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ASPB News

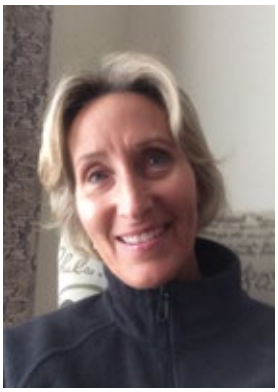
THE NEWSLETTER OF THE AMERICAN SOCIETY OF PLANT BIOLOGISTS

President's Letter

Roll Up Your Sleeves!

BY SALLY MACKENZIE
University of Nebraska–Lincoln

I consider it a tremendous privilege to serve you as president of ASPB this year. Because I have participated for the past several years as chair of the Publications Committee and member of the Science Policy and Executive Committees, I feel as though the start of this year provides an invaluable opportunity to take a step back and reflect on the Society as a whole with you, its membership. ASPB is moving in so many exciting new directions, it can be difficult to keep up.



Sally Mackenzie

In 2016, ASPB finds itself in a rapidly evolving environment, one dominated by social media and web-based community interactions. To help ensure that we continue to support the plant science community as it moves into this space, ASPB has developed a powerful new platform called Plantae. Plantae is an online digital ecosystem that is evolving almost monthly as we learn more about the needs of the community. But Plantae can become a fully active conduit for information and exchange only if we all participate in defining its capabilities and growing its participant population. I hope that this year we will see our interlinking Society grow, both domestically and internationally.

For my own part, I envision Plantae to be the place where the community can openly discuss emerging science, technologies, future-looking student training, and the politics of the current funding climate for research and education. Perhaps Plantae will also become a facilitator of more rapid online publishing and of post-publication discussion. But you may have your own vision of where Plantae will grow (pun intended). One way you can make your voice heard is to join Plantae and get active in helping ASPB improve and refine its spectrum of offerings. A steering committee

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Nominations Opening Soon for 2017 ASPB Awards!

The Time to Recognize and Honor Excellence Among Our Fellow Plant Scientists Is Approaching

The 2017 Call for ASPB Award Nominations will be sent to all members on January 3, 2017, and nominations will be due Friday, February 17. ASPB encourages you to participate in the 2017 awards program by nominating highly deserving individuals. Please watch for the Call for Nominations in your email inbox, on our website, and via social media. In the meantime, please visit ASPB's awards pages (http://www.aspb.org/awards-funding/aspb-awards/) so that you can see who among your colleagues has received these awards in the past and determine who might be most deserving in the future.

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Contents

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, April 5 for May/June publication).

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ASPB Officers and Committee Members Assume Posts for 2016–2017

Listed below are governance committee members for the current year. The year in which each committee member's term ends is indicated in parentheses.

Board of Directors

Sally Mackenzie (2017), *president*
Harry Klee (2018), *chair, president-elect*
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Joseph J. Kieber (2017), *elected member*
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Kathy Osteryoung (2019)

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Ken Keegstra (2018)

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Sally Mackenzie (2018), *president*
Richard Dixon (2017), *chair, immediate past president*
Harry Klee (2019), *president-elect*
Alice Harmon (2018), *secretary*
C. Robertson McClung (2017), *treasurer; chair, Board of Trustees*
Joseph J. Kieber (2017), *elected member*
Maureen McCann (2019), *elected member*
Jill Deikman (2019), *chair, Membership Committee*
Adán Colón-Carmona (2017), *chair, Committee on Minority Affairs*
Neil E. Olszewski (2017), *chair, Publications Committee*
Marisa Otegui (2017), *chair, Women in Plant Biology Committee*
Sarah Wyatt (2019), *chair, Education Committee*
Leon Kochian (2018), *chair, International Committee*
Nathan Springer (2020), *chair, Science Policy Committee*
Hua Lu (2019), *Mid-Atlantic Section representative*
Ed Cahoon (2017), *Midwestern Section representative*
Peter Melcher (2018), *Northeastern Section representative*
Becca Dickstein (2017), *Southern Section representative*
Camille M. Steber (2017), *Western Section representative*
Crispin Taylor, *executive director*

Education Committee

Sarah Wyatt (2019), *chair*
Scott Woody (2018)
Subhash Minocha (2017)
Stacey Slijepcevic (2017)
Erin Friedman (2018)
Ken Helm (2018)
Valerie Haywood (2019)
David Holding (2020)

International Committee

Leon Kochian (2018), *chair*
Yunde Zhao (2017)
Kendal Hirschi (2018)
Kazuki Saito (2018)
Kranthi Mandadi (2019)
Bijay Singh (2019)

Membership Committee

Jill Deikman (2019), *chair*
Prateek Tripathi (2018), *postdoc member*
Stephanie Klein (2019), *graduate student member*
Catharina Coenen (2019)
Ken Korth (2019)

Committee on Minority Affairs

Adán Colón-Carmona (2017), *chair*
Beronda L. Montgomery (2017)
Savithramma Dinesh Kumar (2017), *ad hoc member*
Michael Gonzales (2018)
Gustavo Macintosh (2018)
Sona Pandey (2018)
Terri Long (2019)
Miguel Vega-Sanchez (2019)

Nominating Committee

Harry Klee (2019), *president-elect; chair*
Sally Mackenzie (2018), *president*
Richard Dixon (2017), *immediate past president*

Program Committee

Alice Harmon (2017), *secretary; chair*
Harry Klee (2019), *president-elect*
Andrew Bent (2020), *secretary-elect*
Phil Taylor (2017)
Maria Harrison (2018)
Rob Last (2019)
Gilles Basset (2020)

Publications Committee

Neil E. Olszewski (2017), *chair*
Steve Rodermel (2017)
Pamela J. Hines (2018)
Katie Dehesh (2019)
Steve Theg (2021)

Science Policy Committee

Nathan Springer (2020), *chair*
Rick Dixon (2017), *immediate past president*
Daniel Peterson (2017)
Ruby O'Lexy (2017), *early career rep*
José Dinneny (2018)
Rebecca Bart (2018)
Jim Carrington (2019)
Neal Stewart (2019)
Judy Callis (2020)
Alan Jones, *ad hoc member*

Women in Plant Biology Committee

Marisa Otegui (2017), *chair*
Kathy Osteryoung (2017)
Laura Wayne (2017)
Li Tian (2018)
Eva Farre (2018)
Sreekala Chellamma (2019)

ASPB/AAAS 2017 Mass Media Science & Engineering Fellows Program

Are you interested in science writing?

Do you want to help people understand complex scientific issues?

