both set a goal to get the vast majority of their ARRA funding awarded by the end of fiscal year (FY) 2009, which was September 30. Except for a few ongoing competitions mainly related to infrastructure, both agencies met this deadline.

At NIH, decisions have been made about almost all of the $10 billion provided in ARRA. In particular, funding has been awarded for special ARRA competitions in Challenge Grants, Grand Opportunity Grants, and Faculty Recruitment Grants; for renewals of existing grants; and for new grants in the pipeline. However, the vast majority of awards (approximately three-quarters of the more than 12,000 ARRA awards) were supplements to already funded grants. The complete list of NIH ARRA-funded awards, which is at http://report.nih.gov/recovery/arragrants.cfm and which is being updated regularly, suggests that close to 70 plant biology grants were funded or supplemented by NIH by mid-October. Note that while decisions about research grants and competitions were completed by September 30, 2009, most of the instrumentation (S10) and construction and renovation (G20, C06)

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ARRA Spending
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awards will not be made until late 2009 or early 2010.

At NSF, $2 billion was distributed as research and education grants to proposals that were, on the whole, in the review pipeline at NSF when the stimulus funding was announced. This approach is consistent with congressional direction to NSF to use the $2 billion from ARRA to raise the success rate in FY2009 competitions. The funding was spread across all areas of science, with a particular emphasis on the science pipeline, including support for graduate and postdoctoral fellowships in a variety of fields and over 300 CAREER awards. In total, the $2 billion covered more than 4,600 standard grants, with about half of the awards having the typical three-year duration. Information on individual NSF ARRA awards is available by searching at http://www.nsf.gov/awardsearch/tab.do?dispatch=4 with Reference Code 6890. Preliminary indications are that as many as 90 plant biology research awards, totaling over $46 million, were funded via ARRA. Over the next six months, there will be additional awards made from special ARRA competitions for instrumentation, facility renovation, and professional science masters grants; as of mid-October, some 20 major instrumentation grants (approximately $8 million) that include some support for plant biology research or education had been awarded by NSF.

At the Department of Energy (DOE) Office of Science, there was not a September 30 deadline for ARRA decisions. Most of the $1.6 billion of the office's ARRA funding was distributed to the DOE laboratories immediately for facilities or ongoing research programs. For external awards, while most competitions have been announced (such as the Office of Science Early Career Research Program competition; see http://www.science.doe.gov/SC-2/early_career.htm), the review and decisions are ongoing and will be made over the next three to six months. Similarly, for the applied research programs, including renewable energy, smart grid, fossil energy, and other areas, most solicitations have been issued, with some awards having been announced and more decisions expected to be made in the coming months. Information about DOE ARRA programs and awards is available via http://www.energy.gov/recovery/.

Notable in its absence from this update, the U.S. Department of Agriculture (USDA) did not receive any stimulus funding under ARRA. The USDA leadership—particularly those responsible for the agency's research portfolio—are acutely aware of this lack and what it indicates of Congress's perceptions of USDA science. However, as is described in the online article "NIFA (and Its First Director, Roger Beachy) Introduced at Gala DC Event" (http://www.aspb.org/publicaffairs/news/nifagala.cfm), everyone from Agriculture Secretary Vilsack on down is determined to see these perceptions change.

With the ARRA funding mostly completed or at least well in process, the focus among leadership and program staff at NIH, DOE, and NSF has shifted to planning and executing FY2010 programs and developing the FY2011 budget. For the research community, however, the challenge of carrying out projects, meeting the ARRA reporting requirements, and convincing Congress and the public of the value of the research investments in ARRA is just beginning.

Beachy Named Head of NIFA
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issued a supportive statement regarding Roger's appointment. Sen. Lincoln, quoted in another Danforth Center press release, "Chairman Lincoln's Statement on the Appointment of Dr. Roger N. Beachy, Ph.D., as Director for the new National Institute of Food and Agriculture" (http://www.danforthcenter.org/newsmedia/NewsDetail.asp?nid=178), said "I look forward to working with Dr. Beachy as he leads" NIFA.

Prior to learning that a long-time ASPB member would be the new NIFA director, ASPB's leadership was already actively discussing ways in which the Society might lend increased support for USDA-funded research. In addition to pursuing its own efforts, ASPB is engaged with a number of coalitions that are advocating for increased support for NIFA and the Agriculture and Food Research Initiative (AFRI), the competitively awarded extramural component of USDA-funded research.

Roger, of course, has his own plans and ideas for NIFA. Working in support of USDA and Obama administration priorities—as well as with other federal funding agencies—he sees NIFA focusing attention on biofuels, human nutrition, and food production. Additionally, Roger, quoted in a September 23 article from the *St. Louis Beacon* ("Obama Taps Beachy of Danforth Plant Science Center to Lead new Food and Agriculture Institute," http://www.stlbeacon.org/science/obama_taps_beachy_to_lead_new_food_and_agriculture_institute), wants "to transmit the excitement of research science to young people in 4H groups and science clubs" around the country.

Renewing and Recycling ASPB's Education Outreach Leadership

Erin Dolan and Roger Hangarter to Serve…Again

ASPB's outreach efforts will continue to bloom and grow under a new season of leadership from two veterans of innovative plant biology education. Erin Dolan has been named the new chair of the Education Committee, and Roger Hangarter will serve as the chair of the Education Foundation board. This article will focus on Erin Dolan and the Education Committee. The story in the January/February issue will feature Roger and the Education Foundation.

Erin Dolan

Erin Dolan is an associate professor of biochemistry and the outreach director of the Fralin Life Science Institute at Virginia Tech (http://www.biotech.vt.edu/content/outreach). She says she first "saw the light" of using plants as educational tools in 2002, when she started the Partnership for Research and Education in Plants (PREP; www.prep.biotech.vt.edu) with Frans Tax at the University of Arizona and Eric Brooks at Buena High School in Sierra Vista, Arizona. Currently director of outreach at the Fralin Institute, Erin is responsible for curriculum development, teacher and scientist professional development, and student–teacher–scientist collaboration efforts.

Erin has served on the ASPB Education Committee since 2007, and this past summer she accepted a position on the Education Foundation board. She organized the dynamic, well-attended Education Workshops at Plant Biology 2008 in Mérida (http://aspb.org/newsletter/septoct08/25edwrkshp.cfm) and Plant Biology 2009 in Honolulu (http://www.aspb.org//newsletter/septoct09/18workshop.cfm).

Erin appreciates the many aspects of quality teaching and outreach, but reports that "working with teachers is especially rewarding because they want to learn science so that they can teach someone else, and not just so they can pass a test."

During her tenure as Education Committee chair, Erin will align resources toward

- broadening awareness of the wealth of plant education materials that members can use to teach students, teachers, and the general public about the importance of plants in our lives
- increasing involvement of the ASPB membership in high-quality K–12 education outreach, including sharing the outcomes and lessons learned through scholarship of teaching and learning
- improving the rewards available to scientists for engaging in high-quality teaching and outreach.

Erin welcomes any feedback about these priorities or suggestions regarding plant education. You can e-mail her at edolan@vt.edu.

Katie Engen
katie@aspb.org

2009–2010 Masters of Plant Science Team Members Named

ASPB Sponsors Seven Members of the Team

PlantingScience (http://plantingscience.org/) is a learning and research resource that brings together middle and high school students, plant scientists, and teachers. Students engage in hands-on plant investigations while working with peers at their schools and online with scientist mentors to build collaborations and to improve their understanding of plant science.

