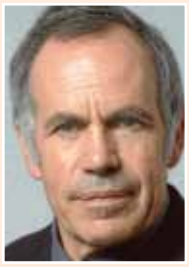
July/August 2013 • Volume 40, Number 4

p. 9

ASPB Members Elected to Academy

Four ASPB members were elected as new members and one as a foreign associate.



p. 10

Steve Long Selected for AAAS Charles Valentine Riley Memorial Lecture

p. 11

Cathie Martin and Graham Farquhar Receive Honors

ASPB News

THE NEWSLETTER OF THE AMERICAN SOCIETY OF PLANT BIOLOGISTS

ASPB Election Results

Many thanks to those members who took the time to vote this spring, and hearty congratulations to our new officers! They will begin their cycle of service to ASPB on October 1, 2013. Look for more information about each winning candidate in an upcoming issue of the *ASPB News*.

Incoming President-elect
Julian Schroeder
University of California, San Diego

Incoming Elected Member
Lisa Ainsworth
USDA–ARS, Urbana, Illinois

President's Letter

Is It Time to Think Outside the Box About Funding for Agricultural R&D?

BY PEGGY G. LEMAUX
ASPB President
University of California, Berkeley

On June 3, ASPB was privileged to be able to share its thoughts with the National Research Council (NRC) regarding the USDA's Agriculture and Food Research Initiative (AFRI). The NRC's Board on Agriculture and Natural Resources (BANR) was commissioned by USDA to review its AFRI competitive grants program (http://tinyurl.com/mz-de3z8), and ASPB's comments were invited in the context of that review.

Prior to the June 3 meeting, the 16-member panel convened by BANR to review AFRI (http://tinyurl.com/lhnb8jt) had held two previous meetings at which

continued on page 3

Contents

ASPB staff are dedicated to serving our members.
We welcome your questions and feedback.

For quick response, e-mail us at info@aspb.org or visit our FAQ at www.aspb.org/faq.

The *ASPB News* is distributed to all ASPB members and is also available online. It is published six times annually in odd-numbered months. Its purposes are to keep membership informed of ASPB activities and to reinforce the value of membership. The ASPB News is edited and produced by ASPB staff from material provided by members and other interested parties.

Copy deadline is the 5th day of the preceding even-numbered month (for example, December 5 for January/February publication).

Contact: Nancy A. Winchester, Editor, *ASPB News,* 15501 Monona Drive, Rockville, MD 20855-2768 USA; nancyw@aspb.org; 301-296-0904.

PRESIDENT'S LETTER
continued from page 1

members discussed various aspects of the program. At the June meeting, the panel listened to and queried a number of stakeholders. Jim Carrington, president of the Danforth Center and member of this committee, asked BANR to invite ASPB to share its thoughts as a major stakeholder in AFRI. As president of ASPB, I welcomed the opportunity to share ASPB's viewpoints.

ASPB was the only scientific society invited to present thoughts at this meeting, but a number of other individuals shared their perspectives. Among them was Barbara Schaal, cochair of the committee that recently released the PCAST (President's Council of Advisors on Science and Technology) report on agricultural preparedness (http://tinyurl.com/bmlwkg9) and Roger Beachy, former director of the National Institute of Food and Agriculture (NIFA), who talked about some of the frustrations and successes he had while leading NIFA. Kei Koizumi from the Office of Science and Technology Policy (OSTP) also spoke about the challenges in reorienting funding priorities at USDA, where research is just one of many concerns competing for funds. He shared that it was often easier to work with other agencies where there were fewer competing interests. For example, he pointed out that at NSF there is only research and education, making reorganization of funding priorities easier.

Prior to the June 3 meeting, the BANR panel shared with invitees several points regarding AFRI that it was charged with addressing. To ensure that ASPB's responses were broadly informed by the Society's membership, we gathered feedback from discussions with leadership and members of the Public Affairs (now the Science Policy) Committee, and we posted a survey on the ASPB website and announced it in the member blog to gather feedback from the broader ASPB membership in the United States on the points the panel raised.

I would like to thank the members who found the time to share their thoughts through the survey because the results sent some strong messages to the panel members. Because of ASPB's active presence on Capitol Hill, we often have the privilege of giving our direct feedback. And we can most accurately do so if members participate when given the opportunity.

From the feedback received, there was a loud and clear message of utmost concern for plant scientists—the **paucity of funds** for competitive plant research. This means, of course, that AFRI can't support all of the innovative research that needs to be done to address emerging challenges in agriculture. In fact, it can't begin to fund all of the research that review panels feel is deserving of funding. This problem has grown worse in recent years, with fewer funded projects—both fundamental and applied. And, sadly, spending on agricultural research in the United States is being eclipsed by those types of investments in other countries [see *ASPB News* 40(1):1,3,8; http://newsletter.aspb.org/2013/janfeb13.pdf].

Another message that came through in the survey and from leadership is AFRI's tendency to **cycle grant priorities in an unpredictable manner.** Cycling of priority areas has led to long breaks between RFAs for some topics, resulting in uncertainty as to when specific topic areas will reappear. This situation may be changing, but it is difficult to determine if this will restore researchers' confidence in AFRI. A related area of great concern is AFRI's **overly prescriptive** RFAs**,** with funding priority areas being too narrowly defined, thus limiting the innovation that often leads to new ideas and unanticipated, successful outcomes. Approximately 60% of survey respondents felt that AFRI program areas were relevant to their interests, but the same proportion felt that the flexibility of the AFRI program was not meeting the breadth of plant science interests. Only 27% of respondents felt they could easily see how their specific research interests fit into current AFRI RFAs. In my comments to the panel, I made it clear that ASPB supports competitive research programs with broader focus that are funded based on intellectual merit and impact—not on prescribed and apparently short-term goals.

A third important message was that there was uniform agreement for the need for **increased funding for small-group and single-investigator fundamental grants,** which are critical in supporting the research interests of the next generation of plant scientists

Also described to the panel was the vision that derived from the two-phase Plant Science Research Summit, which calls for a national initiative that will address decadal challenges. Although the report had not been released at the time of the meeting, I shared with the panel that implementation of this vision will lead to the plant science research that is needed to respond to the urgent needs and tremendous opportunities that will present themselves in the next decade and beyond (see the recently published Plant Science Research Summit report, "Unleashing a Decade of Innovation in Plant Science—A Vision for 2015-2025," at http://plantsummit.wordpress.com/). The themes embodied in this initiative could provide important areas in a long-term vision for AFRI funding.

To secure the congressional funding needed to meaningfully address its priorities, it is important that AFRI be viewed as a strong force for research that embraces the full spectrum of research approaches. With a top-rated AFRI competitive research program attracting the brightest minds and investing in the next generation of researchers, the USDA can effectively meet future challenges in food and agriculture. But, if AFRI is trying to attract the best and brightest, it seems their approach to date has disenfranchised many researchers, due in part to micromanaging application areas. The large problems facing agriculture and bioenergy need to involve the entire research community and to include the prudent use of model systems that can provide insights and proof-of-concept approaches for agricultural applications.

Despite its challenges and shortcomings, most survey respondents felt that AFRI is a dedicated source of fund-

continued on page 4

PRESIDENT'S LETTER
continued from page 3

ing that supports plant science research. But a serious challenge for AFRI is finding ways to increase funding. In this regard, one remark made by Barbara Schaal stuck with me. She intimated that for the past 40 years, NRC reports have been saying the same thing—competitive research is important—and little has happened as a result. This recalcitrance in changing funding priorities at USDA, I believe, relates to an observation shared by the OSTP representative—that it is difficult to reorient research priorities in USDA because of the many competing interests.

As long as Congress and the Executive Branch are unable to agree on and support meaningful and substantial changes in structures and funding for competitive research at USDA, the U.S. agricultural research enterprise runs the risk of becoming poorly equipped to address the challenges we face. Perhaps it is time to think "outside the USDA box" to find funding for agricultural research. In a recent publication, Phil Pardey, a professor at the University of Minnesota and member of the BANR panel, and others concluded that, if one uses an economic approach to analyze U.S. agricultural R&D policy, you come to realize it is not necessarily the federal government that must foot the entire bill—although it certainly must continue to take major responsibility (Pardey et al., 2013a). In their model, funding for this "enterprise" could be accomplished by coupling increased federal investments with policy innovations that would encourage financial contributions from both state governments and industry. A Senate committee proposed a new "Foundation for Food and Agricultural Research" (http://tinyurl.com/mkuvhjl) that embraces elements of this idea by combining public and private research investments to fund agricultural research. But this proposed path falls short in the level of funding and clear details on how the approach would be implemented.

In another publication on this topic, Pardey and others suggest a related approach to reinvigorate U.S. agricultural R&D. It involves coupling commodity checkoff monies with matching public funding (Pardey et al., 2013b). Pardey, an Australian native, told the BANR panel that in Australia, where agricultural research was also facing decreased funds, the research community partnered with commodity boards to use checkoff funds, matched with taxpayer dollars, to fund agricultural R&D. Funds are allocated through Research and Development Corporations, entities separate from the government and industry. This approach has brought more funds for publicly performed R&D and more industry involvement with academic scientists.

Funding for competitive food and agricultural research certainly needs a lot more money, and it might also need a new paradigm. In working toward a new U.S. Farm Bill, committees in both the Senate (Committee on Agriculture, Nutrition, and Forestry) and the House (Committee on Agriculture) proposed to eliminate "direct payments" in order to reduce commodity supports. Frustrating to many of us, none of the over $4 billion savings per year, if it were to be realized, was to be redirected in any substantial way to investments in public agricultural R&D! The short-term, and ultimately long-term, result of such modest investments in agricultural R&D will further erode the preeminence of U.S. agricultural research and development. It is time to think outside the box for ways to fund U.S. agricultural research! ■

References

Pardey, P. G., Alston, J. M., and Chan-Kang, C. (2013a). What Can be Done to Reinvigorate U.S. Agricultural Research? June 2013 OreCal Issues Brief 009 v04; http://orecal.org/storage/issues-briefs/OreCal Issues Brief 009.pdf.

Pardey, P. G., Alston, J. M., and Chan-Kang, C. (April 2013b). Public Food and Agricultural Research in the United States: The Rise and Decline of Public Investments, and Policies for Renewal; http://tinyurl.com/ljlsbo4.

Kathy Munkvold Heads Back to the Bench

ASPB said farewell to Kathy Munkvold, associate director of public affairs, on June 26. Kathy joined ASPB as a policy fellow in 2011 and became our full-time science policy director in 2012. But she missed doing research, so heads back to the bench as a plant research scientist at Keygene, Inc. She'll still be in Rockville, so her former coworkers at HQ look forward to seeing her frequently.

Mid-Atlantic Section

Spring into Plant Biology in Mid-Atlantic Region

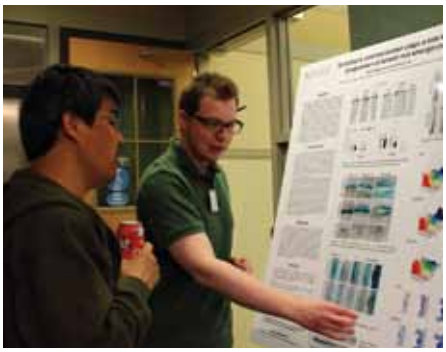
BY JUNG–YOUN LEE, University of Delaware

The Mid-Atlantic Section of the American Society of Plant Biologists (MAS–ASPB) held its annual spring meeting on April 6, 2013, at the Delaware Biotechnology Institute on the University of Delaware campus. The meeting attracted more than 130 participants, including undergraduate and graduate students, postdocs and research associates, and faculty and research scientists from both academe and industry in at least seven states in the Mid-Atlantic region, including Rutgers University in New Jersey; Franklin and Marshall College, Wilkes University, University of Pennsylvania, and Penn State University in Pennsylvania; College of William and Mary and James Madison University in Virginia; University of Maryland, Salisbury University, and USDA–ARS, Baltimore in Maryland; George Washington University in Washington, D.C.; USDA Appalachian Fruit Research Station in West Virginia; and DuPont Pioneer and University of Delaware in Delaware.

Attendees gather at the lunch table.

At the registration desk.

University of Delaware volunteers at the registration desk.



Poster presentation and discussion.