Apply for the ASPB/AAAS Mass Media Science & Engineering Fellows Program and learn how to increase public understanding of science and technology. Fellows in the 10-week 2017 summer program will work as reporters, researchers, and production assistants in mass media organizations nationwide. **Deadline: January 15, 2017.**

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

AMERICAN SOCIETY OF PLANT BIOLOGISTS 1924 INVENIAMVS VITALIA ARCANA PLANTARVM

AAAS
ADVANCING SCIENCE, SERVING SOCIETY

Some former host sites

CNN en Español

Discover magazine

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KQED Science

The Los Angeles Times

The Milwaukee Journal-Sentinel

National Geographic

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NOVA

The Oregonian

PBS NewsHour

The Philadephia Inquirer

The Raleigh News & Observer

Sacramento Bee

Scientific American

Slate

Univision

Voice of America

WIRED

PRESIDENT'S LETTER
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chaired by Alan Jones is helping oversee this expansion and would welcome useful input.

Over the past year, we have continued to circulate widely the Decadal Vision (see *Unleashing a Decade of Innovation in Plant Science: A Vision for 2015–2025* at https://bit.ly/1TNrKSv) as we prepare for the transition to actively pursuing its goals. The Decadal Vision is a document produced collaboratively by ASPB and a dozen other professional societies that is designed to help focus the conversation on national plant science research and training directions in support of the U.S. economy. If you have not read the Decadal Vision, I recommend that you do so now. The document does a nice job of reminding us all that some of the most fascinating research challenges of plant science exist at a systems level, focusing more on networks than the effects of individual genes. Understanding a plant's responses to its environment is as much computational as cell biology. And some of our greatest efforts need to be directed at properly creating and managing the associated large data sets to make them useful to the entire community while training students to think in very new ways as they prepare for a future career in plant science. Important activities are under way that address these issues.

Decadal Vision Workshops

David Stern, president of Boyce Thompson Institute and a primary author of the Decadal Vision, has overseen the development of two workshops sponsored by NSF and the Research Coordination Network that were held October 18–20, 2016, in Rockville, MD, under the auspices of the Plant Science Research Network. This network is a more formal collaboration among many of the societies involved in generating the initial Decadal Vision.

The first workshop, Modernizing Postgraduate Training in the Plant Sciences, centered on ways in which the training of plant science students needs to adjust for a future in which students will encounter a much greater demand for sophisticated skill sets and a broader range of job opportunities. These opportunities will span academic, industry, government, and international development and will include science writing, policy, and entrepreneurship. The students of today and tomorrow are as likely to spend their careers in front of a computer screen as they are at the bench or in the field. Future students must be good communicators, broad thinkers, interdisciplinary collaborators, and creative revenue generators. A national dialogue within the plant science community can help formulate a consensus on these priorities and practices that will be central to future student training efforts around the country.

The second workshop, Cyberinfrastructure for Plant Systems Research over the Coming Decade, focused on managing big data in the plant sciences. Cyberinfrastructure, data management, standardization, and powerful mining capabilities are areas in which the plant science community must come together to plan and coordinate resources of immense value to us all. Visionary thinking and careful planning in the current environment will be essential in laying the groundwork for a future in which entire research paths can be pursued entirely from in silico data sets.

A third workshop—planned for next spring—will focus dedicated attention on the vital issue of inclusivity in the plant sciences. Ensuring that the discipline is welcoming and accessible to individuals from all backgrounds and ethnicities is essential.

National Plant Science Council and Phenomics

Also called for in the Decadal Vision was the formation of the National Plant Science Council (NPSC) to help give voice to plant science national priorities. The NPSC, whose membership can be found on the Plantae website (http://bit.ly/2dcO1tE), has begun its work by launching a new annual meeting in the area of plant phenomics. Phenome 2017, to be held in February 2017 in Tucson, Arizona, is the first annual U.S.-based meeting in phenomics, and its primary aim will be to foster interdisciplinary collaboration among plant biologists, agronomists, ecologists, engineers, and computational scientists in academia, government, and industry to accelerate the science in this emerging field.

U.S. research in phenomics currently lags behind work in Australia and Europe, so this meeting is an important step to help push things forward. It is also an important venue for forging the interdisciplinary alliances that will be essential for rapid technology innovation. ASPB will help power this meeting and, along with the NPSC, is partnering with the nascent North American Plant Phenotyping Network to ensure its success. You can learn more about it at www.phenome2017.org. Over the next several years, the expectation is that this meeting will energize biology–computation–engineering connections in a whole host of research directions.

Other Efforts

Over the coming year, there are other places where ASPB can have an even greater impact in helping foster plant science. Although many graduate students and post-

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Plantae

To join Plantae,
visit http://community.plantae.org and register.

To provide input or feedback regarding Plantae, email Alan Jones, chair of the Plantae Steering Committee, at ajones@aspb.org, or post a comment directly in our feedback forum at http://bit.ly/PlantaeFeedback.

PRESIDENT'S LETTER
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docs are able to attend the annual meeting to present their work, this opportunity might happen only once or twice in their post-graduate careers because of the expense. For most undergraduates with an interest in plant science, it may not happen at all. Regional ASPB-affiliated section meetings are held annually as well, but unfortunately, most regions associated with any given meeting are quite large, encompassing unrealistic driving distances.

One goal I hope that ASPB will pursue in the coming year is to consider ways to allow an ASPB regional meeting to be held each year within driving distance of any undergraduate or graduate student wishing to attend. Imagine plant science students having the opportunity to attend an ASPB meeting in each year of his or her training and how conducive this would be to creating stronger, more cohesive and vibrant plant research communities in each region of the country.

The Year Ahead

I hope you will give consideration to some of these ideas and offer your feedback. This year promises important progress in growing Plantae, the new Phenome meeting, vigorous dialogue on big data, and student training directions. Of course, we also hope for greater attention from Congress with a new administration to the importance of plant science to national food security priorities in the United States and for greater consideration in Europe of the impact of Brexit on European plant science priorities. ■

NOMINATIONS
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All that is required to make a nomination for ASPB's awards is a one- to two-page letter of nomination and a detailed CV of the nominee. However, nomination committees may opt to go back to the nominator to ask for additional information if they deem it necessary. Nominations should be submitted electronically as a single PDF via the URL that will be provided in the New Year. The names of the 2017 award recipients will be announced in mid-April via social media and email broadcast to ASPB members, and the awards themselves will be presented during Plant Biology 2017 in Honolulu, Hawaii.

Awards to Be Given in 2017

ASPB Innovation Prize for Agricultural Technology

This prize was inaugurated in 2015 to recognize the outstanding work of industry scientists in companies of all sizes who translate discovery research into real-world outcomes that benefit agriculture. The award additionally acts as a vehicle to increase the awareness of the highest quality science performed by industry scientists, whether or not they are members of the Society upon nomination, and showcases the opportunities and rewards of this career path. The Innovation Prize, which is made biennially, is a monetary award that also provides a one-year membership in the Society.