Mentors play a key role in this process. One category of mentors consists of graduate and postdoc students active in all areas of plant science research. These mentors constitute an important part of PlantingScience's Masters of Plant Science Team (MPST). MPST members have an abiding interest in helping middle and high school students and their classroom teachers to develop practical, insightful research skills while investigating the plant themes and teaching modules (http://plantingscience.org/index.php?module=pagesetter&func=viewpub&tid=4&pid=52) provided by the PlantingScience program.

ASPB became an official partner in the PlantingScience project in 2006, and the first ASPB members participated as online scientist mentors that year. More recently, ASPB sponsored five graduate student MPST mentors during the 2007–2008 and 2008–2009 academic years. For the current academic year, ASPB is sponsoring seven MPST mentors. They are graduate students selected by the ASPB Education Committee from a larger cohort of registered mentor applicants

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homeWORK ~ grassroots ideas for cultivating knowledge in your community

'Tis the Season to Create a Sustainable Future

'Tis the season for scientists to look back over the year and revel in the cornucopia of outreach activities they shared within their communities. Hopefully these educational elves will celebrate the many ways they found to spread the gospel truths, glowing reports, and gelt-tinged good ideas of their expertise. Surely as the year draws to a close, the children (ages 1–99) who learned from these scientists have visions of plant biology dancing in their heads. And what of those lucky students who reached higher levels of biological enlightenment in the company of these heralds of scientific literacy? May they paint the town red and green over the plant science concepts that are exploding like firecrackers across the panorama of their imaginations.

Yet perhaps some scientists are checking their lists once, twice, or even thrice, only to find their 2009 outreach didn't actually reach very far. And now in the waning hours of 2009, with Grinch-like twinges and Scrooge-ish concern, they are wishing they had been more generous with their knowledge. Happily, it's never too late to spark an idea and bask in the glow of the teachable moment. Researchers who are tardy to the outreach feast can redeem themselves for a song. Literally. Any lyrically minded latecomers can go caroling with the adapted tunes, "The Twelve Days of Science" and "Plant Cells, Oh Plant Cells" (see sidebar). Those less musically inclined can tweet or Facebook about the great outreach gifts available to one and all at http://www.aspb.org/education. If singing and tweeting are too much for those scientists rushing out to yet another holiday fete, then the following party chitchat opener is a quick but certain fix:

- **Reveling scientist:** *Nelson Mandela, Elie Wiesel, Mother Teresa, and Dr. Martin Luther King, Jr. are four of only five people to win the Nobel Peace Prize, the Presidential Medal of Freedom, and the Congressional Gold Medal. Who's the fifth?*
- Party guests: [offer random guesses, but remain stupefied]
- Reveling scientist: *Norman Borlaug*

Reveling scientists will consider it a gift to themselves as fellow partygoers hang on their every word about the great feats of Norman Borlaug (http://www.worldfoodprize.org/press_room/2009/march/norm95.htm). The guests will appreciate not only that Borlaug's work saved maybe a billion people from starvation, but also that plant biology is a career option that should merit great respect. Now that's some good outreach!

Of course, as part of all the Auld Lang Syne, it's also the season to look forward to the New Year. What themes should the intrepid scientists resolve to incorporate into their education outreach for 2010? Of the many options vying for attention, certainly "sustainability" is a top contender.

Some plant scientists might wish to start by considering how best to define sustainability education for their outreach audiences. Jim Elder (director, Campaign for Environmental Literacy) says it's "learning to live off the sun in real time." An excerpt from *Our Common Future,* by the United Nations World Commission on Environment and Development (http://www.un-documents.net/ocf-02.htm), defines it as teaching "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." So is sustainability a brand new, shiny scientific area of study—a new type of "-ology"? Or is it a worldview that should be woven into all other areas of scientific expertise? Well, that debate could last through 2010 and beyond. In the meantime, how can plant scientists build sustainability concepts into their community outreach efforts? They can start with their own teaching options by linking their current courses and their institutions' existing sustainability efforts. For example, the University of New Hampshire's undergraduate program in "ecogastronomy" (http://www.unh.edu/ecogastronomy/curriculum.html) offers PBIO 650 Crop Production Technologies, PBIO 652 Culture of Vegetable Crops, and PBIO 726 Integrated Pest Management as electives in a major that combines sustainable agriculture, hospitality, and nutrition. Ecogastronomy may not fit on every college campus, but the eager scientist could propose similar cross-campus curriculum coordination at the first faculty meeting of 2010.

If hardcore applications of sustainability don't inspire, maybe building the future by utilizing best-teaching practices will. After all, who says excellent outreach concepts can't also be turned inward? An overview of effective teaching can be found in "Teaching and Learning Strategies That Work," by Roald Hoffmann and Saundra McGuire (*Science,* September 4, 2009: 1203–1204; DOI: 10.1126/science.325_1203). The *ASPB News* series, "Teaching Tips for Higher Education" (http://www.aspb.org/education/newfaculty.cfm), provides more specifics. And professors-as-educators ready to promote effective teaching ideas with their faculty colleagues may wish to peruse the Louisiana State University's Center for

Academic Studies site (http://www.cas.lsu.edu/workshops-presentation), which provides a plethora of materials worth sharing. Those scientists interested in reaching out across campus can contact colleagues in their school's education department and look for opportunities to invite students who want to teach K–12 science in plant biology classes. Then there are those truly motivated ambassadors of good teaching who aspire to set up on-campus training for faculty to guide undergraduates toward scientific literacy. These champions of outreach will find much to learn from Elisabeth Schussler (http://aspb.org/newsletter/julaug09/03wipb24.cfm), director of Biology Teaching and Learning (http://eeb.bio.utk.edu/schussler.asp) at the University of Tennessee–Knoxville.

Of course, as the day-to-day routine of 2010 overtakes their calendars, those busy, busy scientists with a bent for outreach can take a less formal but no less effective tack. They will do much good just remembering to weave in a bit of plant biology expertise anytime they're chatting about today's hot issues. Such opportunities abound in the grocery store checkout line (renewable resources/paper versus plastic); gas station or carpool line (biofuels); doctor's office (medicinal plants); home improvement store (carbon footprint/sequestration); and the campus cafeteria line, local restaurants, or farmers market (GMOs). Of course, these outreaching scientists should always keep in mind that handing out shiny new perspectives on plant science should be like any holiday gift giving—offer what the recipient will enjoy, wrap it up in an appealing package, try not to gush or gloat over the contents, and be appreciative of any thanks that are proffered.

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"Plant Cells, Oh Plant Cells"*

Plant cells, oh plant cells
Use light with your chlorophyll.
Then signal a party—
a dance among organelles

Spin out specialized tissues
Like roots, fruits, and leaves
Responding and ripening
With help from ethylene

And as you are building
Cell walls keep movements slow
And filter what's right
To use nutrients and light
And sustain you and help the plant grow
To use nutrients and light
And sustain you and help the plant grow

*To the tune of "Hanukah, Oh Hanukah"
http://www.songsforteaching.com/chanukah/hanukkahohhanukkah.php

****Disclaimer: Adapted lyrics are not meant to relay textbook-perfect biology.**

Poetic license was used to convey the essence of plant cell functions.

"The Twelve Days of Science"*

The Twelve Principles of Plant Biology Song**

http://aspb.org/education/foundation/principles.cfm

On the first day of science,
my professor said to me,
"photosynthesis converts energy" . . .