This meeting featured seven invited talks, 10 short talks given by students and postdocs including two undergraduates, and more than 30 posters, which all added to the high quality of science and lively interactions throughout the day. The best student talks were selected by a panel of three judges for the Marsho award, which is presented annually at this meeting to honor the late plant biologist Thomas V. Marsho at the University of Maryland, Baltimore County, who made significant contributions to our understanding of photosynthesis and to the regional plant biologist community. Among the nine contenders, Elizabeth Badley, an undergraduate from James Madison University, and Daniel Czerny, a graduate student from the University of Maryland, were selected for the award. Each student received a cash award.

The highlight of the meeting was the keynote talk given by Jen Sheen on sugar signaling. Immediately following her talk, many people enjoyed additional sugar sensation with homemade ice creams brought from the Ag College–run creamery on the University of Delaware campus. This meeting was generously supported by ASPB, the Department of Plant and Soil Sciences and College of Agriculture and Natural Resources of the University of Delaware, DuPont–Pioneer, and Fraunhofer–CMB. The meeting was organized by the president and treasurer of the MAS–ASPB, Jung-Youn Lee (University of Delaware) and Hua Lu (University of Maryland, Baltimore County). ■

Mid-Atlantic Section

14th Annual Plant Biology Minisymposium in Maryland

BY HEVEN SZE
Chair of the Organizing Committee, University of Maryland

The 14th Plant Biology Minisymposium was held on May 23, 2013, on the College Park campus of the University of Maryland. This annual one-day meeting has featured junior scientists as well as established investigators who are revealing new insights in plant biology using innovative methods and approaches. Eleven invited speakers (from the University of California, San Diego, North Carolina State University, Texas A & M University, Iowa State University, USDA–Agricultural Research Center (ARS), and the University of Maryland) presented their research on diverse topics, including the mechanisms of plant immunity, fruit and tree development, hormone and stress signaling, and novel tools for functional genomics. About 100 participants attended the meeting, including undergraduates, graduate students, postdocs, faculty, and scientists from Howard University, Salisbury University, Wilkes University, Roanoke College, University of Delaware, USDA–ARS and the National Science Foundation. Several short talks were also selected from poster abstracts.

This minisymposium was organized by members of ASPB associated with various units at the University of Maryland, College Park and Baltimore County, and supported in part by the Department of Cell Biology and Molecular Genetics, Plant Science and Landscape Architecture, and the Institute for Bioscience and Biotechnolgy Research. More information on speakers, organizers, and topics can be found at http://www.life.umd.edu/labs/atrium/Symposium/index.htm. ■

Participants at the 14th Plant Biology Minisymposium 2013. PHOTO BY FLORENT VILLIERS.

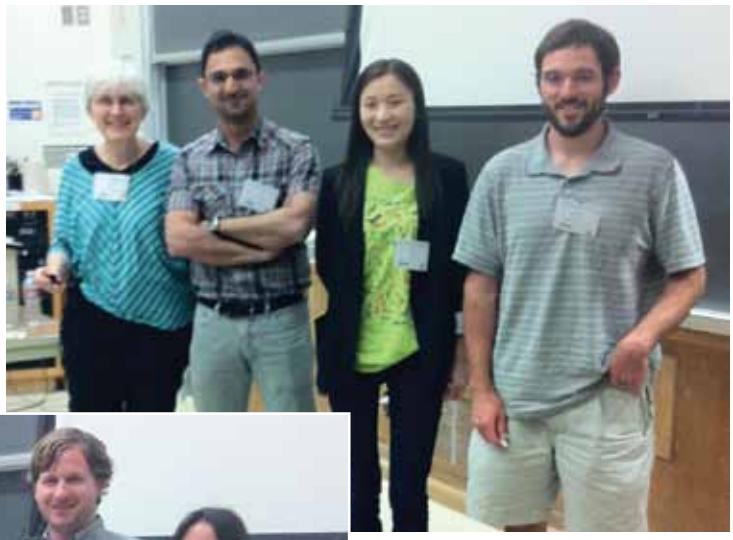
Discussions and poster viewing during lunch break.

Western Section

2013 Spring Meeting Highlights

BY JOHN CUSHMAN
University of Nevada

The annual Western Section ASPB Spring Meeting was held on April 12–13, 2013, on the campus of the University of California, Davis. This year's meeting was organized by Eduardo Blumwald (Chair, WS–ASPB, University of California, Davis) under the highly relevant theme of "Sustainable Plant Yields in a Changing Climate 2013." The meeting drew more than 130 participants from across the western region and facilitated open exchange of plant science research ideas and results among undergraduate and graduate students and postdoctoral researchers within the Western Section of ASPB. On Friday evening, Jorge Dubcovsky (University of California, Davis) delivered the keynote address on "Integrating, Sending, and Decoding Environmental Signals in the Wheat Flowering Response." The next day, Jose Dinneny (Carnegie Institution) chaired the morning session entitled "Signaling Mechanisms Acting at the Cellular, Intercellular, and Organismal Levels" that featured oral presentations by graduate students and postdoctoral fellows on diverse topics including strategies for characterizing root growth dynamics in response to environmental stresses, signaling of salinity stress responses, hypoxia stress responses, proton-antiporter function, circadian clock components, control of root development, and effects of fungal infections on tomato fruit development. Crispin Taylor, ASPB executive director, presented a brief update to the group about new initiatives and recent developments at ASPB. John Cushman (University of Nevada, Reno) chaired the mid-morning session on "Photosynthesis and Photoassimilation," which featured talks on biodesign strategies to move crassulacean acid metabolism (CAM) into C_3 species, transcriptome analysis in *Agave* species, plant metabolic network databases at Metacyc, the use of cyanobacteria to produce biofuels, development of stomatal complexes, the role of Myb transcription factors in fruit ripening, and the production of rice with improved drought tolerance. Luca Comai (UC Davis) chaired the afternoon session on "Omics, System Biology, and Novel Genetics and Physiological Tools." This session included talks on RNA-Seq Tilling in poplar, posttranslational gene regulation, root xylem gene regulatory networks, the membrane interactome, functional analysis of plant protein:pathogen effectors using protein microarrays, gene coexpression network mapping among different fungal plant pathogens, and phenotypic characterization in purple false brome mutant collections. Peggy Lemaux, ASPB



Award winners of the WR–ASPB 2013 regional meeting for best poster presentations (left to right): Peggy Lemaux (ASPB president), Amirhossein Ahkami (Washington State University), Fan Yang (Joint Bioenergy Institute, Lawrence Berkeley National Lab), and Joseph Edwards (University of California, Davis).

Award winners of the WR–ASPB 2013 regional meeting for best oral presentations (left to right): Peggy Lemaux (ASPB president), Mallorie Taylor (University of California, Davis), Graham Dow (Stanford University), and Yinghsan Hsu (University of California, Davis).

continued on page 8

Southern Section

2013 Annual Meeting Report

BY KENT CHAPMAN
University of North Texas

The 2013 meeting of the Southern Section of the American Society of Plant Biologists (SS–ASPB) was held April 6–8 at the historic Capitol Hotel in Little Rock, Arkansas. Ashlee McCaskill, secretary/treasurer, in cooperation with local hosts, Carole Cramer and Emily Devereux, organized the meeting. The meeting was held in conjunction with the annual research meeting of the Arkansas Center for Plant Powered Production (P3), a consortium of plant biologists throughout the state of Arkansas funded by the National Science Foundation and the Experimental Program to Stimulate Competitive Research. Paul Stephenson presided as chair and Jay Shockey served as vice chair, putting together this year's thematic symposium.

The meeting enjoyed support from 27 colleges, universities, and government laboratories from 11 states in the southern region. There were 43 oral presentations, including 32 graduate student oral presentations. Fifty-six participants presented posters, including 16 from undergraduates. The Kriton Hatzios Symposium featured four terrific speakers on the general theme of secondary metabolism and plant defense. Plenary speakers were Natalia Dudareva, Purdue University; Eric Schmeltz, USDA–ARS, Gainesville; Linda Walling, University of California, Riverside; and Ken Korth, University of Arkansas.

Thanks to Carole Cramer for a generous donation to expand the prizes this year from first through third place for both graduate and undergraduate students. In an exceptionally competitive field, the winners of the graduate student oral competition were as follows: first place, Mark Bundy, University of Tennessee; second place, Ritu Mihani, University of Arkansas; and third place, Komal Kunder, Texas Tech University. The winners out of the large field of the undergraduate poster competition were as follows: first place, Kathryn Lankford and Darryel Wilson, University of West Georgia; second place, Miranda Jarrett, Arkansas State University; and third place, Drew Sturtevant, University of North Texas.

Kathryn Lankford and Darryel Wilson, University of West Georgia, winners of the undergraduate poster competition, pictured with Paul Stephenson, 2013 SS–ASPB chair. PHOTO COURTESY OF STEPHEN BANKS.

Thanks in large part to the active participation and financial support from the P3 group, the meeting was a great success, offering a diverse array of plant science research for 157 attendees. The program pages are available at SS–ASPB.org. Next year's meeting will be held in Lexington, Kentucky, with Rick Turley, USDA–ARS, Stoneville, as organizer and Joe Chappell and Robert Houtz, University of Kentucky, serving as local hosts. ■

WESTERN SECTION
continued from page 7

president (UC Berkeley), was on hand to present first-, second-, and third-place cash prizes for the best oral and the best poster presentations. Lastly, the results of the Western Section election were announced. The new officers serving 2013–2015 terms include John Cushman, Chair (University of Nevada, Reno); Georgia Drakaki, Secretary/Treasurer (University of California, Davis); and Camille Steber, regional representative to the ASPB Executive Committee (Washington State University/USDA–ARS). WS–ASPB members interested in hosting the next WS–ASPB meeting should contact John Cushman. ■

ASPB Members Elected to the 2013 Class of the National Academy of Sciences

Plant biology research was well represented once again in this year's selections to the National Academy of Sciences (NAS). Four ASPB members were elected as new members and one as a foreign associate. Each year, the academy elects a maximum of 84 members and 21 foreign associates based on their exemplary achievements in original research. Congratulations to the following ASPB members selected for this highest honor:

Ian Baldwin

Ian Baldwin

Max Planck Institute for Chemical Ecology

Ian received his PhD in chemical ecology from Cornell University and afterwards began his own research program at the State University of New York (SUNY) Buffalo in the Department of Biology. In 1996, he moved to Jena, Germany, to become the founding director of the Max Planck Institute for Chemical Ecology. He has been heavily involved in the Max Planck Society's open access endeavors, including the eLife journal *Evolutionary Biology,* where he serves as senior editor. Ian's research focuses on combining molecular-genetic tools and field studies to understand the real-world interactions between plants and their pests, pathogens, and symbionts.

When asked about his reaction upon receiving this prestigious recognition, Ian stated, "It was a wonderful surprise! One that beautifully crystallized one of the main pleasures of being a scientist: having the chance to stand on the shoulders of others to see further. And it was such an honor to be recognized by the very scientists on whose shoulders my coworkers and I have been standing to gain altitude for our research."

Ian is the recipient of an NSF Presidential Young Investigator Award and the Silverstein–Simeone Award from the International Society for Chemical Ecology. Ian also served as a participant in the second phase of the Plant Science Research Summit (https://plantsummit.wordpress.com/) held in January 2013.

Xuemei Chen

Howard Hughes Medical Institute and University of California, Riverside

Xuemei received her PhD from Cornell University and her postdoctoral training from the California Institute of Technology. She began her own research program at Rutgers University studying floral patterning, where she was among the first to discover the existence of microRNAs in plants. In 2005, she moved to the University of California, Riverside, where she is currently a professor of plant cell and molecular biology and a Howard Hughes Medical Institute–Gordon and Betty Moore Foundation Investigator.

Xuemei responded with words of gratitude after being elected to NAS: "The surprise and thrill from learning about my election to the NAS were followed by deep and sincere feelings of gratitude. I am grateful to my family, my PhD and postdoc mentors, my past and present graduate students and postdocs, and my colleagues and friends for making it possible."

Xuemei has been named a AAAS fellow and is a recipient of the Charles Albert Shull award from ASPB.

Xuemei Chen

Xing-Wang Deng

Xing-Wang Deng

Yale University

Xing-Wang received his PhD at UC Berkeley and is currently the Daniel C. Eaton Chair of Plant Biology in the Department of Molecular, Cellular, and Developmental Biology at Yale University, where his research focuses on light signaling and plant development. He is also director of the Peking–Yale Joint Center of Plant Molecular Genetics and Agrobiotechnology.