Charles Albert Shull Award

This award was initiated in 1971 by the Society to honor Dr. Charles A. Shull, whose personal interest and support were largely responsible for the founding and early growth of the Society. It is a monetary award made annually for outstanding investigations in the field of plant biology by a member who is generally under 45 years of age on January 1 of the year of presentation or is fewer than 10 years from the granting of the doctoral degree. Breaks in careers will be considered when addressing the age limit of this award. The recipient is invited to address the Society at the annual meeting the following year.

Charles Reid Barnes Life Membership Award

This award was established in 1925 at the first annual meeting of the Society through the generosity of Dr. Charles A. Shull. It honors Dr. Charles Reid Barnes, the first professor of plant physiology at the University of Chicago. It is an annual award for meritorious work in plant biology; it provides a life membership in the Society to an individual who is at least 60 years old. Membership is a requirement for the award, and, if appropriate, every fifth award should be made to an outstanding plant biologist from outside the United States.

Corresponding Membership

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

Early Career Award

The Society's executive committee instituted the Early Career Award in 2005 to recognize outstanding research by scientists at the beginning of their careers. This award is a monetary award made annually for exceptionally creative, independent contributions by an individual, whether or not a member of the Society, who is generally not more than seven years post-PhD on January 1 of the year of the presentation.

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Scenarios for 2035: The Making of a Plant Scientist

BY NATALIE HENKHAUS
Executive Coordinator, Plant Science Research Network

The Plant Science Research Network (PSRN) was established in August 2015 through the support of an NSF Research Coordination Network award to the Boyce Thompson Institute (BTI) and ASPB to further the goals outlined in the 2013 publication *Unleashing a Decade of Innovation in Plant Science: A Vision for 2015–2025* (https://bit.ly/1TNrKSv). In a little over a year, the PSRN has grown from nine founding members to more than a dozen organizations! Led by David Stern (BTI) and Crispin Taylor (ASPB), members of the PSRN have participated and organized activities such as strategic planning workshops and community listening sessions and have exhibited at the annual meetings of the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) and the Annual Biomedical Research Conference for Minority Students (ABRCMS).

Participants at the Plant Science Research Network meeting at the Howard Hughes Medical Institute (September 2016). Front row, left to right: Vanessa Greenlee, Natalie Henkhaus, Susan Stickley, Angus Murphy, Chelsea Specht, Michael Gonzales, Pam Soltis. Back row, left to right: Harriet Alexander, Molly Megraw, Paul Okello, Kaitlyn Bissonnette, Mary Crowe, Judy Glaven, Fumiaki Katagiri, Crispin Taylor, JP Dundore-Arias, Alex Thomasson, Paul Chomet, David Stern.

Workshops to Address the Future of Plant Science

In 2016, the PSRN began to plan a series of workshops to address the future of plant science research, education, and training. The first of these, a Scenario Modeling workshop, created a set of relevant, insightful, and plausible scenarios that will act as the platform for PSRN's ongoing dialogue and future workshops. According to facilitator Susan Stickley (Stratus, Inc.), scenario planning is a strategy used by many organizations and communities to test their long-term assumptions and explore the uncertain landscape of their future. The PSRN has used this process to explore the plant research community's deeply held assumptions and beliefs and the critical uncertainties facing the plant research community in areas such as funding, policy, and regulation; environmental stresses; enabling tools and technology; education, training, and future workforce; and communication and connectivity.

Broad Interest in Postgraduate Training

In September 2016, the PSRN Scenario Modeling workshop was held at the Howard Hughes Medical Institute. The workshop was informed by discussions with the PSRN, formal interviews with 16 prominent plant scientists (including two outside the United States), and a survey to quantify the uncertainty and criticality of 20 drivers of the future that might affect plant science research. Twenty representatives from across the plant science and agricultural research community, including agronomists, bioinformatics specialists, ecologists, molecular biologists, and plant pathologists, as well as three postdocs and two graduate students, were invited to participate in the scenario development process.

The strategies and recommendations developed through this exercise will be used for the next several years. The scenarios provide a view 20 years into the future, a span of time that should allow those developing and exploring the scenario set to readily imagine a wide range of possibilities, without limiting their ability to stretch into the truly uncertain future landscape.

Workshops Supported by HHMI, NSF PGRP, and NSF DGE

The PSRN successfully sought funding to expand workshop participation and was awarded supplemental funding of $121,900 from NSF Plant Genome Research Program (PGRP) and the Division of Gradate Education

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NEXT STEPS
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(DGE) to support the facilitated workshops. HHMI staff, David Asai, agreed to host the meeting and provide overnight accommodations for attendees. David Asai, Judy Glaven, and Clif Poodry all participated in the workshop.

Most Plant Scientists will Have Careers Outside of Academia

As a follow-up to the September scenario workshops, two workshops were held simultaneously in October 2016 to address the future needs of the plant science community in two areas: (1) cyberinfrastructure and Big Data; and (2) training for postdocs and graduate students. The scenarios developed in September were used to frame the conversation and encourage forward-thinking thought, such as providing empowerment and responsibility to trainees and the modularization and customization of training. The PSRN is currently in the process of summarizing the recommendations and will communicate the results of these workshops in a report as well as community-wide meetings at Phenome 2017 (in Tucson) and Plant Biology 2017 (in Honolulu).

Participants at the Scenario Modeling workshop, held at HHMI in September 2016. From left to right: Angus Murphy, Fumiaki Katagiri, Tyrone Spady, Parker Antin, Crispin Taylor, David Stern, Clif Poodry, Kaitlyn Bissonnette, Michael Gonzales, Paul Okello, Alannie-Grace Grant, JP Dundore-Arias, and Mary Crowe.

Growing the Community Represented by the PSRN

In addition to planning and executing the workshops, this year the PSRN has welcomed five new organizations: the Association of Independent Plant Research Institutes, the American Society of Plant Taxonomists, the Ecological Society of America, the Global Plant Council, and the Phytochemical Society of North America! Throughout the next year, the PSRN will continue to expand the membership to include diverse organizations interested in plant science research, education, and outreach. By the end of the five-year grant, the PSRN will refresh the Decadal Vision document and has already begun eliciting feedback on a new outline called the National Plant Systems Initiative (NPSI). ASPB has reviewed the NPSI and provided critical feedback through ASPB's Science Policy Committee.

Everyone is encouraged to learn more about the PSRN by joining the group on Plantae, where the scenarios and recommendations developed by the PSRN workshops will be shared. Questions about the network may be directed to the PSRN coordinator, Natalie Henkhaus (nhenkhaus@aspb.org).