. . . On the twelfth day of science,
my professor said to me,
"Plants support all ecosystems,
react to their surroundings,
need water molecules,
fight pests and diseases,
make food and medicine,
come in all shapes and sizes,
build using cell walls,
respire, grow, and age,
use seeds or propagate,
enriched our atmosphere,
cycle many nutrients,
and photosynthesis converts energy"

*To the tune of "The Twelve Days of Christmas"
http://www.12days.com/library/carols/12daysofxmas.htm

****Disclaimer: Adapted lyrics are not meant to relay textbook-perfect biology.**

Poetic license was used to convey the essence of each principle of plant biology.

Masters of Plant Science
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(registration details and links can be found at the end of this article). Congratulations to these 2009–2010 MPST members:

Robert Baker
University of Colorado at Boulder

Brunie Burgos
University of Georgia

Kellie Gillespie
University of Illinois

Lisa Kanizay
University of Georgia

William Perez
City University of New York, Lehman College

Amber Robertson Smith
University of Wisconsin–Madison

Josh Rosnow
Washington State University

MPST members commit to mentor up to five teams of students during the fall and/or spring PlantingScience sessions. Beyond the satisfaction of helping to create teachable moments for so many eager learners, the compensation package for mentors sponsored by ASPB includes a T-shirt, 50% off ASPB meeting fees, and free ASPB membership during their mentorship. See "Talking Up MPST—Quotes from Recent Participants" [sidebar] for more insight into the program.

Full information about getting involved is available through PlantingScience at http://www.plantingscience.org. Graduate students or postdocs interested in this year-long commitment can join at http://plantingscience.org/index.php?module=SurveyManager&func=display&sid=13. Faculty interested in serving as mentors can register at http://www.plantingscience.org/index.php?module=SurveyManager&func=display&sid=2.

This year's fall session—already underway—runs from October 1 through November 30, 2009, and the spring session will run from February 15 through April 15, 2010. A few months prior to the next session, PlantingScience staff will contact new and returning mentors to confirm availability.

If mentoring with PlantingScience is not possible now, it could still be helpful to follow the program's advice for success in almost any mentoring or teaching arrangement. Two key tips are

- **Establish realistic expectations.** Set a friendly expectation for active engagement at the outset. Most students (and grade-level teachers) have little or no prior experience studying plants or designing science investigations. Make every effort to help them establish ownership of the process.
- **Communicate early and often.** Explain terminology and tasks very carefully as you develop a working vocabulary. Several short, simple comments or questions are usually more effective than multiple paragraphs or long speeches.

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Talking Up MPST—Quotes from Recent Participants

Students

" It's been a blast talking to you. It has been really cool; you really helped us to push ourselves to find information that we never would have thought to look into."

"I've never been a fan of science, but these experiments really made science come alive for me!"

"The thing that I liked most about this experiment was working in a group and having mentors. I felt like a real scientist."

Teachers

"I feel it's a great experience to make the science real for the students."

—Charles Guercia

"I love this opportunity for kids. It's the best thing that I have to get kids interacting with a 'community' of people trying to understand a small aspect of the world in a scientific way. It gets kids interest because they have choice in the question and design, they have opportunity to get their hands on stuff and use the computer to connect with people from around the country. How cool of a learning opportunity is that?"

—Participant

Mentors

"Science is a community, and this is a great way to foster communication between experienced and new scientists. Students need to learn, though, that this is exciting and serious stuff, and worth doing well."

—Eric Ribbens

"Communication needs to be clear and repeated so that everybody understands what is going on. PlantingScience does a good job in helping with that communication. I wish my lab had an interactive domain like this website. In the future do you think professors could set up such a domain on this website?"

—Josh Rosnow (ASPB-sponsored graduate student MPST member)

"I thoroughly enjoyed working as a mentor for two groups during this past session. One group experienced great success from the start, and they consistently reported their results in an easy-to-understand manner . . . they were a pleasure to work with and they kept me on my toes to ensure I was giving them proper guidance. The other group was equally as bright, yet they encountered problems with their experiment beyond their control. We worked through several situations, and after some tweaks, they succeeded. These students met adversity, worked through it, and won . . . is there any better example of teaching?!"

—R. Michitsch

ASPB Statement: The Importance of Scientists Participating in K–12 Science Education

On July 17, 2009, the ASPB Executive Committee approved the following statement on the importance of scientists' participation in K–12 science education:

> **University Scientist Involvement in K–12 Education**
> The American Society of Plant Biologists (ASPB) encourages administrators and leaders in institutions of higher education to give appropriate credit to faculty who participate in formal outreach and partnership activities involving K–12 students and teachers. For example, during the appointment, tenure, and promotion process, participation in sustained, high-quality instruction, professional development, and curriculum development should be highly valued. Continued public support for plant science and informed decision making by the public demand an understanding of how plant science research is critical for scientific discovery and human health and well-being, as well as for the production of a range of commodities, including food, feed, fuel, and pharmaceuticals. ASPB will continue to leverage its expertise, in particular its membership, and provide leadership and organizational infrastructure to improve K–12 science education to achieve the goal of an informed public.

Statement Rationale

The plant sciences present a uniquely flexible, scalable, and compelling context for active investigation across the K–12 spectrum, including learning about the processes and nature of science. Plants are large enough to be manipulated by small hands, inexpensive enough to grow in the scale required in K–12 classrooms, and hearty enough for student caretakers. Despite the unique advantages of using plants as instructional tools, the plant sciences are underrepresented in K–12 curricula and textbooks.

Plant science also presents an almost untapped opportunity to engage the public in understanding the genomic revolution, in particular, the development of genetic and genomic knowledge and its translation into products and practices. The results of genomic studies will have direct effects on the lives of today's high school students. Because of the classroom friendliness of their organisms of study, plant scientists are uniquely positioned to engage K–12 learners and their teachers in this revolution.

A number of projects and an array of educational materials have been developed to teach about plant science, but curricula aren't enough. Alan Leshner, CEO of the American Association for the Advancement of Science (AAAS) and executive publisher of *Science*, stated in his 2007 editorial:

> "scientists must engage more fully with the public about scientific issues and concerns that society has about them . . . the notion of public engagement goes beyond public education. We must have a genuine dialogue with our fellow citizens about how we can approach their concerns and what specific scientific findings mean."

The National Science Foundation has already challenged its grantees to "broaden the impact" of their research by working with K–12 audiences. In addition, the National Institutes of Health has made "Engaging Scientists in Science Education" a challenge topic in its request for challenge grant applications as part of the American Recovery and Reinvestment Act of 2009.

Scientific societies can play a complementary and critical role in encouraging institutions to put reward systems in place. Promotion and tenure metrics for high-quality, sustained contributions to K–12 science education will encourage and compensate faculty who dedicate time and energy to these efforts. Endorsing this statement is a small but substantial way that ASPB can support its membership in ensuring ongoing public sponsorship of plant science research and developing a scientifically literate citizenry.

The statement was drafted by member Erin Dolan, in conjunction with the ASPB Education Committee. It is based on a similar statement adopted by the American Society of Human Genetics (http://www.ashg.org/education/k12statement.shtml). Other societies have been invited to follow suit. The ASPB statement is posted on the ASPB website education page (http://aspb.org/education/).

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SURF

ASPB Summer Undergraduate Research Fellowships (SURF)

The 2010 SURF Application Process Will Open on December 14, 2009

SURF fellowships are designed to assist promising undergraduate students in conducting meaningful research in plant biology early in their college careers. Ideally, students should conduct their SURF-funded research the summer following their second year. Exceptionally well-prepared first-year students and third-year students who provide evidence of a strong interest in plant biology will also be considered. Undergraduates needing more or less than the standard four years to earn a degree may still be eligible. Students must work with a mentor who is an ASPB member. All students (including any following nontraditional yearly calendars or in the Southern Hemisphere) will complete their SURF research over a consecutive 10-week period in preparation for presentation at Plant Biology 2011, August 6–10, in Minneapolis, Minnesota.