Xing-Wang learned about his election through an early morning phone call. He recounted, "A

continued on page 10

MEMBERS ELECTED TO NAS
continued from page 9

number of NAS members from the [field of] plant biology at the NAS 150th annual meeting talked to me and congratulated me on my election to NAS. I was so excited and honored to hear the news."

Xing-Wang has also been named a AAAS fellow and has served on the editorial board of *The Plant Cell*.

Jorge Dubcovsky

Howard Hughes Medical Institute and University of California, Davis

Jorge received his PhD at the University of Buenos Aires and postdoctoral training at the National Agricultural Technology Institute (INTA) and UC Davis. He is currently a professor in the Department of Plant Sciences at UC Davis and a Howard Hughes Medical Institute–Gordon and Betty Moore Foundation investigator. Through his research on wheat genomics, genetics, and breeding, Jorge has improved the nutritional quality of the crop and continues to work toward improving yield and pathogen resistance.

Regarding his election to NAS, Jorge stated, "It feels fantastic! But it also comes with great responsibilities, which I hope I can serve well."

Jorge is a recipient of the Dennis Hoagland Award from ASPB and the USDA Secretary's Honor Award. He has also been named a AAAS fellow.

Jorge Dubcovsky

Foreign Associate

Graham Farquhar

Australian National University

Graham currently holds the position of distinguished professor in the Research School of Biology at Australian National University, where he also received his PhD. His research focuses on a wide range of topics in plant biology, from water use efficiency and stomatal physiology to the isotopic composition of plants.

Graham was alerted to his election by a long list of congratulatory e-mails in his inbox one morning. When asked how it feels to be elected, he said, "It feels marvelous. I do see opportunities and some responsibilities. I feel gratitude to all those who supported me and who collaborated with me."

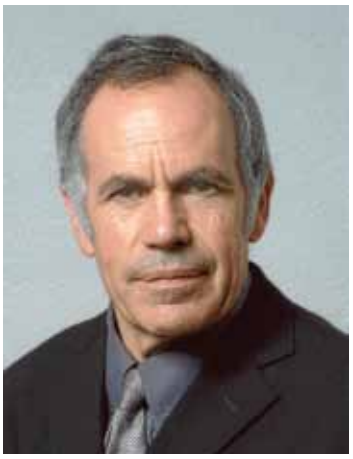
In addition to his numerous awards, Graham contributed to the reports of the Intergovernmental Panel on Climate Change, which was awarded the Nobel Peace Prize in 2007. He has been named a fellow of the Australian Academy of Science, a fellow of the Royal Society, and an ASPB Corresponding Member. Graham also currently serves as an associate editor for *Plant Physiology*. ■

Graham Farquhar

Steve Long Selected for the 2013 AAAS Charles Valentine Riley Memorial Lecture

ASPB member and Gutgesell Endowed University Professor of Plant Biology and Crop Sciences at the University of Illinois, Steve Long has been selected to deliver the 2013 AAAS Charles Valentine Riley Memorial Lecture. The annual lecture highlights the important role of research and innovation in agriculture and honors the 19th-century entomologist Charles Valentine Riley. Steve's research focuses on maximizing photosynthetic productivity in crops through analyses ranging from the biochemical and molecular level to the whole field level. He has been recognized for his scientific achievements in being named a AAAS fellow, an ASPB fellow, and a fellow of the Royal Society. He also received ASPB's Charles F. Kettering Award in 2012.

Past lecturers include ASPB members Roger Beachy and Pamela Ronald and Robert Horsch, deputy director for research and development at the Bill & Melinda Gates Foundation. Both Pam and Rob participated in the January 2013 meeting of the Plant Science Research Summit. ■



Steve Long

Cathie Martin Receives Order of the British Empire Honor

Cathie Martin, editor-in-chief of *The Plant Cell,* group leader at the John Innes Centre, and professor at the University of East Anglia, has been made a Member of the Most Excellent Order of the British Empire (MBE) for her "services to plant biotechnology." This and other awards of the Order of the British Empire are granted to individuals for their distinguished service in the arts and sciences, for public service, and for work in charitable organizations.

Cathie's research focuses on cellular specialization, specifically how flower color and cell shape are used to attract pollinators, and she discovered the first genes known to regulate cell shape in plants. Cathie also has an interest in the connection between diet and health and the role of biofortified crops in improving human nutrition; her work on anthocyanin-rich tomatoes has been featured in the news. She has been recognized for her achievements as a scientist through her election to membership in EMBO and being named a fellow of the American Association for the Advancement of Science.

The Order of the British Empire was originally established by King George V in 1917 to more broadly recognize those who contributed to the war effort as part of the military or as civilians, as men or women, or as British citizens or foreigners. Now the only criterion used to select the recipients is valuable service. The tradition continues today as part of the Queen's Birthday Honours, and the recipients are recognized by the Queen in a ceremony at Buckingham Palace. ■

Cathie Martin

Plant Physiology Associate Editor Graham Farquhar Receives Honors

This year has seen one of our very own acknowledged twice over for his contributions to the plant sciences. Graham Farquhar, one of the associate editors with *Plant Physiology,* was elected to the U.S. National Academy of Sciences as a foreign associate in April (see page 10), and in June he was honored by Her Royal Highness Queen Elizabeth II, charged with the post of Officer of the Order of Australia for service to science in the areas of plant physiology and climate change.

The Order of Australia was established in 1975 for meritorious services to humanity and is not necessarily associated with Australia. Among other distinguished recipients are Aung San Suu Kyi, Jacques Cousteau, Alf Morris, and Nelson Mandela.

Graham Farquhar has done research for more than 40 years across a range of fields and scales, from the cellular to the field. He is one of a relatively small number of plant scientists who brings to his research a background in both physics and biology. He studied physics and mathematics at Monash University in Melbourne, Australia, completing his first degree in biophysics at the University of Queensland (Australia) before pursuing his PhD at the Australian National University in Canberra. Graham's interests include photosynthesis, its interactions with nitrogen and water use of plants, and stomatal physiology and its impact on global environmental change. His efforts in the 1980s led to some of the first quantitative models of CO_2 and transpirative gas exchange from plants in the field, still widely cited in the literature. More recently, his research has included the development of Drysdale, a water-efficient strain of wheat, in collaboration with Richard Richards and colleagues at CSIRO. Graham is a member of the Intergovernmental Panel on Climate Change and a joint recipient of the 2007 Nobel Peace Prize. He is a fellow of the Australian Academy of Science and of the Royal Society, he has been a corresponding member of the American Society of Plant Biologists since 1991, and he is a leading Australian citation laureate. ■

Adapted from Blatt, M. (2013). Associate Editor Graham Farquhar Receives Honors for His Research in Plant Physiology and Climate Change (Editorial). *Plant Physiology* 162:1213.

Brad Balukjian, 2013 ASPB/AAAS Mass Media Fellow, Spending Summer at *Los Angeles Times*

Brad Balukjian, a recent PhD graduate of the University of California, Berkeley's Environmental Science, Policy, and Management (ESPM) program, has been named the 2013 ASPB/AAAS Mass Media Science and Engineering fellow. He will be working in the *Los Angeles Times* newsroom developing and writing stories for the science desk and learning how to communicate scientific research to a broad audience.

Brad earned his PhD this past May, working under Rosemary Gillespie on a group of plant-feeding insects (in the family Miridae) endemic to the archipelagoes of Tahiti and French Polynesia. He discovered 23 new species of these bugs, bringing the total number of species to 26, by using an integrative taxonomic framework drawing on genetic, morphological, ecological, and geographic data. While in graduate school, Brad dedicated much of his energy to teaching and service, receiving the university's Outstanding Graduate Student Instructor award in the fall of 2010 and ESPM's first-ever Graduate Student Distinguished Service Award in May. He established a pedagogy seminar for graduate students, created a graduate student support fund, and developed a new graduate student researcher position to improve communication between faculty, students, staff, and postdocs.

Brad Balukjian

A native of Rhode Island, Brad attended Duke University for his undergraduate studies (with the self-designed major "island biogeography") and then worked for three years at *Islands,* a consumer magazine dedicated to the people and cultures of the world's islands. He is most passionate about translating the often arcane details of science into a form that students and the general public understand and appreciate. To that end, he devoted a chapter of his dissertation to the study of the efficacy of a yearlong, natural history–based education program he taught to fifth graders in Tahiti. He looks forward to dedicating that same energy to the audience of the *Los Angeles Times* and beyond. ■

From Around the Web

Your Guide to Plant Biology Newsmakers

ASPB members were in the spotlight once again, providing science-based perspectives in the conversation regarding genetically modified foods. ASPB President **Peggy Lemaux** and University of California, Davis, professor **Eduardo Blumwald** were featured in the 30-minute documentary, "Next Meal—Engineering Food." The documentary tackles the pros and cons of genetically engineered (GE) crops, explores how GE crops are produced, and discusses the future of labeling. The piece was broadcast on KQED TV in early May (http://science.kqed.org/quest/video/next-meal-engineering-food/).

In a similar vein, a cohort of ASPB members authored a perspective piece in *Nature's* special issue (May 2, 2013) on genetically modified organisms titled "Using Membrane Transporters to Improve Crops for Sustainable Food Production." Authors include **Julian Schroeder, Wolf Frommer, Mary Lou Guerinot, Maria Harrison, Luis Herrera-Estrella, Tomoaki Horie, Leon Kochian, Rana Munns, Naoko Nishizawa, Yi-Fang Tsay,** and **Dale Sanders.** The article (http://www.nature.com/nature/journal/v497/n7447/full/nature11909.html) describes the potential for utilizing the natural genetic diversity of plant membrane transporters for crop improvement, including improving aluminum tolerance in acidic soils, salt tolerance, pathogen

resistance and phosphate use efficiency, and increasing iron and zinc content, among others.

An article in *The Atlantic* also featured the promise of plant biotechnology—this time in repopulating our nation's eastern forests with American chestnut trees (http://www.theatlantic.com/technology/archive/2013/05/genetically-engineering-an-icon-can-biotech-bring-the-chestnut-back-to-americas-forests/276356/). American chestnuts had all but been wiped out in the early 20th century by a fungal blight caused by *Cryphonectria parasitica*. Recently, researchers at the State University of New York's (SUNY's) College of Environmental Science and Forestry have produced resistant trees, genetically engineered to express oxalate oxidase, a protein from wheat that disarms the pathogen's main weapon, oxalic acid. Interestingly, an abstract from the ASPB annual meeting in 1997 (abstract no. 1152) published by Randy Allen's laboratory on expressing oxalate oxidase to confer resistance to fungal diseases inspired the work that would take place over the next two decades. Although the SUNY researchers' results are still preliminary, hopes are high that American chestnut trees will once again be commonplace in eastern forests.

The Plant Cell editor-in-chief and group leader at the John Innes Centre, **Cathie Martin**, was featured in *The Telegraph* for her anthocyanin-rich tomatoes (http://www.telegraph.co.uk/science/science-news/10076492/Genetically-modified-purple-tomato-tastier-than-normal-varieties.html). In addition to being a great source of antioxidants, the tomatoes—engineered with two snapdragon genes—have been shown to have an increased shelf life.

Harsh Bais was featured in a *Wired Science* story on the ability of plants to recognize their siblings (http://www.wired.com/wiredscience/2009/10/plant-siblings/). Harsh's lab at the University of Delaware recently published research demonstrating that compounds present in Arabidopsis root exudates are responsible for changes in root growth of plants grown near siblings versus nonsiblings.

John Kiss, professor and dean of the graduate school at the University of Mississippi, was interviewed by *The Naked Scientists*—a BBC radio program aimed at educating the general public about science—to help answer the question of why plants grow upward (http://www.thenakedscientists.com/HTML/podcasts/show/20130524/). John shared that some of his latest research takes place on the International Space Station to learn more about photo and gravitational tropisms.