Learn More About the Plant Science Research Network

Sign up and join Plantae: https://community.plantae.org/groups/home/336
Twitter: https://twitter.com/plantsciresnet
Facebook: http://bit.ly/2dpJKpS ■

Women's Young Investigator Travel Award Program for Plant Biology 2017 in Honolulu, Hawaii

Travel grant applications for eligible women are being accepted now.

The submission deadline is December 14, 2016.

All applications must be submitted electronically at **https://wyita.aspb.org.**

Recipients will be notified by mid-January.

PHENOME 2017

TUCSON, AZ FEBRUARY 10-14

HILTON EL CONQUISTADOR HOTEL

The first-ever **Phenome 2017** conference will bring together a multidisciplinary community comprising plant biologists, ecologists, engineers, agronomists, and computer scientists. The goals are to share information, ideas, and connections in a rich and diverse networking environment that is intended to foster collaboration, innovation, and the initiation of multi-investigator and multi-institution projects.

The conference is organized by the National Plant Research Council and the newly formed North American Plant Phenotyping Network.

This conference is an important step in the development of a path toward training and collaboration among disciplines poised to address critical social issues and generate greater understanding about plants and climate change.

Program Highlights

Phenomic Insights into Quantitative Traits

Tom Mitchell-Olds, *Duke University, Durham, NC*

Natalia deLeon, *University of Wisconsin–Madison*

Gloria Coruzzi, *New York University, New York*

Maureen McCann, *Purdue University, West Lafayette, IN*

Environmental Stress Biology

Julia Bailey-Serres, *University of California, Riverside*

Eduardo Blumwald, *University of California, Davis*

Jonathan Lynch, *Penn State University, University Park*

Leon Kochian, *University of Saskatchewan, Saskatoon, Canada*

Plasticity in Plant Traits

Anna Amtmann, *University of Glasgow, Glasgow, United Kingdom*

Bob Schmitz, *University of Georgia, Athens*

Frank Johannes, *Technical University of Munich, Freising, Germany*

Nathan Springer, *University of Minnesota, St. Paul*

Zsuzsanna Merai, *Gregor Mendel Institute, Vienna, Austria*

Jose Gutierrez-Marcos, *University of Warwick, Coventry, United Kingdom*

Metabolomics and Large-Scale Biochemical Phenotyping

Ivan Baxter, *Danforth Plant Science Center, St. Louis, MO*

Andrew Hanson, *University of Florida, Gainesville*

Courtney Jahn, *Colorado State University, Fort Collins*

Mark Lange, *Washington State University, Pullman*

Lloyd Sumner, *University of Missouri, Columbia*

Leslie Hicks, *University of North Carolina at Chapel Hill*

Nine concurrent afternoon sessions will address topics such as Metadata Analysis and Challenges in Climate, Imaging, and Genetics; Statistical Analysis of Multivariate Data; Robotics and Remote Sensing; and more!

Learn more at www.phenome2017.org

NOMINATIONS
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Breaks in careers will be considered when addressing the time limit of this award.

Eric E. Conn Young Investigator Award

The Eric E. Conn Young Investigator Award, first given by the Society in 2011, honors Eric E. Conn's contributions in plant biology by recognizing young scientists who will be inspired to follow in his footsteps. The award recognizes demonstrated excellence in outreach, public service, mentoring, or teaching by plant scientists at the beginning of their careers. This award is a monetary award made biennially for demonstrated commitment by a member of the Society who is not more than five years post-PhD on January 1 of the year of the presentation. It also provides a one-year membership to the Society.

Excellence in Education Award

This award, initiated in 1988, recognizes outstanding teaching, mentoring, and/or educational outreach in plant biology by an individual, whether or not a member of the Society. It is a monetary award to be made annually in recognition of excellence in teaching, leadership in curricular development, or authorship of effective teaching materials in the science of plant biology.

Fellow of ASPB Award

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

Martin Gibbs Medal

This monetary award, initiated in 1993, honors Martin Gibbs for his outstanding service to the Society as editor-in-chief of *Plant Physiology* from 1963 to 1992. This award is to be given biennially to an individual, whether or not a member of the Society, who has pioneered advances that have served to establish new directions of investigation in the plant sciences. The recipient is invited to organize a symposium at the annual meeting the following year.

Stephen Hales Prize

This award honors the Reverend Stephen Hales for his pioneering work in plant biology published in his 1727 book *Vegetable Staticks*. It is a monetary award established in 1927 for an ASPB member who has served the science of plant biology in some noteworthy manner. The award is made annually. The recipient of the award is invited to address the Society on a subject in plant biology at the next annual meeting. ■

ASPB Travel Grant Program for Plant Biology 2017 in Honolulu, Hawaii

Travel grant applications are being accepted now.

The submission deadline is December 14, 2016.

All applications must be submitted electronically at https://travelgrants.aspb.org.

Recipients will be notified by mid-January.

ASPB Recognition Travel Award Program for Plant Biology 2017 in Honolulu, Hawaii

Travel grant applications for eligible candidates are being accepted now.

The submission deadline is February 2, 2017.

All applications must be submitted electronically at https://rta.aspb.org.

Recipients will be notified by April.

Plant Biology 2017

JUNE 24–28 | HONOLULU, HAWAII

Abstract Categories*

Abiotic
- General
- Gravitational and Space Biology
- Light
- Salt and Minerals
- Temperature
- Water

Applied
- Biotechnology, Molecular Breeding
- Plants and Human/Societal Health

Biochemistry
- Bioenergy
- Metabolism
- Specialized Metabolites
- Transport

Biotic Interactions
- Plant–Animal
- Plant–Microbe

Cell Biology
- General
- Plastids and Organelles

Development
- Reproduction
- Vegetative
- Education and Outreach

Genes and Genomes
- Bioinformatics
- Epigenetics
- Gene Regulation and Transcriptional Networks
- Genetics
- Genome Editing
- Molecular Evolution/Comparative Genomics
- RNA Biology

Hormone Biology

Signal Transduction

Systems, Synthetic, and Computational Biology

Whole Plant
- Climate Change
- Environmental and Ecophysiology

*** Don't see a category for your research? Please add a new category when you submit an abstract.**



PHOTOS COURTESY OF THE HAWAII TOURISM AUTHORITY

Call for Abstracts

Submission Now Open

http://plantbiology.aspb.org/abstracts

ASPB invites the submission of abstracts that report new scientific research developments in the areas of plant biology. Abstracts are welcome from scientists and students in all sectors, including academia, industry, government, and education.

All abstracts submitted for consideration for a concurrent symposium talk are reviewed by the Program Committee. The selected abstracts will make up the scientific program for 28–30 concurrent symposia. Complete abstracts will be online only.