Funding

Each fellowship provides a $4,000 student stipend; $700 for mentor's lab supplies; a one-year student membership in ASPB; and a $575 travel allowance to attend the ASPB national meeting. The registration fee for the national meeting is waived. The student must be a coauthor of an abstract registered at the conference to qualify for the travel money. Students traveling excessive distances for unusually high fees or who have very limited travel resources may contact Katie Engen (katie@aspb.org) to initiate a special case for additional travel funds.

Eligible Students

Application is open to all undergraduate students who are enrolled full-time and seeking a degree. International students or students following nontraditional academic calendars will have the opportunity to define their status on the application. Applicants must propose a research project to be pursued in the laboratory of a faculty mentor. Applicants may not receive other direct financial support for their research (institutional stipend, Sigma Xi Grants-in-Aid of Research, Council on Undergraduate Research Fellowship, etc.).

Selection Criteria

Competitive student applicants should have high academic achievement, strong motivation for research, skills for conducting the research, and career objectives relevant to the aims of the fellowship program.

Faculty Mentors

Students cannot apply without first securing a mentor. A mentor must be a member of ASPB and have an ongoing research program. Mentors should demonstrate a commitment to undergraduate education and research and be conducting a research program that is of high scientific merit. Mentors will actively guide the student's proposal writing and so must be secured at the onset of the project.

Need a Mentor? Students without plant biology faculty at their home institution may apply to SURF by collaborating with a mentor at another institution. Such students are encouraged to seek a mentor by checking ASPB's Diversity Bank at http://www.aspb.org/committees/minorityaffairs/DiversityBank/ or reviewing the list of institutions with plant biology programs at http://www.aspb.org/resourcelinks/scripts/cats2.cfm?cat=34. If needed, further assistance for finding a mentor can be initiated by contacting Katie Engen (katie@aspb.org) very early in the process (prior to writing the proposal). A mentor cannot be found at the deadline.

Proposal Evaluation

The proposed SURF project should clearly support and enhance the goals of the mentor's ongoing research program, be appropriately targeted for undergraduate work, and guarantee the student regular access to appropriate research facilities. Preference is given to proposals that demonstrate the mentor's close supervision along with the institution's financial commitment to the work.

ASPB supports undergraduates at all types of institutions. Therefore, the proposals are grouped according to the applicant's institution type within the Carnegie classification scheme. Group A is for research and doctoral universities. Group B is for all other colleges and universities. The number of proposals awarded funding in each group will be weighted according to the number of proposals received. The Carnegie Foundation has updated its system to include more classification factors. Applicants who cannot designate Group A or B can find their school's category at http://www.carnegiefoundation.org/classifications/index.asp?key=807 or select a category from the list of institutional descriptions at http://www.carnegiefoundation.org/classifications/sub.asp?key=786.

Applications

Students and their mentors can apply online at http://www.aspb.org/education/summerundergrad.cfm.

SURF 2010 applications will be accepted December 14, 2009, through midnight (ET) February 26, 2010.

Questions?

Contact Katie Engen at katie@aspb.org or 301-251-0560, ext. 116.

The Science Faculty with Education Specialties Group Is Looking for YOU!

If you are a faculty member of a science department at a U.S. university and have specialized training or experience in education, then your colleagues in the Science Faculty with Education Specialties (SFES) group are looking for you. The group currently includes Seth Bush (California Polytechnic State University, San Luis Obispo); Nancy Pelaez (Purdue University); James Rudd (California State University, Los Angeles); Michael Stevens (California State University, Stanislaus); Kimberly Tanner (San Francisco State University); and Kathy Williams (San Diego State University). They are interested in identifying other SFES across the nation. Although all college and university science faculty are education specialists in some regard, SFES are defined here as individuals who have either (1) been specifically hired in science departments to specialize in science education or (2) have transitioned to a role as a science faculty member focused on issues in science education after their initial hire.

As a collaborative research team, SFES has conducted and published an initial study of SFES in the California State University system (http://sepal.sfsu.edu/about-sfes.html) that was recently published in *Science*. From this study, it became clear that there is a need for a greater understanding of SFES across the nation. As a result, the founding SFES members are conducting a national SFES search and have reached out to ASPB (among others) for assistance in this effort. The national SFES search is a prelude to the SFES group's plans to perform a national study of SFES individuals who are working at different types of higher education institutions. If you are an SFES or think you might be an SFES, the ASPB Education Committee and the SFES group would appreciate it if you would take a few minutes to complete a brief survey at http://www.surveymonkey.com/National-SFES-Search. (SFES will not share your information with third parties.) Beyond a national research study of SFES, the long-term goals are to foster a national SFES professional community and to promote cross-disciplinary SFES conversations.

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Vision and Change: Preparing Faculty to Transform Undergraduate Education

Ten tables full of eager science educators participated in the Preparing Faculty subgroup of the "Transforming Undergraduate Education in Biology: Mobilizing the Community for Change" conference (http://www.visionandchange.org/), which occurred July 15–17, 2009, in Washington, D.C. An overview of the event was published in the September/October issue of *ASPB News* (http://www.aspb.org/newsletter/septoct09/12undergrad.cfm). This particular subgroup—one of eight established by the conference organizers—was led by William Wischusen (Louisiana State University), David Lynn (Emory University), and Shawn Drew (NIH, NIGMS).

The Preparing Faculty subgroup members represented diverse interests from many types of academic institutions, federal agencies, and professional societies. Such a mix of expertise helped create lively exchanges that were richly informed by multiple perspectives. Everyone was encouraged to use real "out-of-the-box thinking" and not worry about current policies or funding that could stifle the discussion of ideals.

Not Making the Grade

Before launching into "blue sky" discussion, the subgroup reviewed what was not working in faculty development. They determined that too often faculty don't have access to sufficient direction, resources, rewards, and valid evaluation options for fulfilling their many roles as teachers, lab managers, grant writers, and mentors. Faculty also need training in diverse student learning styles and/or cultural backgrounds and in how to use science education literature to meet these needs while covering relevant course content and processes of scientific literacy. Further back in the pipeline, there is little to no integration of "how-to-teach" instruction during graduate and postdoctoral training. Coordination within departments, across campuses, and among institutions also is deficient in professional development.

Doing Better

As one participant quipped, "Just backing up a truck full of money onto campus won't create better teachers; we have to do better than that." So the subgroup developed the follow-

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Vision and Change
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ing two strategic principles for more effectively preparing faculty to teach:

- develop and grow communities of scholars (students, postdocs, faculty, and administrators) who are committed to creating, using, assessing, and disseminating effective practices in teaching and learning
- change the culture to value and practically incentivize teaching and mentoring through action by all stakeholders (funding agencies, societies, academic institutions, accreditation boards, faculty, and students)

Taming the Beast

In some ways, getting a grip on effective professional development is a bit like taming a multi-headed hydra. The subgroup determined that nurturing the following components should help focus the diverse, yet oft-overlapping issues inherent in faculty training:

- incentives for teaching efforts from funding agencies, professional societies, and accreditation bodies
- learning communities (i.e., journal clubs on science education papers) that engage graduate students and faculty at all ranks
- faculty development workshops for interdisciplinary or bridging groups
- departmental meetings to discuss teaching practices
- well-developed mechanisms for the dissemination of science education resources
- nationally recognized certificate(s) in STEM education awarded with science PhD
- carefully designed undergraduate, graduate, and postdoc training programs to prepare future faculty in teaching and mentoring
- information flow between individuals at diverse institutions
- strategic planning conversations across and between departments, institutions, and funding agencies
- engagement of all faculty in curriculum development and pedagogy
- authentic, developmental assessment to inform teaching and learning practices
- updated institutional structure on course evaluations that encourages innovation in teaching.