Articles on the science news website *Science Daily* also recently featured several ASPB members, including **Ray Ming,** professor of plant biology at the University of Illinois, and **Jane Shen-Miller** of UCLA, for their work in sequencing the Lotus genome (http://www.sciencedaily.com/releases/2013/05/130510180252.htm); **Jay Hollick,** associate professor at The Ohio State University, for his work on the role of RNA polymerase IV in heritable epigenetic variation in maize, recently published in *The Plant Cell* (http://www.sciencedaily.com/releases/2013/03/130326112003.htm); **Claus Schwechheimer,** at the Technische Universität München, for dissecting the molecular signaling underlying phototropism (http://www.sciencedaily.com/releases/2013/05/130528105946.htm); **Roy Navarre,** with the Agricultural Research Service (ARS), for his work toward a novel control strategy against potato cyst nematodes that uses natural egg-hatching factors (http://www.sciencedaily.com/releases/2013/03/130318132823.htm); **Leon Kochian,** also with ARS, for his lab's discovery that a citric acid transporter, when present in triplicate, confers aluminum tolerance in maize (http://www.sciencedaily.com/releases/2013/03/130320133320.htm); and **Ian Graham,** professor at the University of York, for his lab's work on further elucidating the regulatory networks controlling seed germination in Arabidopsis (http://www.sciencedaily.com/releases/2013/06/130610152046.htm). ■

Please visit the *Plants in the News* blog post at http://my.aspb.org/blogpost/700968/Plants-in-the-News for easy access to all the articles highlighted in this column.

"From Around the Web" represents a subset of the news posted on ASPB's *Plants in the News* blog, Facebook page, and Twitter feed. To stay up-to-date, subscribe to the blog (www.aspb.org/plantsinthenews), "like" us on Facebook (www.facebook.com/myASPB), and "follow" us on Twitter (www.twitter.com/ASPB).

If you or your colleagues have been featured in the news and would like to be included in an upcoming issue of the *ASPB News,* please e-mail publicaffairs@aspb.org.

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C_4 plant drought stress

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C_3 plant drought stress

answer - OS1p or OS5p with the Burke Assay, LCi-SD, LCpro-SD, *iFL*/LCpro-SD

Nitrogen stress for: Rice, wheat, corn, sugar cane, soybean, hay, potatoes, barley, mustard, peas, cassava, and other food crops. *It is possible to measure plants from germination through harvest.*

answer - CCM-200*plus*, CCM-300

Nitrogen stress *for very small and difficult to measure plants*: Conifers, Turf grasses, Arabidopsis, germinating plants, CAM plants including cactus.

answer - CCM-300 - Chlorophyll content

Other nutrient plant stress:

Calcium, manganese & phosphorus - All fluorometers

Boron, chlorine, cobalt, copper, nickel, potassium, zinc - OS1p or OS5p

Sulfur, iron, molybdenum, - CCM-200*plus,* Lci-SD, LCpro-SD*, iFL*/LCpro-SD

Heat stress in C_3 & C_4 plants

PAR clip with OS1p or OS5p, *Lci-SD, LCpro-SD, iFL*/LCpro-SD

Cold stress in C_3 & C_4 plants

All fluorometers and gas exchange systems

Best- Y(II) from the OS1p & OS5p along with *J*/A from *iFL*/LCpro-SD

Pesticide, herbicide & chemical stress:

Various instruments are used depending on chemical type. Go to www.optisci.com for the **Desk Top Plant Stress Guide v.2.3** for details.

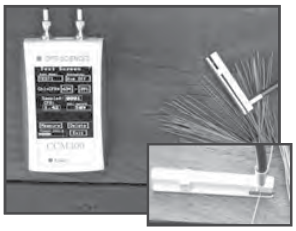
Light stress -

OS5p with PAR Clip - q_E,q_T,q_I *IFL*/LCpro-SD

OS1p & PAR clip

OS5p & PAR clip

Burke Assay for C_3 plant drought stress



CCM-300 direct readout in chlorophyll content

CCM-200*plus* CCI for chlorophyll content

Os30p+ for F_V/F_M, F_V/F_O, Advanced OJIP, & PI_{ABS}

LCi-SD- ambient IRGA system

iFL / LCpro-SD - Integrated Fluorometer & Gas Exchange With all fluorescence and IRGA parameters

Welcome to the *ASPB News* "Luminaries" column. Student and postdoc members are invited to submit their ideas for a 500- to 750-word interview they might like to conduct with a prominent scientist. Contact Membership Committee Chair David Horvath at david.horvath@ars.usda.gov, who will help you develop some questions to frame your story. If we publish your interview, you will receive a $50 Amazon gift card.

Imre Somssich

Max Planck Institute of Plant Breeding Research, Cologne, Germany

BY PRATEEK TRIPATHI, ASPB Student Ambassador, Postdoc Fellow, University of Southern California

What got you interested in plant biology in general, and what influences directed you to your specific area of research?

Actually, I already had a strong interest in transcriptional regulation before I got interested in plant biology. I did my PhD (1979–1983) in the Department of Human Genetics and was interested in identifying differences in DNA replication that were causally linked to T-cell leukemia in mice. Our hypothesis was that shifts in the timing of DNA replication during the S-phase would influence the expression of gene loci within such regions. With the advent of molecular biology, I was searching for new challenges to apply such techniques to elucidate the molecular mechanisms underlying the control of transcription. This area was not well studied in plants in the early 1980s, so I applied to the Max Planck Institute for Plant Breeding in Cologne, Germany, to pursue this avenue of research.

Who influenced your scientific thinking early in your career, and how?

There was no one specific person who directly had a great influence. I read a lot of papers on DNA replication and transcriptional control from renowned scientists (David Baltimore, Max Birnstiel, Michael R. Green, Mark Groudine, Arthur Kornberg, Mark Ptashne, Robert G. Roeder, Kevin Struhl, and Robert Tjian), and that certainly influenced my way of thinking. Naturally, my mentors were also important in helping me to learn how to practically address specific scientific questions in the laboratory.

What do you think are good career moves for young scientists, and why?

I believe the most important things for a young scientist are

1. to decide, within a reasonable time period, whether to pursue an academic or industrial career;
2. to be honest and self-critical and to ask, "Am I truly driven by science, and am I really good at it?";
3. to ask, "What scientific question(s) do I wish to address in the future?"; and
4. to determine the best research laboratories where you can learn what you will need for your future career.

Often, young researchers continue what they have done as a PhD student or early postdoc because this is convenient and they feel relatively knowledgeable about the research area. However, it certainly is worth thinking more deeply about moving to other research topics or even changing fields. This may require getting acquainted with new biological systems and methodologies, but it may turn out that this is where your vocation truly is.

Imre Somssich

If you were able to repeat your years as a graduate student or early years as a postgraduate student, would you do anything differently, and why?

Although I enjoyed my PhD research, I should have thought more about the project before I took it on. I only realized quite late that the financial situation of the laboratory did not allow one to dig deeper into certain biological questions because the required methodologies were too expensive. Moreover, the scope of the project was rather limited.

What journals do you regularly follow, and why?

I have always tried to follow the content of as many journals as possible that contained research relevant to my studies. This has become increasing difficult over the years due to the continuous increase in the number of journals. Certainly I always look at the high-impact general journals, such as *Cell, Nature,* and *Science,* as well as the plant-specific ones, but I also continuously monitor journals that publish new methods and technologies. Particularly the latter ones can sometimes give me new ideas about how to approach particular questions in the lab.

What scientific discoveries over the past couple of years have influenced your research directions, and why/how?

The development of next-generation sequencing in combination

continued on page 16

LUMINARIES
continued from page 15

with computational biology has revolutionized the way in which we can map protein–DNA interactions in vivo. By utilizing this technology with various methods such as chromatin immunoprecipitation, genomic footprinting, and DNase I hypersensitive site analysis, chromatin transitions and the occupancy of transcriptional activators and repressors to specific DNA sequences on genomic DNA can now be monitored on a global scale.

What do you think is the next big thing in plant biology, and why?

Unraveling the various complex and interwoven signaling pathways and how these signals are integrated within a cell will be a future challenge that should become feasible. Moreover, intense comparative genomics will uncover unexpected functional features related to plant genome evolution.

What do you think will be the next big thing in your specific area of study, and why?

I can envision that we will soon be able to identify the various components that build up distinctive transcriptional protein complexes and that we will be able to directly monitor in vivo the dynamic assembly, exchange, and disassembly of large transcriptional complexes at distinct regulatory DNA sites that will reveal how temporal expression of specific genes is modulated.

As an employer, what are the five key qualities you look for in a potential team member?

1. A clear definition of his or her research interests and the ability to formulate testable hypotheses.
2. The ability to stay focused on a research topic and to clearly outline why certain avenues of investigation will or will not be pursued.
3. An eager willingness to learn new methods and technologies to further advance the research.
4. A commitment to keeping up with the current literature despite the lab work.
5. Complete honesty, and the ability to openly collaborate within the team and to help and motivate others.

What advice would you give to a student interested in plant biology today?

Research in plant biology is still not as crowded as in other fields, and there are highly interesting scientific questions that need to be addressed. Finding ingenious solutions to certain problems may not only be of academic importance, but also could have direct implications in improving plant traits in the field, which can be equally satisfying.

What experience or training do you think it is most important to have?

In the beginning, it is important to invest time into gaining in-depth knowledge of both the biological processes you are investigating and the state-of-the-art technologies used to extract the maximum information from experiments. Don't be superficial. Read and think deeply about your research area and get to know the details behind the various methods you are employing. Finally, learn to organize your experiments and to be extremely critical in interpreting the results of your research. Don't be satisfied with ambiguous results.

What is the single most important factor for a successful career in plant biology?

In my opinion, there is no single such factor. Having identified, outlined, and initiated a novel research project with long-term perspectives is the ideal starting point for such a career, but many other factors will also contribute. These include your own personality and the ability to communicate the importance of your research plan to others, lab space and financing to demonstrate the feasibility of your approach, sufficient time to fully develop the project, and qualified colleagues to help exploit the various promising avenues that such a research program will surely open.

What advice would you give to educators to encourage young people to explore science and plant biology?

Teachers/educators can have a profound positive, but also negative, influence on how young people perceive science. Thus, it is important for such professionals to convey the excitement and enthusiasm intrinsic to science and not merely to present dry facts and information. I know that many teachers are already giving courses in such a creative way despite the fact that this requires intense preparation. Still, we need to intensify this form of science education. I am absolutely convinced that we can get more young people to think about going into science if we can give them a feeling of how important and rewarding such a career can be. Actually, it was my high school teacher's enthusiastic way of giving biology classes that got me excited about biology.

How do you see the future of basic plant science as a part of policy-making body?

Research in basic plant science needs to be given similar priority as that of human health and medical research. Policy makers must become aware of the fact that the increasing world population and global climate changes will have a profound effect on crop yields and all aspects of plant growth and development and that this will drastically influence the quality of life on our planet. Such effects are already becoming increasingly evident in some parts of the world. If we are to at least partly counteract such negative effects, we need to gain a deeper molecular understanding of how plants function. This can be achieved only by strongly supporting basic plant research. ■

Policy Update

BY KAITLIN CHELL, Lewis-Burke Associates, LLC

Since President Obama released his budget request for fiscal year (FY) 2014 this spring, Congress has been working toward approving spending bills for FY2014. At the time of writing, the House and Senate have made progress on the bills that fund NSF, USDA, and the DOE, whereas only the Senate has acted on the bill that funds NIH.

For NSF, the House bill would provide $6.995 billion, which is 1.6% above FY2013 (including sequestration). In contrast, the Senate bill would provide NSF with $7.426 billion, which is 7.9% above FY2013.

The House has passed the bill that funds DOE, proposing funding for the Office of Science at $4.653 billion, which is 4.6% below the FY2013 level. Biological and Environmental Research (BER) would see a significant decrease as the House would fund it at $494.106 million, which is 19.0% below the FY2013 level. However, the bill notes its support for plant biology—the focus of these BER decreases is climate change research. Conversely, the Senate proposes funding the Office of Science at $5.152 billion, which is an increase of 5.7% above FY2013. BER would be funded at the President's FY2014 requested level of $625.347 million.

For USDA, the House bill would provide the Agricultural Research Service (ARS) with $1.074 billion, which is the same as the FY2013 enacted level. The Senate would fund ARS at $1.278 billion, which is an increase of 6.2% above the FY2013 level before sequestration. For the National Institute of Food and Agriculture (NIFA), the House bill would provide $1.208 billion, which is an increase of less than 1% above the FY2013 level. The Senate would fund NIFA at $1.277 billion, which is an increase of 6.2% above the FY2013 level. The House would fund the Agriculture and Food Research Initiative (AFRI) at $290.7 million, which is nearly level with FY2013; the Senate would fund AFRI at $316.4 million, which is an increase of 8.9% above the FY2013 level.

Finally, the Senate proposes funding NIH at $30.955 billion, which is an increase of 1.0% above the FY2013 level.