Abstract submission is separate from Plant Biology 2017 meeting registration. Please register for the meeting at the conclusion of your abstract submission. Registration is now open.

Submission Deadlines

January 30, 2017: Deadline to be considered for a concurrent symposium or lightning talk. Lightning talks, new in 2016, are one-minute presentations added to selected concurrent symposia.

May 24, 2017: Deadline to be included in the online program book and receive a poster number. Primary poster presenters must be registered for the conference, and abstract submission must be completed.

June 12, 2017: Deadline for late abstract submissions to be included in the app. Posters will not receive a poster number, and spots are first come, first served. Primary poster presenters must be registered for the conference. This will be the last day to submit an abstract.

Abstracts must be submitted at **http://plantbiology.aspb.org/abstracts.**

Winning Entries of the August 2016 Teaching Tools Proposal Competition

BY MARY WILLIAMS
Features Editor, *The Plant Cell*

Teaching Tools in Plant Biology®
ideas to grow on

Many excellent proposals were submitted for the fourth round of the Teaching Tools in Plant Biology competition, from which we selected five for further development. We've added another opportunity for you to submit your idea for consideration as a Teaching Tool with a deadline of March 31, 2017 (see http://bit.ly/1NkcZEe for more information). Feel free to contact us at any time to discuss your ideas about creating a Teaching Tool.


Amy Marshall-Colon


Ursulla Idleman


Christine M. Fleet

A Bioinformatics Pipeline to Understand Transcriptional Regulation in Plants

by Amy Marshall-Colon and Ursulla Idleman

It is difficult to conceptualize genomewide transcriptional regulation and even more challenging to organize, analyze, and visualize data at this scale. Network analysis of gene expression data is a popular way for plant scientists to deal with -omic scale data. However, the tools and techniques needed for such an analysis are not commonly taught alongside other plant biology curricula. As big data becomes standard in more plant research groups, students will benefit greatly from training, at both the undergraduate and graduate levels, to perform meaningful analyses. In particular, construction of gene coexpression networks can provide students with diverse training in statistics, molecular biology, gene ontology, and basic graph theory.

Amy Marshall-Colon is assistant professor in the Department of Plant Biology at the University of Illinois at Urbana–Champaign, where she leads a research program that uses plant systems biology approaches to integrate genomic and metabolomic information into network models to investigate regulatory crosstalk between primary and secondary metabolism. She teaches an undergraduate genetics course and a graduate-level course in biological modeling. She also leads an internship program in collaboration with the local community college to provide two-year students with training in bioinformatics and systems biology.

After spending quite some time vacillating between research and teaching, **Ursulla Idleman** worked under Amy Marshall-Colon for two years as lab manager and technician. During this time, she grew interested in addressing issues of educational equity in plant biology and developing broader impact and outreach opportunities. This fall, she started graduate school in the University of Illinois at Urbana–Champaign's Department of Curriculum & Instruction to focus on these challenges. Her research interests in plant biology include plant–insect interactions, conservation, and paleobotany.

Genetics of Floral Development

by Christine M. Fleet

The genetics underlying floral development has been well established and provides an accessible introduction to developmental genetics for students. This Teaching Tool will focus on the modified ABC model by which homeotic genes specify floral structure. The Teaching Tool will include consideration of gene regulation via transcription factors and epigenetic mechanisms, as well as consideration of how variation in floral morphology occurs both within and across species. Students will acquire the ability to observe differences in floral morphology and predict how changes in floral gene expression may cause these changes in morphology and to give examples of how floral morphology impacts reproductive success.

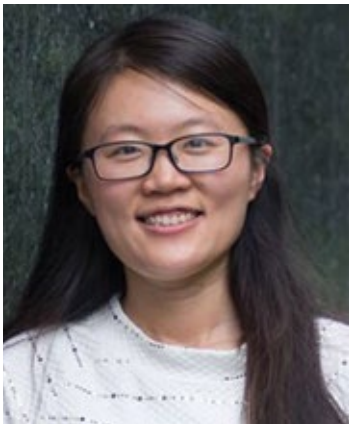
Christine M. Fleet is associate professor of biology at Emory & Henry College in southwest Virginia. Her research interests focus on genetic regulation of plant development. She earned her PhD from Duke University,

working on transcriptional regulation of gibberellin production, and currently enjoys a variety of collaborations with undergraduate researchers. Christine coauthored the Teaching Tools in Plant Biology article on gibberellins.

Herbicide Target Sites and Weed Resistance Mechanisms: Insights into Applied Plant Biochemistry

by Dean Riechers, Rong Ma, and Rex Liebl

Dean Riechers



Rong Ma

Rex Liebl

Herbicides are organic chemicals that interact with specific protein target sites within plant biochemical pathways and disrupt physiological processes for growth and development. Inhibition of these enzymes, or in some cases overstimulation of plant hormone responses (e.g., auxin), can lead to catastrophic effects that are lethal to certain plants. The complex interactions of herbicides with their respective target sites make them exceptionally useful tools to experimentally investigate, manipulate, and better understand plant biochemical and physiological processes. Additionally, the intense selection pressures imparted by herbicides have led to the rapid development of herbicide-resistant weed populations worldwide via unique and diverse resistance mechanisms. Understanding how weeds have adapted to the selection pressures caused by herbicides and investigating these resistance mechanisms at the physiological, molecular, and genetic levels have greatly expanded our knowledge of plant biochemistry and primary metabolism.

Dean Riechers received his PhD in crop sciences at Washington State University in 1996, followed by a two-year postdoctoral position at the University of Virginia, and he is currently professor of crop sciences at the University of Illinois at Urbana–Champaign. His research and teaching programs investigate plant responses to abiotic stresses with the long-term goal of discovering new mechanisms to enhance abiotic stress tolerance in crops. His current research projects use grain sorghum *(Sorghum bicolor)* as a model grass and cereal crop to explore biochemical defense and herbicide detoxification mechanisms in seedling coleoptile tissues and tall waterhemp *(Amaranthus tuberculatus)* to investigate its perplexing and troublesome ability to adapt to current weed management strategies, particularly the rapid development of multiple herbicide-resistant populations.

Rong Ma is a postdoctoral research associate in the Department of Crop Sciences at the University of Illinois at Urbana–Champaign, where she earned her PhD in crop sciences in 2014. One interesting but challenging aspect of her dissertation research was to investigate the detoxification mechanisms that confer resistance to two different herbicides, mesotrione and atrazine, in a population of tall waterhemp *(Amaranthus tuberculatus)* in Illinois. Her current research focuses on the molecular–genetic analysis of etiolated grain sorghum *(Sorghum bicolor)* coleoptiles following herbicide safener or oxylipin treatment using a combination of biochemical, cytochemical, immunological, and molecular techniques.