Testing, Testing

The subgroup members all concurred that formative and summative evaluations of any faculty preparation methods are necessary to validate and duplicate successful changes. Any improvements to professional development should include established baselines and best practices based on scholarship of teaching and learning; consistently upgraded tools to measure student learning; assessment of instructors by peers, students, and external agencies; and vertical measures of "cultural change" across the institution.

Participants agreed that it would have been helpful to have been provided with

ASPB Supports Faculty with Vision to Prepare for Change

Since 2007, the ASPB leadership has been active in the conversations and planning meetings that lead to the July 2009 Vision and Change conference (http://www.visionandchange.org/). ASPB's activities included

1. Annualizing the ASPB "Excellence in Education" award (formerly named "Excellence in Teaching"). This updated award includes teaching, outreach, and mentoring. It is in effect starting in 2010.
2. Consulting with conference planners to provide baseline strategies for societies supporting the evolution of undergraduate biology education (UBE).
3. Sharing the information from UBE events and meetings with our members via the *ASPB News* and website
   a. http://www.aspb.org/newsletter/septoct09/12undergrad.cfm
   b. http://www.aspb.org/newsletter/septoct07/33edforum3.cfm
4. Conferring across the Society's committees and departments to determine how suggestions from the conference can be incorporated into ASPB initiatives.
5. Evaluating the processes in place within ASPB for continuing the goals of the Vision and Change conference to support forward momentum within plant biology.
6. Adopting a Statement on University Scientist Involvement in K–12 Education (on page 23). Preparing K–12 students for expanded undergraduate learning is an important link in the chain.
7. Considering a statement or policy on how ASPB can support scholarship in teaching and learning.
8. Collaborating with other societies to develop an adaptable set of key concepts and guidelines for societal support of education reforms.
9. Inviting our members to respond to these ideas or add their own by contacting Katie Engen at katie@aspb.org or by joining ASPB's online networking options at http://aspb.org/membership/internet.cfm to discuss these topics with others.

current scholarship on teaching and learning information during this workshop.
The subgroup further agreed that it would facilitate progress if all subsequent meetings, conversations, or conferences on this topic included such a resource for everyone to reference. Individual case studies are inspiring, but aggregate data are needed to validate processes, attain funding, and convert others to the cause.

Cultural Change

For undergraduates to have better teachers, teaching must be viewed everywhere from the water cooler to the boardroom and throughout popular media outlets as important, exciting, and professionally responsible. If such pervasive cultural change occurred, it would free up a variety of individual and institutional resources for teaching. Suggestions for group-specific action items to create cultural change are

- funding agencies—financial resources and grants that include teaching/mentoring skills as required elements of the review criteria
- societies—promotion of and structures for dissemination of science education research
- institutions—strategic planning that emphasizes teaching and learning; continual efforts for professional development
- faculty—departmental seminars to include teaching and learning; incentives that encourage group members to attend faculty development workshops
- students—better engagement of students in the educational mission of their own institution and others (two-year, four-year, and research-intensive institutions).

That Extra Something

The subgroup posited that changing the culture would require some extraordinary resources and tools. Visionary leaders who provide support at local, regional, or national levels would provide effective focus for change efforts. "Exchange programs" between institutions would increase the dissemination of successful strategies and leadership skills, a process that would be facilitated by developing intramural and extramural partnerships between science and education researchers. There should be point persons in departments and institutions who focus on the evaluation of teaching and provide feedback based on the results. Workshops, institutes, and meetings that present "best practices" should become standard entries on the academic calendar. Faculty jobs should explicitly include more time in the day/semester/year to develop and implement successful and/or innovative practices for cultural change or improved teaching, and a larger portion of the financial resources from funders should be specifically allocated to faculty development. For example, all grants (research and others) might contain a budget line item requiring a focus on teaching. Finally, a newly designed single point of access portal to a searchable database of existing and developing teaching resources would benefit everyone.

A Final Distillation

The subgroup distilled all of their ideas into one overarching view as a guide for others actively working toward a future where undergraduate biology education is

- evidence-based with goals for student learning that are skills-based
- integrated and interdisciplinary so that learners address key core content and processes
- shared responsibly by stakeholders that encourage innovation
- ready for evolutionary changes from
  - programs in societies
  - accreditation groups
  - core competencies in biology
  - government/funders.

Just Do It

The subgroup concluded that if cohorts of experts mobilize to engage in shared, directed, provocative, and ongoing discussions that lead to timely action, then undergraduate biology education will be rich and rewarding to students and faculty. ASPB's response to the challenge of helping to create such a future is outlined in the sidebar, "ASPB Supports Faculty with Vision to Prepare for Change." Now what will your response be?

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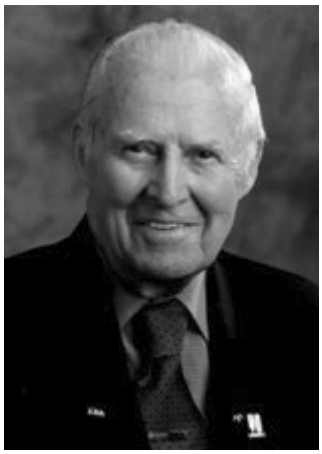
Norman E. Borlaug


Norman Borlaug

The world lost a great scientist, humanitarian, and true hero with the death of Norman E. Borlaug, who succumbed to lymphoma on September 12, 2009, at his home in Dallas, Tex. Norm was 95 years of age, had worked for 65 years after receiving his PhD in plant pathology from the University of Minnesota in 1942, and had an outstandingly productive career. The wheat varieties he developed, with broad and stable disease resistance, broad adaptation to growing conditions and latitude, and high yield potential helped hundreds of millions of people escape a life of hunger and poverty. He not only worked in the laboratory and field to breed these high-yielding wheat varieties, he was also tenacious in helping and pushing other scientists, governments, donors, and the private sector to deliver the new seeds to the small-scale farmers who needed them. Some claim that through his work he saved over a billion lives.

Of the numerous awards and honors Norm received over the years, six should be mentioned here: the Nobel Peace Prize, the Congressional Gold Medal, the Presidential Medal of Freedom, the National Science Foundation's National Medal of Science, the U.S. National Academy of Sciences Public Welfare Medal, and the ASPB Leadership in Science and Public Service Award. The latter was awarded in 2002 when he gave an inspirational speech at the ASPB Annual Meeting in Denver, Colo. Despite all his awards, though, Norm remained a humble man who sought no attention for himself but rather only for the cause that drove him: ending hunger throughout the world.

Within the United States Norm was little known outside the plant science and agriculture communities. But outside the USA he was widely known and considered a hero. I had the privilege of traveling with him in rural areas on several occasions. We would spend dawn to dusk visiting research stations and farmers. Norm loved to talk with young scientists—he trained hundreds—and with farmers, inspiring the former and learning from the latter. At the end of a long, hard day when we returned to the hotel or guest house, there would be local reporters and dignitaries waiting to see him. He would meet with them until late at night, telling the reporters that the farmers were poorly served and getting ready to revolt and telling the officials that they had better do a better job of serving farmers or else they would have a revolt on their hands. The next day there would be headlines in the local paper quoting Norm about the plight of local farmers and quoting government officials about their new plans to help solve the farmers' problems.