Farm Bill Progresses in Both Senate and House

After the Senate passed its version of the Farm Bill in early June, the House struggled to pass its version. The House's first attempt to do so ended with a defeat on the House floor when a bipartisan version of the bill failed in late June. The biggest hurdle were objections from both sides of the aisle related to the nutrition section (mainly the Supplemental Nutrition Assistance Program; formerly called "food stamps") of the bill—many Democrats said the bill cut SNAP too much while Republicans said it didn't cut SNAP enough. The House Farm Bill only passed in mid-July after House Republicans stripped the nutrition section from the bill, leaving a significant difference in the House and Senate bills that must be reconciled in conference to negotiate a final bill.

The bills would authorize most research programs through FY2018, including ARS and NIFA. Both bills would extend the authorization for AFRI at the current $700 million annual level (however, AFRI is currently funded at about $275 million in FY2013). The House bill also would remove USDA's authority to fund non-competitive grants.

Both the Senate and House versions of the Farm Bill would continue the current formula grant programs for land-grant institutions through FY2018. Formula programs authorized under the Hatch Act and Smith-Lever Act would have open-ended authorizations for appropriations at "such sums as may be necessary." Both bills would extend the authorizations for the Extension Service and for Hispanic-Serving Institutions through FY2018.

Neither the Senate nor House bills address the indirect cost rate as the 2008 Farm Bill did. Thus, under the proposed bills, the indirect cost rate would remain at the current level of 30% as established in the Consolidated and Further Continuing Appropriations Act of 2013. The 2008 Farm Bill increased the indirect cost rate from 19% to 22%.

A controversial provision in the research section of the House bill is a requirement for USDA to institute a 1:1 match for new research grants (only land-grant institutions and USDA research entities would be exempt). Furthermore, the Obama Administration has taken issue with a House provision barring USDA from obligating appropriated funding for extramural competitive research grants unless USDA submits a comprehensive spending plan to Congress for its approval.

Both the House and Senate bills reinstate the authorization

continued on page 18

It's official! ASPB's Committee on Public Affairs has changed its name to the Committee on Science Policy.

Peggy G. Lemaux Presents ASPB's Perspective on AFRI at the National Academies

KATHY MUNKVOLD
Former ASPB Associate Director of Public Affairs

On June 3, ASPB President Peggy G. Lemaux presented the Society's view of the USDA Agricultural and Food Research Initiative (AFRI) competitive grants program at the National Academies in Washington, D.C. The National Research Council, Board on Agriculture and Natural Resources has undertaken a study reviewing the program and solicited comments from several scientific societies, including ASPB, as stakeholders of the program.

Peggy began her comments to the committee by acknowledging the importance of the program and ASPB's appreciation for a truly competitive grants program at USDA. Her comments focused on three major themes:

1. The fiscal constraints that limit AFRI's ability to adequately fund truly innovative, competitive research that can address emerging challenges;
2. The overly prescriptive nature of AFRI's funding mechanisms; and
3. Support for increased funding for small-group and single-investigator grants.

Following Peggy's presentation, she discussed with the committee the value of Coordinated Agricultural Project grants, as she has been involved in five such AFRI grants. She spoke from experience of achievements made through these large collaborative grants on specified topics and of opportunities for improvement. Overall, the committee was engaged and interested in the perspective of the Society. ■

POLICY UPDATE
continued from page 17

of mandatory funding for the Specialty Crop Research Initiative ($416 million in mandatory funding from FY2014-2023), the Organic Research and Extension Initiative ($80 million in mandatory funding over five years), and the Beginning Farmer and Rancher Program. These programs expired with other Farm Bill authorities last year when Congress failed to extend existing law.

Finally, the Senate bill creates a Foundation for Food and Agriculture Research (FFAR), as it did last year, and includes $200 million over five years in mandatory funding to capitalize FFAR for research, which must have a 1:1 match from non-federal funding. FFAR would promote public-private partnerships to leverage additional funding for agricultural research. The House bill does not include FFAR in its version of the bill, nor did it do so last year.

Merit Review

Recently, the House Committee on Science, Space, and Technology introduced the High Quality Research Act, which would amend the merit review process at NSF to require funded research be in the national interest and advance "national health, prosperity, or welfare, and secure the national defense" as well as "solve problems that are of utmost importance to society at large" and not be "duplicative of other research projects." The bill also would initiate a process by which other federal sciences agencies must determine if they should adopt the same criteria.

ASPB, along with other scientific societies and universities, has been active in advocating for NSF's merit review process for awarding research grants. In addition to advocating on Capitol Hill, ASPB signed on to a letter in support of NSF and its merit review process. The letter states NSF's merit review process "has a proven track record in supporting outstanding, fundamental research across all disciplines of science and engineering" and this process is "a model for identifying research projects that are worthy of taxpayer-funded support." Furthermore, "if the criterion for awarding grants shifts away from scientific merit as the primary goal, the quality of research proposals will suffer." A copy of the letter is available at http://www.cnsfweb.org/Letter.MeritReview.Smith.pdf. ■

This column provides just a small sample of the content from ASPB public affairs, including material provided by ASPB's government relations consultants, Lewis-Burke Associates, LLC. Also be sure to check out our blogs: Plant Biology Policy, Funding Opportunities, and Plants in the News. Please visit http://www.aspb.org/publicaffairs for the most up-to-date news.

Interview with Sonny Ramaswamy

Director of the National Institute of Food and Agriculture

BY COLLEEN DOHERTY
ASPB Committee on Science Policy Early Career Representative, University of California, San Diego

What are the biggest scientific questions for agricultural research right now?

I like to think of agricultural sciences as breadth in food, agriculture, natural resources, and human sciences, and the key questions are not just in the biophysical sciences, but also in the social sciences. The challenges we face today are related to people not understanding where their food comes from and ensuring people make that connection in the context of global challenges, including climate change and diminishing resources.

From a plant perspective, the first area is to look at C_3 versus C_4 photosynthesis. For example, if we could make C_4 photosynthetic rice, we could cut the needed acreage by half and could also cut the amount of water use in rice paddies. This would also cut down on the challenges from the use of fertilizer and production of methane, thereby reducing greenhouse gases.

The second area to examine from a plant perspective is the possibility for increasing water productivity per acre. Using the tools that are available to us today, how can we enhance drought tolerance and water-conservation capabilities of various crops?

The third area, in my opinion, is nitrogen fixation. Imagine how we could significantly reduce the amount of nitrogen fertilizer we are using, which is contributing in part to the challenges of hypoxia and dead zones in oceans and lakes, and reduce the contribution from nitrogenous fertilizers to greenhouse gas emissions.

Finally, the fourth area where we need significant transformative efforts is in the area of food loss and food waste. In developing countries, almost half the food is lost before reaching the dinner table and in the developed world, almost half of the food is lost after the dinner table. In 30 to 40 years we'll need to feed nine billion people, and one way to do that is to imagine ways to mitigate that loss and waste.

You hinted at the beginning about incorporating more social science. Do you see a role for "classically trained biologists"?

Absolutely. I don't think the "omics" revolution that is still unfolding will allow us to figure out how to put food on the table in the context of our changing environment unless we have top-notch and outstanding physiological capabilities. And this is where traditional biology must integrate with field work and deploying new technologies. When I took plant breeding and genetics almost 35 years ago, we talked about G×E (interactions between genes and the environment). Now, we talk about G×E×M (M is for management). The average yield of farmers growing corn in the Midwest is 150 to 180 bushels per acre, but top farmers can get 350 bushels of corn per acre. That says we are far from understanding what happens to that plant out there. Genetics in and of itself is not sufficient if you don't have good management.

Sonny Ramaswamy

Do you feel that there has been progress made toward raising awareness of the importance of agricultural research? What more can be done?

I don't think the awareness level is where it could be. President Obama has made announcements on the BRAIN Initiative and the Human Genome Project and when the public sees that on the news, they understand it's important for the government to fund those kinds of projects. But scientists do not connect their discoveries with the funding source that enabled those discoveries. Agricultural scientists need to be more explicit about how funding from NIFA [National Institute of Food and Agriculture] allowed them to do research that helps put food on the table.

How is NIFA working with other entities within USDA and with other federal science agencies?

We already have been working with other agencies such as NSF, NIH, the Department of Defense, the Department of Energy, and the U.S. Agency for International Development. I've had conversations with my counterparts in these agencies and we want to strengthen and grow these into broad and deep connections between the agencies.

In areas where we have co-invested in research, whether it's genomics, bioenergy, climate change, or animal diseases, we are able to leverage our funds 5:1 because the other agencies are able to fund five times as much money as we can in those areas. In fact, NIFA is also doing some multi-agency solicitations, not just bi-lateral ones, which I think will offer us some fantastic possibilities.

continued on page 20

RAMASWAMY
continued from page 19

The President's Council of Advisors on Science and Technology (PCAST) recently released a report on the agricultural research enterprise. Is NIFA planning any new activities related to implementing the report's recommendations?

I encourage people to read not only the agriculture research report (http://tinyurl.com/bmlwkg9), but also the report on America's research enterprise (http://tinyurl.com/at3x7ko). The second report calls on America to invest 3% of its GDP on the research and development enterprise (currently the U.S. invests 2.4% to 2.6% in endeavors other than the food and agricultural disciplines, where we invest about 1.6% of GDP).

In regard to the report on the agricultural research enterprise, NIFA, in the coming weeks, months, and years, will evaluate its direction based on this report. In the report, PCAST calls for: a significant increase in funding for the Agriculture and Food Research Initiative; increased funding at NSF to focus on the food and agricultural enterprise; funding for promoting the pipeline of young people in agricultural sciences; and for creating regional centers and institutes. NIFA is putting together an action plan, and that's going to take a multi-pronged approach—working within the construct of the budgeting process; in collaboration with NSF and other federal agencies; and in concert with the community of academic, public-sector, private-sector, and NGOs [non-governmental organizations].

Do you have any advice for young scientists considering careers in plant biology?

If you are a young scientist studying to be a plant molecular biologist, don't just take classes in plant molecular biology or undertake research on some small part of the genetic sequence of one organism. Instead, really broaden your horizons. Many students in graduate school in the U.S. study at large universities that offer courses in communications, rhetoric, philosophy, and the social sciences. I think it is critical to also have non-cognitive skills such as critical thinking, leadership, communication, being able to work in a team environment, etc. Also, it's important to spend time in different labs in order to develop broad thinking skills alongside technical skills.

Today, most jobs are not in academia. I've talked with people in the private sector, and they are looking for scientists with the ability to go from lab to field and with "people skills." You have to know how to communicate, not just in proposals and papers, but to the public as well. Give a talk in your community about your research (and remember to mention where the funding comes from) to a local school, service club, or place of worship.

For young scientists starting their careers, what is one area, approach, or resource that you think should be strengthened in order to address the biggest problems in agricultural research?

Transformative approaches in thinking will come only if young scientists think about broader impacts. Be sure you are seeking out collaborations that address the broader context. Focus on grand challenges, not just immediate needs and develop a global way of thinking and a global perspective.

Don't think only about opportunities in academia, as the corporate sector can address societal challenges, too. Consider a short stint at a corporate or government lab. Additionally, academic departments need to promote a second discipline for students, such as an internship in a non-academic setting or establishing connections with the corporate sector. Training programs need to step up and think of young people's success. Multi-disciplinary research should not only be about research priorities, but should also be about helping young scientists. I also think we should reconsider the way universities evaluate for tenure, since current problems aren't dealt with by a single scientist. A researcher might be just one of multiple authors but still provide a major contribution.

What do you think will be the biggest change in plant biology and agricultural research?

Translating the "omics" revolution. We have invested quite a bit as a nation in the various areas that encompass "omics." But now we need to focus on taking this "big data" and translating it into physiology and putting it in the dirt, as it were.

What is an area where you think agricultural research in the U.S. really is exemplary?

We are outstanding in "omics" and other such fundamental sciences, but my favorite example is that we are really good in taking knowledge and translating it into solutions. Our Extension system in the U.S. is effective at applying lab knowledge to benefit end users.

What is the best thing about your position?

I enjoy the excitement of the possibility of facilitating great science and great education. I enjoy working with young people and end users, and I am enthusiastic about building up our education portfolio.

What is the most challenging part of your position?

By nature, I am very impatient. I want to enable people to do great things. But in the federal government things have their own pace, which is different from the fast-paced world of science. Adjusting to that pace is a challenge.