Since completing his PhD at North Carolina State University in 1985, **Rex Liebl** has worked in herbicide discovery, mode of action, and technical development, first in academia and later in the agrochemical industry. Early in his career, he led biological screening efforts to identify and characterize new herbicide active ingredients. Rex is currently global product development manager at BASF and is responsible for the advancement and commercial introduction of new herbicide active ingredients into the marketplace.

The Plant Cell Wall

by Jenny C. Mortimer and Igor Cesarino

This Teaching Tool will use the plant cell wall to unite aspects of plant physiology (cell wall function), metabolism (polysaccharide and lignin biosynthesis), and biotechnology (current and future uses for plant biomass). This topic can be daunting for a nonspecialist to teach because it seems to require extensive complex biochemistry. This tool will demonstrate that only a brief introduction to cell wall structure and composition is needed in order to formulate and understand the core concepts. We will show that the cell wall is a dynamic and fascinating organelle that was crucial to plant evolutionary milestones (e.g., colonization of land) and is at the core of how the plant grows and interacts with its environment.

Jenny C. Mortimer is a scientist at Lawrence Berkeley National Laboratory in Berkeley, California, where she leads the Plant Systems Biology Group at the DOE-funded Joint BioEnergy

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Jenny C. Mortimer

Igor Cesarino

Wolf Scheible

Peter Lundquist

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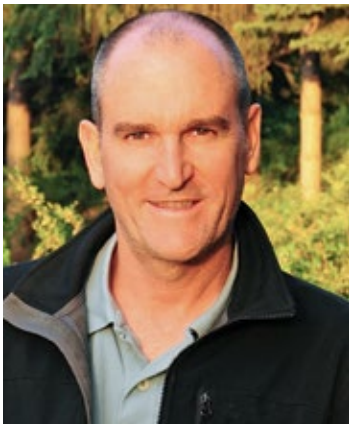
Institute. After completing graduate work with Julia Davies at Cambridge University, United Kingdom, she began studying the plant cell wall and lipid glycosylation as a postdoc with Paul Dupree and the Biotechnology and Biological Sciences Research Council Bioenergy Centre, also at Cambridge University. This was followed by a fellowship at RIKEN Yokohama, Japan, hosted by Taku Demura. Her group seeks to understand the control and function of glycosylation in the plant—specifically, cell wall biosynthesis and sphingolipid glycosylation—and to use this knowledge to improve the production of biofuels and bioproducts from plant biomass.

Igor Cesarino is professor in the Department of Botany, University of São Paulo, Brazil. During his PhD studies at the State University of Campinas, also in Brazil, he worked on characterization of peroxidases and laccases involved in sugarcane lignification and used lignomics to provide the first in-depth characterization of the phenolic profile of sugarcane stems. This was followed by postdoctoral work with Wout Boerjan at VIB/University of Ghent, Belgium, working on lignin metabolism and cell wall engineering for biofuel production. His current work focuses on the molecular mechanisms underlying all aspects of lignin metabolism, including transcriptional regulation, biosynthesis, and polymerization, with a major focus on grasses. The ultimate goal is to engineer lignin deposition to reduce plant biomass recalcitrance for downstream applications such as the production of biofuels and biomaterials.

Peptide Hormones in Plant Biology

by Wolf Scheible, Peter Lundquist, Michael Udvardi, and Sonali Roy

Plant hormones are endogenous signaling compounds that regulate plant growth and development. Small signaling peptides (SSPs) have emerged as major regulators of diverse processes in plant biology. This Teaching Tool will describe the characteristic sequences and structural features of the SSP families and discuss their biosynthesis and transport. We also will introduce students to the importance of SSPs in plants, guide students through state-of-the-art methods for studying SSPs, and discuss the relevance of these regulators in tackling agricultural challenges.



Michael Udvardi

Sonali Roy

Wolf Scheible is a principal investigator in the Plant Biology Division of the Samuel Roberts Noble Foundation in Ardmore, Oklahoma, and was previously a group leader at the Max-Planck Institute of Molecular Plant Physiology in Potsdam, Germany. A focus of his research is to investigate how model plants respond to macronutrient limitation at the molecular level and to apply the acquired knowledge to improve crop and forage plant species. Together with Michael Udvardi and other colleagues, he was recently awarded an NSF Plant Genome Research Program grant to investigate small signaling peptides in *Medicago truncatula,* with an emphasis on macronutrient regulation of root and nodule development.

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Plant Scientists Among First Class of New Foundation-Sponsored Faculty Scholars

The Howard Hughes Medical Institute (HHMI), the Simons Foundation, and the Bill and Melinda Gates Foundation have announced the first class of 84 Faculty Scholars. Among them are six members of the ASPB community. The foundations came together to combat the challenges faced by earlier-career researchers in establishing their careers and successfully competing for their first R01-equivalent grant. The philanthropies have devoted $83 million to fund the first cohort of scholars. The five-year awards come with the stipulation that recipients must devote at least 50 percent effort to research. Please join us in congratulating the recipients.

Siobhan Brady

José Dinneny

Elizabeth Haswell

Siobhan Brady

University of California, Davis

Siobhan maps the transcriptional networks involved in root development. Comparing these networks in different cell types across different species, including crops such as tomato and sorghum, reveals how some plants adapt to abiotic stress.

"I'm really grateful for the award and what it means for my lab to be able to do some cool and exciting science."

José Dinneny

Carnegie Institution for Science

José, a member of the ASPB Science Policy Committee, studies the developmental pathways and molecular genetic mechanisms guiding adaption to drought.

"It's a great honor to be recognized alongside an outstanding cohort of other plant scientists. A better understanding of plants will improve our chances of developing a sustainable civilization. HHMI and the Simons and Gates Foundations get it."

Elizabeth Haswell

Washington University in St. Louis

Liz looks at how plants use mechanosensitive ion channels to sense and respond to mechanical forces such as tension, touch, or vibration. Her team is also developing research tools that will enable the measurement of membrane tension in vivo and exploration of electrical signaling during trap closure in a carnivorous plant.

"I am deeply grateful to HHMI and the Simons and Gates Foundations for supporting our basic research into plant mechanobiology and bioelectricity and for recognizing that plants are valuable systems in which to investigate the fundamental mechanisms of life."

Jennifer Nemhauser

Jennifer Nemhauser

University of Washington

Jennifer's research examines plant signaling pathways to learn how multicellular organisms develop and respond to their environment. She uses insights gained from the molecular networks of natural systems to synthetically program these functions into yeast. Her aim is to develop technologies that support smallholder farmers and foster global health.