Norman Borlaug's career began as a forester working for the U.S. Forest Service. He then returned to the University of Minnesota and received his master's and doctoral degrees in plant pathology working under the legendary pathologist E. C. Stakman. After graduating he worked for DuPont in Delaware for two years. In 1944 he joined the Rockefeller Foundation's cooperative agricultural program in Mexico, at the time a high-risk, start-up, field program, first as pathologist and soon as the lead wheat breeder. He was employed by the Rockefeller Foundation for 39 years, including on secondment to the newly established International Maize and Wheat Improvement Center (CIMMYT) beginning in 1966 until reaching retirement age in 1983.

In his early years in Mexico, Norm's assignment was to introduce stable resistance to rust disease into Mexico's tropical and subtropical wheats. Impatient as always, he recognized that in Mexico he could double the speed of his breeding program by growing two generations a year. Norm's team planted and evaluated test plots at Chapingo in the Central Highlands in the summer, quickly harvested seeds from the best plants, shipped them 700 miles north to the Yaqui Valley in Sonora, planted and evaluated the next generation there in the winter, and quickly harvested and shipped seed back down to Chapingo to repeat the process the next year. Data were analyzed and written up at night and on weekends. This innovative "shuttle breeding" technique not only produced new varieties in half the time, it also led to the selection of plants that were insensitive to day length and had broad adaptation to growing conditions and latitudes, including, as Norm would discover later, those of South Asia.

Another of Norm's great innovations was the development of semi-dwarf wheat. After World War II, a dwarf wheat from Japan was brought to the United States. At Washington State University, USDA wheat breeder Orville Vogel crossed it with a leading winter wheat and obtained semi-dwarf progeny with significantly increased yield potential. In 1953 Dr. Vogel shared these early lines with his friend Norm Borlaug in Mexico (no "research-only MTAs" hindered sharing at that time). Using shuttle breeding, Norm then crossed this material with his rust-resistant Mexican wheats, producing the first semi-dwarf wheats adapted to tropical and subtropical environments. By 1963, 95% of Mexico's wheat crop used semi-dwarf varieties developed by Norm, the harvest was six times larger than it had been in 1944, and Mexico was a net exporter of wheat.

On the basis of the success of its cooperative program in Mexico, the Rockefeller Foundation had established similar programs in several other countries including India. Under that program and training programs sponsored by the United Nations Food and Agriculture Organization (FAO), young wheat scientists from Asia were sent to Mexico for training under Norm. They

took back the Mexican wheats and began testing them in Asia. In 1963 India and Pakistan (then including today's Bangladesh) were facing famine and were highly dependent on food aid. FAO and the Rockefeller Foundation sent Norm on a trip through the region to assess the situation and provide advice. Wheat yields were abysmally low, even on irrigated lands. When fertilizer was added to the farmer's traditional varieties, they produced more grain but also grew taller and tended to lodge, thus reducing both the harvest and the farmer's incentive to use fertilizer. However, Norm's trainees could not wait to show him how the day-length insensitive Mexican semi-dwarf wheats they had taken home were responding to added fertilizer by doubling and tripling yields in test plots. Norm and M. S. Swaminathan, then head of India's wheat improvement program, recognized the potential value of these breeding lines and began testing advanced Mexican wheats across India with spectacular results. To address worsening famine in the region in 1965, Dr. Swaminathan and Norm convinced the Indian government and Norm convinced the Pakistani government to import semi-dwarf wheat seed from Mexico's Yaqui Valley, where Norm knew his farmer friends could easily shift from grain production to seed production. Tens of thousands of tonnes of wheat seed were imported from Mexico, rapidly bulked up across the two countries, and distributed to farmers. Pakistan became self-sufficient in wheat production by 1968, and in India wheat production increased from 12.3 million tonnes in 1965 to 20.1 million tonnes in 1970. By 1968 similar results were also being achieved with semi-dwarf rice seed imported from the Philippines and developed by the Rockefeller and Ford Foundations–supported International Rice Research Institute (IRRI). A "Green Revolution" was declared to be occurring in South Asia, and by 1974 India was self-sufficient in cereal production. While many scientists and political leaders played important roles in this amazing accomplishment, Norm was clearly the leading scientific innovator and the driving force behind broad-scale dissemination and adoption of the technology.

President George W. Bush congratulates Dr. Norman Bourlag during the Congressional Gold Medal Ceremony held on July 17, 2007, at the U.S. Capitol to honor Professor Bourlag's efforts to combat hunger. Also pictured is House Majority Leader Steny Hoyer, left, and Speaker of the House Nancy Pelosi. WHITE HOUSE PHOTO BY CHRIS GREENBERG.

Norman Borlaug (second from left) shown here consulting with Kenyan and CIMMYT leaders near wheat plots in Kenya. USDA PHOTO BY KAY SIMMONS.

Typical of Norm, he did not rest on his laurels following retirement. He became a distinguished professor at Texas A&M University and a senior statesman for agricultural development, but most importantly, he went back to the field, this time in Africa. Serving as president of the Sasakawa Africa Association, he joined forces with the Carter Center in Atlanta to lead Sasakawa-Global 2000, an agricultural development program designed to bring yield-enhancing technologies to small-scale farmers in Africa. In 2006 at the African Fertilizer Summit in Abuja, Nigeria, he gave a rip-roaring speech that challenged African presidents, major donors, and scientists to bring to Africa the same kind of innovation, courage, and leadership that had launched the Green Revolution in Asia in the 1960s. Fortunately, that process in now under way, with Norm Borlaug's legacy serving as the guiding light.

Gary Toenniessen
The Rockefeller Foundation

Michael Denis Gale FRS

Professor Mike Gale, one of the world's leading plant geneticists, died suddenly on July 18. Mike made numerous seminal contributions to genetics and genomics research on cereals, particularly wheat.

Mike was born August 25, 1943, and was brought up on a dairy farm in the West Country of England, where he attended West Buckland School, Barnstaple. From there, he went on to Birmingham University as an undergraduate, where he specialized in genetics under the tutorship of Professor Sir Kenneth Mather. He lived university life to the fullest and ended up with an upper second class degree. During those formative years, he met his future wife, Sue, who was doing microbiology at Birmingham.

The close connection at that time between the Birmingham Genetics Department and the Agricultural Botany Department at the University of Wales, Aberystwyth, resulted in Mike disappearing across the border in 1965 to do a PhD under the supervision of Professor Hubert Rees. Mike thrived in Aberystwyth, enjoying life, working in the lab, and playing a lot of golf and the occasional game of poker, another of his lifelong interests. Indeed, Mike was twice Wales's amateur poker champion!

Mike's PhD was on the "Cytological and Biometrical Studies in the Gramineae," but he was recalcitrant in finishing his thesis and was offered a job at the Plant Breeding Institute (PBI) in Cambridge in 1968 by Professor Sir Ralph Riley, then head of the Cytogenetics Department, without completing his degree. That took another year! The PBI employed Mike as a geneticist and encouraged him into developmental genetics and physiology. He began on a path at PBI that would lead him to make groundbreaking discoveries on the genetics of height and pre-harvest sprouting, and later on wheat genomics. In collaboration with Colin Law, then head of the department, Mike investigated the inheritance of height in wheat and was the first to map the "Green Revolution" dwarfing genes and show their mode of action and agronomic potential in the UK. He made several other insightful and useful discoveries in wheat genetics during this time. His contributions to agricultural research led to the award of the Royal Agricultural Society of England's gold medal for research in 1994.