If you could change one thing about the U.S. funding system, what would it be?

I would like to see more recognition of agricultural sciences as a science that contributes to fundamental knowledge and then applies it.

What would be the most impactful action that young scientists could take to improve the future of funding for agricultural and plant biology research?

Be engaged and tell a story, but not just among your peers. Write a letter to the editor of your hometown newspaper. Remind your community of the work that you do. And when you do talk to the public, remind them where your funding comes from and that federal funding enables you to make the discoveries necessary to address societal challenges, including feeding the world. ■

This interview has been edited for clarity and length.

Committee on Science Policy Advocates for ASPB Priorities in Washington

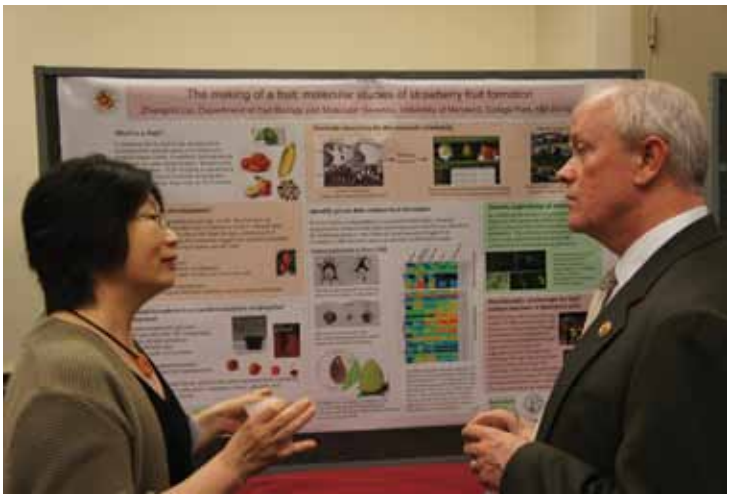
KATHY MUNKVOLD
Former ASPB Associate Director of Public Affairs

The Committee on Science Policy (formerly ASPB's Committee on Public Affairs, see page 17) gathered once again in Washington, D.C., for its annual spring meeting. Over two days in early April, the committee deliberated over current policy issues facing plant scientists, set ASPB's policy agenda for the upcoming year, and helped educate policy makers on Capitol Hill on the importance of plant science research.

The first day began with an update from Lewis-Burke Associates, ASPB's government relations consultants and hosts

continued on page 22

Members of the Committee on Science Policy present at the 2013 spring meeting, from left to right: David Stern, Maureen McCann, Sally Mackenzie, Beth Hood, Pat Schnable, Colleen Doherty, and Julian Schroeder. Other members of the committee include Steve Huber, Norman Lewis, and Dean DellaPenna.



ASPB member Zhongchi Liu discusses her research on strawberry fruit development with Congressman Jerry McNerney.

Zhongchi Liu Presents NSF-Funded Research on Capitol Hill

KATHY MUNKVOLD
Former ASPB Associate Director of Public Affairs

On May 7, researchers from across the nation gathered on Capitol Hill to share their NSF-funded research with policy makers at the 19th Annual Coalition for National Science Funding (CNSF) Exhibition & Reception. The Exhibition drew more than 250 attendees, including 10 members of Congress—Representatives

continued on page 22

ASPB PRIORITIES
continued from page 21

for the committee meeting, on current policy affecting scientific research. Discussions of pervasive issues, such as sequestration and the current fiscal environment, contrasted with those of the administration's continued support for scientific research. The committee then met with representatives from federal funding agencies and the National Academies to discuss the interests of ASPB's members and to learn about new projects and opportunities. These discussions provided a venue for a prepublication peek at the report from the Plant Science Research Summit (https://plantsummit.wordpress.com/), an effort that originated with ASPB's Committee on Public Affairs and that is intended to interface with the government. Speakers included

- **USDA**
  Sonny Ramaswamy, Director, National Institute of Food and Agriculture
- **NSF**
  Jane Silverthorne, Division Director for Integrative Organismal Systems
- **National Academies**
  Robin Schoen, Director, Board on Agriculture and Natural Resources
- **DOE**
  David Lee, ARPA-E Support Contractor (Booz Allen Hamilton)

On the second day, the committee dispersed on Capitol Hill for visits with their delegations and various relevant congressional committees (see box). The visits led to a dialogue on several policy issues for which ASPB was invited to weigh in with scientific insight, including the then-pending national GMO labeling bill and language proposing that some USDA funding be reserved for "classical plant breeding." Overall, committee members delivered to Congress a strong message of the importance of increased support for plant science research funding and for scientific research in general. ■

Congressional Office Meetings

Senator Barbara Boxer (D-CA)

Senator Dan Coats (R-IN)

Senator Joe Donnelly (D-IN)

Senator Dianne Feinstein (D-CA)

Senator Deb Fischer (R-NE)

Senator Kirsten Gillibrand (D-NY)

Senator Charles Grassley (R-IA)

Senator Tom Harkin (D-IA)

Senator Mike Johanns (R-NE)

Representative Bruce Braley (D-IA)

Representative Larry Buschon (R-IN)

Representative Chris Collins (R-NY)

Representative Jim Costa (R-CA)

Representative Jeff Denham (R-CA)

Representative Chris Gibson (R-NY)

Representative Richard Hanna (R-NY)

Representative Darrell Issa (R-CA)

Representative Steve King (R-IA)

Representative Scott Peters (D-CA)

Representative Tom Reed (R-NY)

Representative Adrian Smith (R-NE)

Representative David Valado (R-CA)

Congressional Committee Meetings

Senate Agriculture, Nutrition, and Forestry

Senate Appropriations, Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Subcommittee

House Agriculture

House Science, Space, and Technology

ZHONGCHI LIU
continued from page 21

Howard Coble (R-NC), Chaka Fattah (D-PA), Bill Foster (D-IL), Rush Holt (D-NJ), Eddie Bernice Johnson (D-TX), Walter Jones (R-NC), Sheila Jackson Lee (D-TX), Jerry McNerney (D-CA), David Price (R-GA), and Paul Tonko (D-NY).

Zhongchi Liu, a professor in the Department of Cell Biology and Molecular Genetics at the University of Maryland, represented ASPB and presented her research on strawberry fruit development. Zhongchi is using genomic techniques to dissect the molecular pathways leading to fruit formation in strawberries. She spoke with Congressman Jerry McNerney (D-CA) about the downstream applications of her research, including translating her findings to other Rosaceous crops and the hope of one day producing seedless strawberries. Representative McNerney has a PhD in mathematics and previously had a career in the wind energy sector. He mentioned his strong support for scientific research and the need to share its success stories with Congress and the public. ■

ASPB at NSTA 2013 in San Antonio

Next Generation Science: Learning, Literacy, and Living

BY KATIE ENGEN
ASPB Education Coordinator

ASPB presented a spectrum of outreach materials during the National Science Teachers Association annual meeting in San Antonio (April 11–14, 2013; http://www.nsta.org/conferences/2013san/). The conference as a whole focused on the Next Generation Science Standards (NGSS) released April 9 (see page 25 of this issue). ASPB's team of volunteers shared information and insight to help the teachers at NSTA incorporate plant biology and plants as model systems as part of their transition to NGSS.

Talking About ASPB Resources

Booth visitors had a lot to say about ASPB's activity and coloring book for young scientists, *My Life as a Plant*:

- This is like a short course in plant biology!
- Plants "disappear" from upper-elementary curriculum, so this is a good foundation. And it can be used to infuse upper-elementary curriculum with an overlooked organism—plants.
- Cool! I can pick and choose the pages that best fit my lesson needs.
- Can I get it in Spanish? (See page 32 for information on all the upcoming translations.)
- How do I get a complete classroom set? (See page 32 for options.)

Booth visitors also commented enthusiastically about the Society's 12 bookmarks for the 12 Principles of Plant Biology (http://www.aspb.org/12principles):

- These bookmarks work SO well with some of these other [ASPB] handouts and the book.
- Bookmark #4—Sex, Bugs, & Pollen's Role: Sex? That's a hot topic with my kids. [grades 8–9]
- Bookmark #5—Plants Respire Too: Good one! My kids never think that plants respire, only animals. [grades 5–9]
- Bookmark #12—Green Ecology: Kids will love it. It will help them focus on plants growing in different environments. [grades K–2]

Sweet Math

Veteran ASPB booth volunteer and NSTA workshop presenter Suzanne Cunningham (Purdue University) shared a demonstration-based activity called "Sweet Math" that appealed to teachers of fifth through ninth grade. Suzanne reported:

> You would have shaken your head at the questionable looks and "A-ha" moments when I asked why a 24-ounce bottle contained 31 grams of sugar and its counterpart in a can stated 46 grams. The equivalent amount of sugar in packets strung together showed just how many grams of this we're talking about. They were a giant hit—quite visual. Definitely lots of teachable moments!

Enzyme Models with LEGO®

Suzanne also featured some LEGO® enzyme models she created (and presented as part of a workshop) to showcase plants, photosynthesis, and those products made from starch or cellulose such as the foods we eat or houses we build. She shared one of the most popular analogies she pairs with the models:

> To explain enzymes, I tell kids to imagine they were building from LEGO® bricks a spaceship or mini-city in the playroom while their parents were getting dinner ready. Then they finished the project and ran to the kitchen to get a parent to come see. By the time they got mom or dad back to the playroom, their little sibling had "digested" their LEGO® creation. They acted as enzymes while building; their little brother acted as an enzyme when he broke their creation apart.

Genetics, Evolution, Genomics, and Fast Plants sc

Scott Woody (University of Wisconsin–Madison), ASPB Education Committee member and NSTA booth organizer, presented a suite of resources that enables an integrated approach to education in genetics, evolution, and genomic sciences.

Scott was often found explaining to endlessly cycling small crowds of booth visitors something like this:

> As first published some 60 years ago in the *American Biology Teacher* [volume 35, pages 125–129], "Nothing in biology makes sense

continued on page 24

NSTA 2013
continued from page 23

> except in light of evolution." Furthermore, the science and language of genetics are keys to understanding evolution, and evolution is the key to understanding biology. In other words, a clear understanding of terms used in genetics education is essential for effective student mastery of biology. That's why I offer resources and information that help upper-school students and undergraduates master vocabulary while digging into practical, inquiry-oriented experiences.

The work behind Scott's resources stems from his team based in the laboratory of Rick Amasino (University of Wisconsin–Madison Department of Biochemistry). Over several years, the lab group bred a self-compatible and extensively inbred analog of the Wisconsin Fast Plants (WFP) variety of rapid-cycling *Brassica rapa* that they dubbed "Fast Plants sc" (FPsc). The fundamental difference between WFP and FPsc varieties is that FPsc is self-compatible (sc; capable of propagation through self-pollination) and highly inbred, which facilitates the generation of mutant derivatives and subsequent analysis by students. The lab group also developed a complementary collection of molecular tools that helps teachers and students to bridge the gap between Mendelian and molecular genetics.

Scott also shared these highlights with eager teachers at NSTA:

> We have selected several well-behaved FPsc mutants from our collection for use in schools. Our primary "target demographic" is advanced high school (e.g., AP biology) and undergraduate genetics classrooms. AP bio is especially suitable given the newly revised implementation guidelines for curriculum and laboratory exercises by the College Board in 2011, which promote a "big ideas" approach to biology education. Among the guiding themes of the new AP bio curriculum are the role of evolution as the unifying framework for all of biology and an emphasis on fostering in students a more genuine appreciation of the nature of scientific practice, and we are incorporating those themes into our educational resources.

The FPsc resources can support the crosscutting concepts and STEM practices outlined in NGSS, which also aims to enhance scientific practice. Scott's three current FPsc modules are

- Module 1: Use of the albino mutant allele to explore dominance relationships between wt and mutant alleles, Mendel's law of segregation, and genetic change over time (evolution).
- Module 2: An experiment in artificial selection that makes clear the necessity of standing genetic variation to enable a heritable response to selective pressure.
- Module 3: Use of the dominant abnormal leaf (ale) mutant to explore inheritance and genetic patterning mechanisms.

See http://www.fpsc.wisc.edu/ for recent resource updates from Scott's lab group.

THANK YOU, NSTA–San Antonio VOLUNTEERS!