"I'm very honored to have my work recognized in this way. This endorsement by HHMI and the Simons and Gates Foundations reaffirms the potential of basic plant biology research to lead to unexpected technologies and human health benefits. I am particularly proud to be pursuing this research at a great public university alongside the outstanding undergraduate and graduate students, postdocs, collaborators, and mentors I've been so fortunate to work with over the past 10 years. Many sincere thanks to all."

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Elizabeth Sattely
Stanford University

Elizabeth studies the biosynthesis of plant compounds that contribute to both plant fitness and human health. She is also interested in using metabolic engineering to produce new versions of plant molecules with potential therapeutic benefits and plants that have enhanced tolerance to environmental stress.


Elizabeth Sattely


Daniel Zilberman

Daniel Zilberman
University of California, Berkeley

Daniel investigates how epigenetic regulation of gene expression functions and evolves. His work with diverse species aims to elucidate the evolutionary history of eukaryotic DNA methylation, understand how methylation patterns are faithfully inherited, and determine the influence of such epigenetic inheritance on the agricultural characteristics of crops.

"I am profoundly honored to be selected as a Faculty Scholar by the HHMI and the Simons and Gates Foundations. The flexible funding provided by this award will allow my laboratory to pursue research interests constrained only by our imaginations. I am excited at the prospect of engaging in the cross-disciplinary exchange of knowledge facilitated by the HHMI research community. I am also deeply gratified by the inclusion of multiple plant biologists among the Faculty Scholars, which recognizes the importance of plant research for gaining fundamental knowledge and improving human health."

The full list of 2016 Faculty Scholars can be viewed at http://bit.ly/2dZD44e. ■

TEACHING TOOLS
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Peter Lundquist is a postdoctoral researcher at the Samuel Roberts Noble Foundation. He completed his PhD at Cornell University, studying chloroplast biochemistry and proteomics, and was an Alexander von Humboldt postdoctoral fellow in Düsseldorf, Germany. His current research interests focus on identifying small signaling peptides in *Medicago truncatula* and understanding their relationship to macronutrient limitation and nodulation. He uses a wide array of complementary tools to address his questions, including transcriptomics, proteomics, and chemical genetics.

Michael Udvardi is director of the Plant Biology Division at the Samuel Roberts Noble Foundation. He is primarily interested in how plants obtain nitrogen for growth, either as mineral nitrogen from the soil or from atmospheric dinitrogen via symbiotic nitrogen fixation in bacteria. Specifically, he has contributed to an understanding of transport and metabolism in root nodules. Recently, his group expanded its work on plant nitrogen to include associative nitrogen fixation and nitrogen recycling during shoot senescence in perennial plants. His group also has interests in plant acclimation and adaptation to abiotic stress, including drought and salinity.

Sonali Roy obtained her PhD at the John Innes Centre in Norwich, United Kingdom, investigating the role of the phytohormone auxin in symbiotic nitrogen fixation. She continues her research interests in signaling molecules during her postdoctoral appointment in Michael Udvardi's lab at the Samuel Roberts Noble Foundation, where she examines the role of small signaling peptides in symbiotic interactions. In addition to investigative research, Sonali enjoys mentoring and providing hands-on training to plant and molecular bioscience students. ■

Where Are They Now?

As the years churn on, many esteemed members of ASPB have passed the torch to their younger colleagues and stepped out of the limelight to allow others to bask in its glory. Yet, many continue their good works to the benefit of plant biology and the world. Edited by Beth Gantt, University of Maryland, "Where Are They Now?" is part of the *ASPB News* suite of columns focused on the personal and scientific life and insights of ASPB members at all stages of their career. This column offers a look into the current activities of influential members of ASPB who continue to make a positive mark on our Society. We hope you all enjoy this addition to your newsletter.

Please feel free to submit your own article to "Luminaries," "Membership Corner," or "Where Are They Now?" For details, please contact Jill Deikman, Membership Committee chair, at jill.deikman@monsanto.com. As always, we are open to suggestions for articles or features of interest to readers of the *ASPB News*.

Maarten J. Chrispeels

Distinguished Professor Emeritus , University of California, San Diego

Where am I now, and what am I doing? Well, I am still here in La Jolla at the University of California, San Diego (UCSD), 48 years in the same building and the same office, overlooking a grassy knoll with a colorful statue by French sculptor Niki de Saint Phalle. Life is still wonderful. I come to my office by bike pretty much every day, at least in the morning. I officially retired from UCSD in 2008 after a career of 41 years. I was fortunate to witness the amazing growth of our vibrant plant biology group to 10 scientists, four of whom are members of the National Academy of Sciences.

During these four decades, I've had a number of "careers," in research, teaching, book writing, working with international partners primarily in Latin America, journal editing, authoring *Biographical Memoirs* of deceased plant biologists who were members of the National Academy, helping to set up two different biotech companies, and in my last phase doing outreach to high school science teachers.

Maarten Chrispeels and wife Janet at an ASPB meeting just before the journals went online. Janet, nee Hageman, is the daughter of Richard Hageman, well known for his research on nitrate reductase in corn.

Academic life is wonderful! After the university awards you tenure, you can do many different types of intellectual activities and are limited only by your own energy.

New Textbook Edition

So, let me start with 2016. With help from 15 other plant biologists, I am working to bring out the third edition of a textbook that I first conceived in 1990 while on sabbatical in Australia. I love to teach in an integrated way, and this text, *Plants, Genes and Crop Biotechnology,* integrates aspects of basic plant biology, molecular biology, genetics and plant breeding, soils and plant growth, agricultural systems, diet, and food production for the still-growing human population. One goal is to help students understand the role of biotechnology in food production: biotech is not a panacea that will feed humanity, but it is an essential tool to improve crops. The new edition will be published by Sinauer Associates in 2017.

High School Outreach

For seven years after my retirement and ending just last year, I helped a few young science educators at UCSD obtain grants to improve science education in San Diego high schools. My involvement started with a phone call from Jeremy Babendure, founder of ScienceBridge at UCSD, who asked me to be the principal investigator (PI) of an NSF grant in the Graduate STEM Fellows in K–12 Education program. These grants gave full fellowships to PhD students to work for one year in a science classroom with one particular teacher. Mentoring in this program was a two-way street, with the student learning how to teach science one day a

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WHERE ARE THEY NOW?
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week and the teacher learning of new advances in science in the grad student's field. Together, each student–teacher pair devised a hands-on activity that drew heavily on the grad student's expertise in his or her field. Unfortunately, NSF decided to close this extremely successful program. NSF and other grant-giving agencies need to recognize that many grad students need to acquire skills they cannot learn at the laboratory bench.

Another ScienceBridge activity was to work with three teachers in the San Diego area to set up three biotechnology classes where high school students made kits that could help other teachers do hands-on classroom experiments such as protein purification, *E. coli* transformation with green fluorescent protein, or the effect of ocean acidification on mollusks. The kits made by the high school students were made available to other teachers in San Diego free of charge.