Mike Gale

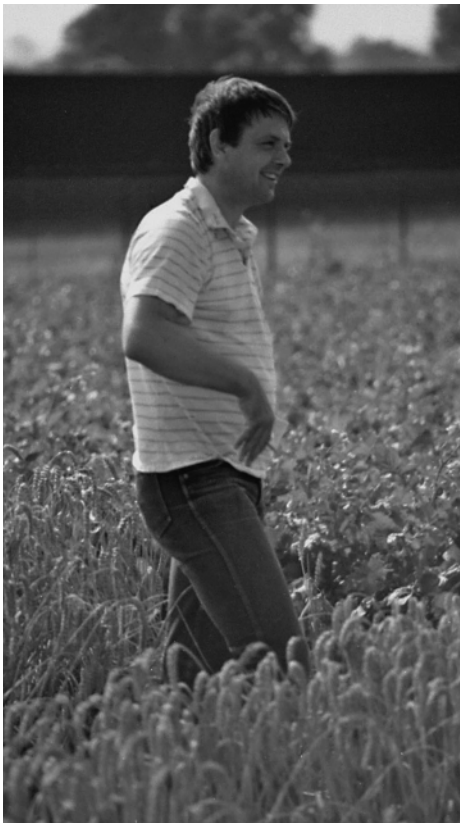
In the mid- to late 1980s, Mike became increasingly interested in genetics at the protein and DNA level, and started programs to discover genetic marker polymorphisms. He began an extensive program to discover and exploit isozyme polymorphisms, and published widely in this area. At the end of the 1980s, his interest turned to DNA polymorphisms in cereals and his group modified technology developed in human studies to wheat. This led to the development of the first comprehensive genetic maps of wheat, and Professor Gale's lab led the world in this field.

In 1990, following the privatization of the breeding activities of PBI, Mike, together with his colleagues on the research side of PBI, moved to Norwich on the site of the John Innes Institute at Colney, into what, at that time, was known as the Cambridge Laboratory. Following restructuring after privatization, Mike became head of Cereal Genetics at the Cambridge lab in 1988 and then director in 1992, following the retirement of Colin Law. In 1994, the Cambridge lab combined with the John Innes Institute and the Nitrogen Fixation Lab (recently moved to Norwich from the University of Sussex in Brighton) to form the John Innes Centre (JIC). Mike became associate research director of JIC.

The years that followed were the most scientifically productive of Mike's research career. His research group, in collaboration with Graham Moore, extended the DNA marker work to analyze the genetic relationships between wheat and other grass species, particularly rice. This led to the seminal discovery that, despite being separated by many millions of years of evolution, the genetic content and gene order in the major grasses had been conserved over time, which in turn led to the "Lego model" and "crop circles" concepts, where the genomes

Mike at a CGIAR Science Council Meeting in 2009.

UK Royal Society "Food Security Report" team, July 2009. The published report (November 2009) is dedicated to Mike.



Mike (1985) in experimental plots at the Plant Breeding Institute Cambridge.

of all grass species could be aligned into a common framework. For this work he was awarded the Rank Prize in Nutrition in 1997, and, with Graham Moore, the Royal Society Darwin Medal in 1998. At this time, Mike, together with Katrien Devos, also extended his research into tropical cereals, making major contributions to genetics and genomic studies in millet species. For his accumulated scientific discoveries and achievements, Mike was elected a Fellow of the Royal Society in 1996. He also took on a greater administrative load at JIC and rose to become director of the JIC.

Mike was always interested in international agricultural research. During the 1980s and 1990s, he had become an important figure in the Rockefeller Rice Biotechnology Program, and also worked extensively for the Plant Breeding Division of the International Atomic Energy Agency in Vienna. This led him to express a passionate view that science, and genetics in particular, has a major role to play in alleviating world food shortages and poverty. Mike became increasingly involved with the Consultative Group on International Agricultural Research (CGIAR) and, in 2004, was elected to the Science Council, the major group that directs the strategic directions of the CGIAR Institutes. In this capacity, Mike played a major role in the directions that international agricultural research has taken over the past few years with respect to crop improvement strategies.

Mike officially retired from JIC in 2003, but became an Emeritus John Innes Foundation Professor in the Crop Genetics Department. Following retirement he kept busy continually working or traveling on business and pleasure. As well as his CGIAR role, he worked as a consultant to numerous national and international organizations, public and private, involved in agricultural science.

As well as having a full professional life throughout his career, Mike lived a busy domestic and social life. He traveled extensively in his role in international agriculture, often accompanied by his wife, Sue, and daughters, Hazel and Tess, and often combined business with pleasure. As a lifelong golfer, and formidable opponent with an 8 handicap, he would invariably look for a golf course in the most unexpected corners of the world. He was also a good poker player and thoroughly enjoyed side visits to the casinos as well.

Mike passed away from a heart attack while attending the Latitude Festival in Suffolk on July 18, 2009, following a game of golf in the morning and catching up with the British Open Tournament, which he always enjoyed.

John Snape
John Innes Centre

Chris Lamb

Chris Lamb, director of the John Innes Centre and one of the preeminent plant scientists of his generation, passed away unexpectedly at his home near Norwich, UK, on August 21.

Chris took a first class honors degree in natural sciences and biochemistry at the University of Cambridge, UK, followed by a PhD in plant biochemistry in Philip Rubery's lab at Cambridge, where he studied mechanisms underlying the wound induction of phenylpropanoid metabolism in potato. In 1975 he joined the Botany School at the University of Oxford as a postdoctoral fellow in Vernon Butt's laboratory. Chris was on a mission to take plant biochemistry into new directions by employing the emerging tools of molecular biology, and he teamed up with Rick Dixon to utilize elicitor-treated bean cell suspension culture to address the question of whether induced responses of plant cells to pathogen signals resulted from the activation of specific sets of genes. At that time there were no molecular probes available, and complex and painstaking methods such as density labeling had to be used to identify and separate the newly formed proteins in the cell from those existing prior to induction of the defense response. Chris and Rick's first paper together was published in 1978 (1), to be followed over the next 25 years by over 100 collaborative publications, many in top international journals.

After Rick moved to the University of London in 1978, there were constant visits between Oxford (where Chris was now a departmental demonstrator with his own laboratory) and London. They followed a similar pattern—long lunches in a local pub, where strategy was decided over several beers; hours chain-smoking through the design of the next set of experiments; the departure of Chris and his students back to Oxford with radiolabeled plant cell culture samples in large boxes of dry ice; and dinners in Queens College Oxford, where Chris was always a convivial host.

Chris in the John Innes greenhouse, June 2009.

During this period, Chris and his student, Mike Lawton, visited Klaus Hahlbrock's lab at the University of Freiburg, learning techniques for in vitro translation of RNA and applying it to the bean cell culture system. Klaus was an adviser (nonresident fellow) for the internationally renowned Salk Institute for Biological Studies in La Jolla, Calif. Although primarily a biomedical research institute, it was contemplating the establishment of a new plant biology laboratory, and Klaus recognized Chris's leadership potential and recommended him for the founding director position. This was remarkable considering that Chris had not yet held a permanent faculty position, but history was to prove Klaus's hunch as correct.

Chris moved his family to Southern California in 1983. During his tenure as director of the Plant Biology Laboratory at Salk, his lab published a series of highly cited papers in the area of plant–pathogen interactions (the top five papers being cited 1,409; 1,128; 884; 639; and 424 times—remarkable by the standards of any field, but off-scale in a small field such as plant pathology), thereby establishing him as a leader in the application of modern molecular and cellular biology to the study of plants.