It's a Texas-sized job to staff an ASPB outreach booth! A tip of the brim goes to these volunteers who ponied up a lot of time, expertise, and "giddy-up" to make this booth a success, with leadership from Scott Woody (University of Wisconsin–Madison): Mark Brodl (Trinity College), Suzanne Cunningham (Purdue University), Jurgen Engelbreth (University of Texas at San Antonio), Valerie Sponsel (University of Texas at San Antonio), Garry Sunter (University of Texas at San Antonio), and Brian Stoveken (University of Texas Health Science Center at San Antonio).

Thanks, FPsc!

Dick Willis, a high school science teacher in Jefferson County, Missouri, wrote to Scott after the two met in the ASPB booth at NSTA:

> First, let me reiterate my thanks to you for your generous donation of seeds for this year's project. I wanted to also say that I grew your plants next to the regular fast plants and was amazed at the difference in the two plants. I really liked how robust the FPsc plants grew and the amount of seeds they produced is awesome and easily recognized by my sometimes less observant high school freshmen. I plan to continue using this particular plant also because of the genetic varieties that are, again, very different (obvious) from each other and easily quantifiable for my students. Thank you.

High School Teachers Access ASPB's Online Journals

NSTA booth visitors from public libraries and public or private high schools in the United States considered free online access to *The Plant Cell* and *Plant Physiology*. The ASPB volunteers offered to sponsor a nomination for such access to any teachers who were especially engaged at the booth. The goal is that these teacher–ASPB volunteer collaborators will use the journals to further general scientific understanding; infuse science curriculum with timely, vetted information; and inspire student research.

About 20 teachers signed up to initiate the easy application process. Once the process is complete, they will receive online journal access and these resources to enhance use of the journals: How to Read a Scientific Paper (geared for use in high schools); Case Study to accompany How to Read a Scientific Paper, and Tips on Outreach in High School (http://journalaccess.aspb.org). These teachers can follow up directly with ASPB booth volunteers as well. ■

Released April 9, 2013

New Standards for a New Generation

BY KATIE ENGEN
ASPB Education Coordinator

The new Next Generation Science Standards (NGSS; http://www.nextgenscience.org/) integrate three dimensions of learning—science and engineering practices, disciplinary core ideas, and crosscutting concepts. This integrated format aims to catalyze deep, inquiry-oriented learning experiences for K–12 students. The NGSS are based on the National Research Council's (NCR) *Framework for K–12 Science Education (Framework;* http://www.nap.edu/catalog.php?record_id=13165). A complete press release from the NGSS team can be found at http://www.nextgenscience.org/final-next-generation-science-standards-released.

Twenty-six states contributed to the development of Next Generation Science Standards through a broad collaborative process. ASPB participated in many early meetings, and several Society members sit in key development positions for this initiative. Achieve (http://www.achieve.org) is the nonpartisan entity selected by the NRC to transform the *Framework* into the NGSS. In May, Achieve senior adviser Jennifer Childress asked ASPB for a letter of support for the goal of getting NGSS adopted (not just adapted) by all states. That letter includes this statement:

> ASPB has responded promptly and favorably with regard to the *Framework* and NGSS, as well as to the closely related Vision & Change in Undergraduate Biology Education efforts. The Society considers its 12 Principles of Plant Biology (http://www.aspb.org/12principles) and Core Concepts in Plant Biology (http://www.aspb.org/PlantBioCoreConcepts; developed together with the Botanical Society of America) as two discipline-specific resources that align with key elements of NGSS.

STEM Practices

The NGSS offers an organized approach to using eight practices of science and engineering identified by the *Framework*. The essential practices woven into the NGSS for all students to learn are

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information.

Crosscutting Concepts

A successfully educated student has developed a deep understanding of the disciplinary core ideas and a coherent, scientifically reasonable view of the world. There are seven crosscutting concepts that bridge disciplinary boundaries and unite core ideas throughout the fields of science and engineering identified by the *Framework* and applied to the NGSS:

1. *Patterns.* Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.
2. *Cause and effect: Mechanism and explanation.* Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.
3. *Scale, proportion, and quantity.* In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.
4. *Systems and system models.* Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.
5. *Energy and matter: Flows, cycles, and conservation.* Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.
6. *Structure and function.* The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.
7. *Stability and change.* For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.

Disciplinary Core Ideas

NGSS does not offer a curriculum or tightly proscribed grade-level activities. Instead, it offers core ideas for each STEM discipline that support progressive (and age-related) mastery. This excerpt from the Life Science core shows many opportunities for integrating plant biology and using plants as model systems for anyone aligning instructional resources with NGSS.

continued on page 28

Plant Biology 2014

JULY 12–16 PORTLAND, OREGON

OREGON2014.ASPB.ORG

American Society of Plant Biologists

FEATURING

Plant Physiology®

THE PLANT CELL

THE CANADIAN SOCIETY OF PLANT PHYSIOLOGISTS

LA SOCIÉTÉ CANADIENNE DE PHYSIOLOGIE VÉGÉTALE

The World Enjoys Fascination of Plants Day 2013

What Were YOU Doing on May 18?

BY KATIE ENGEN
ASPB Education Coordinator

May 18 was the second international Fascination of Plants Day (FoPD; http://www.plantday12.eu). Hundreds of institutions and individuals from Algeria to Zambia hosted events in honor of this blossoming international movement. ASPB members and affiliates supported various activities in the United States, around the world, and online.

See all stats at http://www.plantday12.eu/press-review.htm.

The Impetus for FoPD

Initiated in 2011 under the umbrella of the European Plant Science Organisation (EPSO; http://www.epsoweb.org), FoPD serves to plant virtual and perpetually germinating seeds in the minds of people around the world about how plant science is of critical significance to the social, environmental, and economic landscape now and in the future. See the success stories from the first International Fascination of Plants Day at http://www.plantday12.eu/downloads2013/Success_EPSOglobal_FoPD2012.pdf.

FoPD 2013 Leadership

The international team led by Trine Hvoslef-Eide (EPSO world coordinator for FoPD) and Karin Metzlaff (EPSO executive director) made FoPD 2013 a grand success. They were supported by Ronald Hirt (FoPD web content management), Jan Kellman (Max Planck Institute Editorial Department), Stefan Pigur (FoPD web designer), and Astrid Sneyers (FoPD publication and policy officer). This team communicated effectively with and on behalf of a worldwide network of FoPD national coordinators who voluntarily promoted and disseminated the FoPD activity within their countries. The national coordinators from all over the world are mapped out at http://www.plantday12.eu/map.htm.

The three U.S. national coordinators for 2013 were Kathleen Archer (Department of Biology, Trinity College–Connecticut; ASPB Education Committee chair), Henry T. Nguyen (director, National Center for Soybean Biotechnology; professor at University of Missouri), and Pamela C. Ronald (Plant Pathology faculty, The Genome Center, University of California, Davis; director of Grass Genetics, Joint Bioenergy Institute).

All U.S.-based or ASPB member–run FoPD activities were actively supported or promoted by the ASPB staff and the ASPB Education Committee. U.S.-based FoPD activities included

- **ASPB Facebook and Twitter blitz,** where *"Coffee Man—Caffeinating the world one cup at a time so it can func-*

continued on page 28

Fascination of Plants Day
May 18th 2013

The FoPD 2013 Message for Citizens Everywhere

Plants are unique organisms. They can produce sugars just from sunlight, carbon dioxide, and water. This ability to directly synthesize their own sustenance has enabled plants to successfully colonize, adapt to, and diversify within almost every niche on the planet, and biologists estimate the total number of plant species to be about 250,000. These abilities make plants the primary producers of biomass, providing animals and mankind with food, feed, paper, medicine, chemicals, energy, and an enjoyable landscape.

Worldwide FoPD 2013 Impact (on May 18)

- 74,685+ unique visitors to http://www.plantday12.eu
- 1,016+ Twitter followers
- 950 plant-centered events
- 657 institutional hosts
- 55 countries signed up for FoPD: Algeria, Angola, Argentina, Australia, Austria, Belgium, Brazil, Cameroon, Canada, Chile, China, Croatia, Cyprus, Czech Republic, Denmark, El Salvador, Estonia, Finland, France, Germany, Greece, Guinea-Bissau, Guyana, Hungary, India, Ireland, Israel, Italy, Japan, Lebanon, Lithuania, Mozambique, Nepal, Netherlands, New Zealand, Nigeria, Norway, Paraguay, Philippines, Poland, Portugal, Russian Federation, Serbia, Slovakia, South Korea, Spain, Sweden, Switzerland, Tanzania, Turkey, Ukraine, United Kingdom, United States, Uruguay, and Zambia

NGSS
continued from page 25

Life Science

LS1 From Molecules to Organisms: *Structures and Processes*
- LS1A Structure and Function
- LS1B Growth and Development of Organisms
- LS1C Organization for Matter and Energy Flow in Organisms
- LS1D Information Processing

LS2 Ecosystems: *Interactions, Energy, and Dynamics*
- LS2A Interdependent Relationships in Ecosystems
- LS2B Cycles of Matter and Energy Transfer in Ecosystems
- LS2C Ecosystem Dynamics, Functioning, and Resilience
- LS2D Social Interactions and Group Behavior

LS3 Heredity: *Inheritance and Variation of Traits*
- LS3A Inheritance of Traits
- LS3B Variation of Traits

LS4 Biological Evolution: *Unity and Diversity*
- LS4A Evidence of Common Ancestry
- LS4B Natural Selection
- LS4C Adaptation
- LS4D Biodiversity and Humans ■

FoPD
continued from page 27

tion! Sustainably farming the tropics in a single bound!" was added to the pantheon of Plant Biology Super Heroes (inspired by Norman Borlaug). The blitz also honored ASPB's own Roger Hangarter for "showing the beauty and awesomeness of plants to millions" with s*L*owlife (http://www.chicagobotanic.org/slowlife/sLowlife_rental_info.pdf).

- FoPD meets the **Amgen Bicycle Race in Livermore, California.** Enjoy this well-edited, short video (http://youtu.be/1zrpF8OH-AA) of students from Livermore Valley Charter School presenting clever mash-ups of bike wheels, plants, and creative thinking.

- **DNA for Dinner in New Jersey!** Leeann Thornton (The College of New Jersey) adapted a lesson from the *DNA for Dinner* collection (http://ucbiotech.org/dnafordinner/index.html) to help first graders in Hopewell, New Jersey, learn about plant classification and the importance of understanding how plants are related.

USDA–ARS visits Farmers' Markets in Oregon.

- USDA–ARS National Clonal Germplasm Repository brought interactive exhibits featuring the Svalbard seed bank, U.S. plant repositories, and good food to **Farmers' Markets in Corvallis and Albany, Oregon.**

- 770+ participants in the **Kids Day in the Park** program got to plant a strawberry with scientists at the Noble Foundation of Ardmore, Oklahoma (http://www.noble.org/). Kids of all ages received care and feeding instructions and studied the growth process and the source of the berries that many considered their favorite fruit.

- During **Maryland Day** (April 27), the University of Maryland hosted two family-friendly, plant-related event sites. At the Herbarium/Ag Day Avenue location, kids could (1) be an herbarium specialist for a day or (2) walk and explore. The events at the Arboretum/Sports and Rec Row showed the young visitors (1) an herbarium is a museum for plants and (2) Bee Gardens for Urban Environments.

- **Carnegie Institution for Science** (http://dpb.carnegiescience.edu/) hosted approximately 40 middle school students from East Palo Alto, California, to explore the wonders of plants through imaging. Carnegie scientists helped students use SEM, fluorescence, luminescence, and other high-

EXPLORE OUR WORLD OF
FEARLESS IDEAS
MARYLAND
DAY 2013
SATURDAY, APRIL 27, 10 AM–4 PM

Plant pressing at Maryland Day.

power light microscopes to study live plants or household plant-based plant materials.

- **University of Missouri, Columbia,** hosted an active, hands-on event for visitors to explore biotechnology applied to soybean and corn.

- **ASPB Member–Run Events:** Some FoPD participants associated with ASPB did not "report in" to the Society about their successes. Good news about discussion workshops on topics like sustainability and botany did come from Santokh Singh (University of British Columbia, Vancouver) and Jitendra Khurana (University of Delhi South Campus).

More info: http://tinyurl.com/nf5gvsa

University of British Columbia Botany Department in Vancouver.