After demonstrating how regulatory regions in a number of plant defense genes are responsible for coordinated gene activation during induced chemical defenses to pathogen attack, Chris and his colleagues went on to show that an ultra-fast hardening of plant cell walls, via the cross-linking of cell wall proteins, creates a barrier that is the first line of defense against a fungal pathogen. Seeking a trigger for this cross-linking, Chris's team found that hydrogen peroxide was involved. They showed that hydrogen peroxide was not simply a cross-linking or potentially antimicrobial agent; rather, it also acted as a signal, not only for local disease resistance in the infected area, but also at a distance from the infection site in the non-infected leaves of the plant (2). So-called micro oxidative bursts of hydrogen peroxide production were observed near the veins in uninfected leaves if a lower leaf of the plant had first been infected with a pathogen, and these were necessary for establishing immunity to disease throughout the plant. Commonalities between induced resistance in plants and animals were illuminated by subsequent seminal discoveries of the involvement of nitric oxide and long-distance lipid signals in plant defense (3, 4).

Taken together, this work provides the basis for a very simple and provocative model for plant disease resistance that integrates an oxidative burst at the cell surface with transcription-dependent defense gene activation and host cell death. This elegant series

of studies well illustrates Chris's approach as a scientist, and, in particular, his keen sense for the importance of the unexpected, initially puzzling result; his skill in designing experiments to illuminate their significance and mode of action; and his talent (and delight) in incorporating new data into a larger, coherent intellectual framework. His discoveries have had a major impact on our thinking of how plants respond to microbial attack, and resulted in Chris's recognition by the Institute for Scientific Information as one of the most highly cited researchers in the plant and animal sciences.

One of the great pleasures of working alongside Chris was that he really enjoyed working out ideas and discussing hypotheses. This created an immensely enjoyable yet scientifically rigorous environment centered around open and vigorous discussion of the latest data. These discussions were not only in the lab or his office. In California, the Oxford pubs were replaced by Friday evening "lab meetings" at a Mexican bar/restaurant. Chris also had discovered a hole-in-the-wall Indian restaurant that served one of the hottest lamb vindaloos on the planet, and visits there were both memorable and painful. A burning palate often accompanied the most stimulating scientific discussions with Chris.

Chris was a tireless traveler during his tenure at the Salk Institute and never seemed to suffer from jet lag. He must have been one of United Airlines' most frequent flyers, with a dizzying schedule of trips to Asia, Europe, and South America. He loved recalling his adventures on these trips, from being stranded for days in far-off places, to the time, on his first trip to Venezuela, when he thought he had been kidnapped by armed bandits (the security guards for the wealthy person he was visiting on behalf of Salk's fundraising efforts).

Chris's legacy in La Jolla is not just his own science, but also the scientists he identified and mentored who have made La Jolla one of the top places for plant science in the United States. La Jolla now boasts 16 principal investigators across three institutions

(left) Chris hiking in the English Lake District in the spring of 1999.

(below) Chris with Rick Dixon on a Noble Foundation farm in the mid-1990s.

(Salk, UCSD, and Scripps), seven of whom have been elected by their peers to the U.S. National Academy of Sciences. La Jolla plant scientists have a deep footprint in scientific literature, having published more than 1,500 primary publications, which have been cited in the literature close to 100,000 times.

In addition to founding and nurturing the Plant Biology Laboratory at Salk, Chris was also instrumental in facilitating the early development of another program soon destined to join Salk among the premiere places for plant science research in the United States. The president of the Salk Institute was a friend of a member of the board of the Ardmore, Oklahoma-based Samuel Roberts Noble Foundation, and the foundation had provided a significant five-year start-up grant for the new plant biology program at Salk. Chris saw the potential for also building a world-class program at Noble, fed by significant interactions between the two organizations, and was instrumental in making that happen. After the establishment of Noble's Plant Biology Division in 1988, Chris was a constant visitor to Ardmore. The Noble Foundation renewed its five-year support for Chris's program, which now featured a joint postdoctoral fellowship program, whereby selected fellows would spend 18 months in Ardmore and 18 months in San Diego. This was critical for nurturing the Noble plant biology program through its formative years. Between 1989 and 1999, 15 postdoctoral fellows worked on this program, during a period that saw over 80 joint publications from the two institutes. The interactions were facilitated by yearly retreats, alternatively in California and Oklahoma/Texas, featuring Salk and Noble faculty, postdocs and students, and an array of high-profile guest speakers. Many of these Noble/Salk postdoctoral fellows

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Chris Lamb
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now hold senior positions at prestigious universities and research institutes throughout the world.

Chris loved the American lifestyle. He often spoke of its endless optimism, which was very much a part of his character. However, he remained quintessentially British at heart, and finally made the move back across the Atlantic in 1998, briefly holding the Regius Chair in Plant Science at the University of Edinburgh. A greater challenge soon became available, and Chris moved to the John Innes Centre as director in 1999. He was determined to make a mark on UK plant science and slowly but surely reorganized the science at the John Innes Centre, focusing on "excellence and relevance." He led by consensus and had an impressive ability to bring disparate parties together. As well as strengthening John Innes Centre science, he put a great deal of effort into developing an integrated vision for Norwich's several different research institutions—the John Innes Centre, the Institute of Food Research, the University of East Anglia, and the Norfolk and Norwich University Hospital. By inspiring others to share his vision, rather than by forcing an agenda, Chris left the John Innes Centre as a strengthened force in plant and microbial sciences.

Chris was also determined to open the eyes of policy makers, and the population at large, to the potential of scientific exploration. Recognizing the impact that plant science could have on society as a whole—food security issues, delivering sustainable agriculture, and developing bioenergy—Chris actively took John Innes science to the local community in Norwich, to regional and national media, and to Westminster. There were regular House of Commons dinners between John Innes scientists and politicians, made more memorable by the chaos caused by the security guards who insisted Chris put his bicycle (his favorite mode of transport) through the X-ray machine.

Chris created an enjoyable yet scientifically rigorous environment at the John Innes Centre in which research scientists could project their science more broadly and students and postdocs could sharpen their critical-thinking skills and develop as independent scientists. He continued to demonstrate his passion for science and his skill for talent spotting and was constantly finding ways to stretch and reward those around him. He delighted in recruiting young individuals, providing them with plenty of resources and watching how their work flourished, and he enjoyed ending his Friday evenings by dropping into the John Innes bar to catch up on exciting research news, tune in to the issues of the moment, and discuss local football (soccer) politics.

As director of the John Innes Centre, Chris spent much of his time on administration, at which he was superb, but never lost his interest in probing the mechanisms of plant disease resistance and maintained a small laboratory that was still producing cutting-edge research right up until his untimely death. His last paper, which appeared in *Plant Physiology* earlier this year, provided genetic evidence for the involvement of abscisic acid in non-host resistance in Arabidopsis (5).

Throughout his career, Chris was a tireless campaigner in support of plant science. He was remarkably generous to those who worked in his lab as students, postdoctoral fellows, or visiting scientists. It is notable that many of these people took the projects they had initiated under Chris's supervision to their new jobs, and one of his major legacies will be the number of careers he nurtured that are now flourishing at major universities and research institutes throughout the world. All three of us have been touched by Chris's wisdom, friendship, and generosity, and he will be greatly missed.

Chris's passion for science was matched by his passion for his family. He was an adopted child, and this heightened his appreciation of a stronge family environment. He is survived by his wife, Jane, whom he met during Fresher's week at Cambridge in 1969 and married the following year; his daughter, Catherine; his son, William; and his adopted son, Donald.

Joanne Chory
Salk Institute for Biological Studies

Caroline Dean
John Innes Centre

Rick Dixon
Samuel Roberts Noble Foundation

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