Worldwide Response to Translating *Why Study Plants?*

Many FoPD event organizers eagerly volunteered to translate the inaugural Teaching Tool in Plant Biology, *Why Study Plants?,* into their native languages. This visually engaging PowerPoint presentation is suitable for all ages. It also has accompanying upper-level teaching resources. As the editorial process is completed, the new translations into Chinese, Russian, Spanish, Portuguese, Greek, and several Scandinavian languages will be permanent posts on the ASPB Teaching Tools page (http://www.plantcell.org/site/teachingtools/TTPB1.xhtml).

Keep the Fascination Growing

Tailor an event for your community or campus. Plant the seeds for FoPD 2015 now.

- Run a photo or art exhibition. Award prizes.
- Adapt or create an experiment for school students.
- Lead a tour of a facility involved with plants.
- Talk to a class or vlog about critical topics (e.g., biofuels).
- Write an article about plants and research for your website or newsletter.
- Post fascinating facts and links on Facebook.
- Offer to be an expert guest on a radio show, vlog, or blog. ■

しょくぶつのくらし

My Life as a Plant

Now Available in Japanese!

BY KATIE ENGEN
ASPB Education Coordinator

In July 2012, Kazuki Saito (RIKEN Plant Science Center–Yokohma) visited the ASPB Education Booth during Plant Biology 2012. He was excited about the potential of the newly released activity book funded by ASPB called *My Life as a Plant.* Kazuki initiated a translation by working with ASPB staff and recruiting Keiko Yonekura-Sakakibara and Ayuko Kuwahara-Seo, also from RIKEN, as volunteer translators. The team worked to not only transform the text, but also set up a formal connection for posting the final product on the Japanese Society of Plant Physiology website. (See ad on page 32 for all access options to the translated book.)

Translator Contributions—In Their Own Words

Kazuki: The project was initiated after I met Katie twice in Austin—once at the ASPB booth at the annual meeting and accidentally the second time at the Austin airport. My role was small—I just carried the original English booklet from Austin to Japan (a world tour!) and found two excellent plant biologists who volunteered to do the translation. My hope is that Japanese kids will enjoy the book and that it will give them a good impression of plants they will carry with them throughout their lives.

Susan Whitfield

Keiko: I mainly translated the latter part of the book. It was a great pleasure to contribute to this excellent project and now read the Japanese version to my 3-year-old daughter. I hope the book will provide an opportunity for Japanese children to discover the fascinating world of plants.

Ayuko: It was my great pleasure to have an opportunity to work on such a wonderful project for Japanese children and their parents. I mainly translated the story section pages for younger children. I believe many children will enjoy the book, including my 6-year-old daughter.

Preparing for Publication

Going from the Roman (English) alphabet to Japanese characters was rather challenging when it came time to format the translated text within the book's art-laden template files. Book coauthor Alan Jones (University of North Carolina; UNC) brought in some skilled help from the Chapel Hill campus. Susan Whitfield, the visual arts specialist in the department of biology, has a BA degree in botany from UNC. She has been the scientific illustrator in the Biology Department since 1980 and provides illustration services (along with assistance on the biology website) to the faculty, staff, and students in this large, diverse department. Susan consulted with native-speaking UNC graduate student Ariko Urano to finalize this publication.

Ayuko Kuwahara-Seo (left) and Keiko Yonekura-Sakakibura.

Susan reported on the logistics and technicalities of the project:

> My contribution began with assembling all of the text from the pages of the original version

continued on page 32

New ASPB Higher Education Resource

Inspiring Students to Study Successfully for the Sciences

BY KATIE ENGEN
ASPB Education Coordinator

Do any of these concerns from students sound familiar to you?

- I don't have time to study all this stuff. And even if I spend hours, it doesn't really pay off.
- How do I use the textbook? How does it fit with class notes?
- I understand the different parts but can't fit it together. By the time the test comes, I'm just confused.
- I just can't do science.

Many students actually expect to fail science courses or abandon the pursuit of science altogether because they are overwhelmed with course content, study skill, or time management issues. That's why ASPB now offers a new resource of practical tips that can help undo underperformance and stomp out science-oriented apathy stemming from the fears and inefficiencies students have when learning science.

Inspiring Students to Study Successfully for the Sciences

Practical tips to help your students overcome their struggles with course content mastery (http://tinyurl.com/qcl82gb).

These tips are based on a presentation by Doug Gaffin and Marielle Hoefnagels, of the University of Oklahoma, given at the Introductory Biology Project 2012 Summer Meeting in Washington, D.C. (http://tinyurl.com/omh337k).

Stay Calm and Study On

Inspiring Students to Study Successfully for the Sciences will help you encourage students to

- Set a goal to replace study skill insecurities with curiosity and confidence about content mastery by interacting with material and thinking critically while studying.
- Select one or two techniques that fit best with their learning style, your presentation methods, and scheduling realities. If you make students feel they must use every technique for all classes, they'll run screaming for the humanities (where they still could use these techniques, of course).

DO Try This at Home (or Dorm or Library)

Go to http://tinyurl.com/qcl82gb for simple-yet-detailed instructions and insights for study skills in these categories:

Note Taking: An ounce of prevention is worth a pound of cure. Before diving headfirst into heavy content, start your class with an upbeat, well-paced review of effective note taking.

Rewritten Notes: Simple can be effective. Rewriting the information clearly and in familiar correct terms is a critical step that moves new information to long-term memory and links it to previously mastered content.

Flashcards: Vocabulary? Sure. Yet flash cards also can be used to connect and apply information.

Concept Maps: Build on the brain's network-building tendencies by linking terms with phrases that explain connections and represent deep thinking. Start small and bulk up as the term progresses.

Blank Paper: When studying has degraded to little more than a blank stare, put away the pile of notes and cards, get out a blank piece of paper, and try some new techniques.

Office Hours: They exist for a reason. Even if confidence and grades are high, students should go at some point early in the term.

Table of Contents: If a class relies on a textbook, take advantage of its organization as you review for exams later in the term.

Three Study Habit–Killing Misconceptions and a Posse of Antidotes: Attitude is everything. Perception matters. Help your students manage three major misconceptions and they will advance.

See complete explanations and tip lists to share with your students at **http://tinyurl.com/qcl82gb.** ■

The Important Distinction of Face Time vs. Virtual Learning

Student–teacher interactions are fundamental to successful learning. However, because face time is so valuable, it's in everyone's best interest to determine which interactions *require* face time and which learning opportunities can be effectively applied or even enhanced with online learning—which can be considered as another type of study skill.

In their *Science* editorial (22 Mar 2013, p. 1359) titled "Two Revolutions in Learning" (http://www.sciencemag.org/content/339/6126/1359.full), Susan Singer (Carleton College) and William Bonvillian (Massachusetts Institute of Technology) advocate for the need to scale up innovative, research-based teaching techniques for effective undergraduate learning, especially for use in ever-expanding virtual classrooms (a.k.a., MOOCs). They agree that "across all sciences, students struggle with fundamental concepts and underlying ideas." And they note that "research demonstrates that problem-solving skills can be developed through discussion-oriented learning environments." Susan and William hope that more research will address these needs and lead to properly designed online learning options to create quality hybrid models (online and face-to-face) that help to accelerate learning.

JAPANESE COLORING BOOK
continued from page 31

of the publication into a single document. This document was sent to the translators, who converted the text into the Japanese language and had the translated document returned to me. I replaced the English text in the original illustration files with the translated text, receiving invaluable assistance from Ariko Urano, who was able to tell me where the text line breaks could be made. The translated, resaved pages were then returned to the original translators for another review, and a few additional changes were made. The final product will surely provide fun, educational plant-based activities for Japanese parents and children, just as they have for the English-speaking parents and children already enjoying the original published version. It is gratifying to have participated in this small way to the production of the Japanese version of *My Life as a Plant.*

ASPB is grateful for the time, energy, and expertise each person gave to this project. For options to acquire and/or sell bulk amounts of traditionally printed hard copies of the Japanese (or English) version, please contact katie@aspb.org. ■

ASPB's Activity Book for the Youngest Scientists

Now Available in Japanese!

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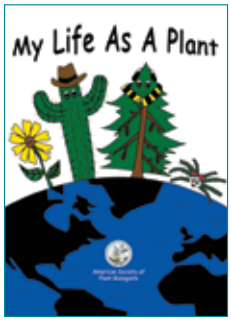
Free PDF: http://tinyurl.com/khe49gw or
http://my.aspb.org/?page=My_Life_As_A_Plant



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Recent Success for 2009 SURF Recipient

Evan Pratt Coauthors Proteomics Journal Article

BY KATIE ENGEN
ASPB Education Coordinator

Evan Pratt (2009)

In 2009 while an undergraduate student at Michigan State University, Evan Pratt received a SURF award to conduct 10 consecutive weeks of mentored research on his project titled *Characterization of Novel Chloroplast Transporters in the C4 Plant Maize.* Susanne Hoffman-Benning, Evan's SURF mentor, reported to the SURF program that Evan's work has resulted in coauthorship on a publication in *Frontiers in Plant Proteomics.* The team Evan worked with included Kalpana Samuel M. Saitie, Banita Tamot, Andreas P. M. Weber, and ASPB members Andrea Braeutigam, Susanne Hoffmann-Benning, and Manandhar-Shrestha. Their paper is titled "Comparative Proteomics of Chloroplasts Envelopes from Bundle Sheath and Mesophyll Chloroplasts Reveals Novel Membrane Proteins with a Possible Role in C_4-related Metabolite Fluxes and Development." The paper's abstract can be found at http://www.frontiersin.org/plant_proteomics/10.3389/fpls.2013.00065/abstract.

Congratulations to Evan! His work is evidence that SURF's mission to support promising undergraduate students as they conduct plant biology research does indeed catalyze future career success in the field. ■

Mary Louise Stiller

(1931–2013)

BY NICK CARPITA
Purdue University

It is with deep sadness that I inform ASPB that Professor Emerita Mary Stiller passed away on June 16, 2013, at the age of 81. Mary had a long, distinguished, and innovative career teaching in the Department of Biological Sciences at Purdue University. She retired as professor emerita in 1997. A longtime member of ASPB, Mary was elected secretary of ASPB in 1973, the first woman to hold an elected office in the Society.

Mary received her BS degree in chemistry at Purdue University in 1954 and pursued graduate studies in biology as an NSF predoctoral fellow, receiving her MS degree in biological sciences in 1956. After a year's study at Newcastle-on-Tyne in the United Kingdom, Mary returned to Purdue for doctoral studies in plant physiology and was awarded her PhD in 1959. Following postdoctoral studies at the University of Chicago and the University of Pennsylvania, she joined the faculty of Purdue's Department of Biological Sciences in 1962.

Mary's research focused on photosynthetic carbon metabolism and nitrite reduction. Her PhD dissertation was on the mechanism of malate synthesis in CAM plants, and she contributed a well-cited review on the path of carbon in photosynthesis in *Annual Reviews of Plant Physiology* in 1964. In 1966, she also teamed with Harry Beevers (ASPB president 1961–1962) in a treatise on the metabolism of organic acids, a special publication by *Plant Physiology.* Her later work turned to hydrogenase activity in Chlorella, demonstrating a role for that enzyme in nitrite reduction.

Mary was a Purdue legend, running all hours on gigantic economy-sized jars of peanut butter, cups of black coffee, cigarettes, and minimal amounts of sleep. She often went days without leaving the office or her lab to go home. Her colleagues recall that she once brought a whole set of encyclopedias to the lab that she used for casual reading. She started with "A" and continued through the alphabet. Every time a colleague would see Mary they would ask, "Hey Mary, what letter are you on?" When she finally finished them, she packed up the whole set and sent it to a brother who was a Catholic missionary in Nepal.

Mary lived a frugal life in a tiny apartment close to campus, but she was well known to her colleagues for her extraordinary generosity. She made good investments with her savings, but she gave away everything she had, every year, many times in the form of stipends that supported needy graduate students of the department. Mary was frugal in the lab and teaching as well. She is famous for her knack for making useful items from soda straws, milk cartons, and other throwaways, and she was able to supply large classes of students with devices for performing basic analytical measurements.

Mary Stiller speaks with Rev. Patrick Baikauskas (St. Thomas Aquinas Catholic Church) prior to the August 28, 2011, Mass on the Grass. REPRINTED BY PERMISSION, WWW.PURDUEEXPONENT.ORG.

Mary discontinued her research program around 1975 to devote herself to teaching. Her pioneering work in educational media from decades ago captured video-taped and computer-assisted teaching—the podcasting of its era—and lives on in the thousands of students she worked with. ■

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