International Work

During this period, I also had the opportunity to teach a three-week course in crop biotechnology at Huazhong Agricultural University in Wuhan, China. My introduction to China was facilitated by my good friend and colleague Yunde Zhao. I taught twice in two consecutive years. Wuhan, a city of 10 million in central China, has an excellent agricultural university—they made the first Bt rice—and a large program for foreign students. The foreign students come to China with fellowships from the Chinese government to study and do research for a PhD degree. They learn basic Chinese but are not sufficiently fluent to take courses given in Chinese; ergo, some of the courses must be given in English.

Each year I had about 60 graduate students, half from Pakistan and the others from developing countries in Asia and Africa. None were from Latin America, and none were from India because India and China do not have friendly relations. Certainly this was a challenging teaching situation of a kind I had never encountered before. The class met five times a week for two hours. During the last three days of the course, the students in groups of four made presentations about a topic or published paper that was of interest to them. This meant that they had to meet a couple of times, discuss the topic or paper, and make a 15-minute PowerPoint presentation, a learning format that was completely new to them.

Yet another activity during my so-called retirement was my service as the convener of an international panel of scientists to evaluate research grants submitted by scientists from Chile to the Millennium Science Program. Much of the work of the panel members was done at home, but once a year we convened in Santiago to rank order the 15 to 20 best proposals after listening to the PIs and their teams make presentations. These meetings in a Santiago hotel room were intense, not unlike similar evaluation meetings in the United States. Happily, on several occasions I was able to explore other regions of Chile, including the Atacama Desert, the southern lakes and volcanoes, Chiloé Island, and the cities of Valparaiso and Valdivia. It was particularly gratifying to witness the improvement in the quality of the proposals and of science in Chile during my 12 years on the panel. I also tremendously enjoyed my interactions with the international scientists on the panel. By the way, if you go to Santiago, don't miss a visit to the spectacular fish market.

In 2005 my postdoc Gabriella Colucci returned to her hometown of Naples, Italy. She took the plunge (in the Bay of Naples) and set up a small plant biotechnology company called Arterra Bioscience. She asked me to be a cofounder to give scientific advice and help identify worthwhile research goals. Early on, we decided to grow slowly and shun venture capital investors. The company, which is still privately held, now employs 24 young scientists and uses cell cultures from a multitude of plant species to produce botanicals for the skin care industry. The compounds, which activate or repress the expression of specific genes in fibroblasts, are used by some of the major cosmetics companies. I enjoy my annual visits to Arterra and the interactions with bright young Italians, most of them from Naples. Will you be visiting Italy? Forget Tuscany; Southern Italy is much more exciting.

All the Rest

So, what else am I doing? Well, I have a wonderful family. My wife Janet (née Hageman) was a professor of education science at UCSD and retired about the same time I did. We often travel to Europe to visit my family or to visit Arterra in Naples. We have taken each of our four grandchildren on a separate two-week trip to a country of their choosing: Paris and Flanders in 2012; London, Oxford, and northern England in 2013; Uluru, the Barrier Reef, and the Sydney opera house in 2014; and Tokyo, the Japanese Alps, Kyoto, and Hiroshima in 2015. Finally, I am a practical plant biologist and work in my small garden nearly every day. Planting, weeding, and fertilizing the flowers and vegetables in my small garden easily fill my leisure hours. ■

ASPB Summer Undergraduate Research Fellowship (SURF)

https://surf.aspb.org/

ASPB's Summer Undergraduate Research Fellowship (SURF) funds promising undergraduate students so they can conduct research in plant biology during the early part of their college careers. SURF recipients must present their research at ASPB's annual Plant Biology meeting in the year following the fellowship award.

Eligibility

Application is open to all full-time undergraduate students in a degree-granting program. Students completing their second year are preferred, but well-prepared first- and third-year students who provide evidence of a strong interest in plant biology may apply as well. Undergraduates needing more or less than the standard four years to earn a degree may still be eligible. International students or students following nontraditional academic calendars are welcome. In order to provide support to the maximum number of students, SURF awards are limited to students without other sources of stipend or salary for the proposed research. Supplemental funds for room and board are acceptable.

Faculty Mentors

Students must secure a mentor before submitting an application. The proposed research project must be pursued in the mentor's laboratory. Mentors must be a member of ASPB, have an ongoing research program of high scientific merit, and demonstrate a commitment to undergraduate education and research. Mentors are expected to attend Plant Biology 2017 in Honolulu, Hawaii, with their SURF student.

Need a Mentor? Students may work with a mentor at their own institution or at another institution. Additional guidance is available by contacting ASPB (see below).

Application

A complete application will include a research project statement and personal statement from the student, a research and mentoring statement from the mentor, a letter of recommendation from another faculty member (not the mentor or in the mentor's lab), and official undergraduate transcripts.

Selection Criteria

Competitive student applicants should have high academic achievement, strong motivation and skills for conducting research, and career objectives showing interest in or relevance to plant biology. Reviewers also will consider the contribution of the project to the mentor's research program, institutional commitment to the proposed research, and the mentor's commitment to undergraduate research.

Successful applicants receive a $4,000 summer stipend, a one-year membership in ASPB, and $700 (paid to the mentor or institution) for materials and supplies. Each fellowship also provides student travel support to Plant Biology 2018, the ASPB annual meeting, to be held July 14–18, 2018, in Montreal, Canada. These travel funds are sent only to the 2017 SURF recipients who (1) register for the meeting, (2) submit proof of using social media or other outlets to communicate with the public or peers about the SURF project, and (3) author and submit an abstract about their SURF project to present as a poster at the meeting.

A Successful SURF Applicant's Sample Timeline

Contact potential mentors: NOW

Discuss research topics: NOW

Request a reference letter: by January 2017 (from college/university faculty member who is not the mentor)

Submit SURF application: by the deadline, February 10, 2017 (11:59 p.m. ET)

Look for emailed decisions: by mid-April 2017

Conduct research: over 10 consecutive weeks when classes are not in session

Present research: July 14–18 at Plant Biology 2018 in Montreal, Canada.

Applications will be accepted December 1, 2016, through February 10, 2017 (11:59 p.m. ET).

Need additional help?

Contact Katie Engen, ASPB Education Coordinator (katie@aspb.org).

Policy Update

BY LAUREN BROCCOLI
Lewis-Burke Associates, LLC

Congress Passes Continuing Resolution, Departs for Recess

On September 28, Congress passed a continuing resolution (CR) to fund government operations through December 9. With only two days to spare before the end of the fiscal year (FY) and in order to prevent a government shutdown, the bill passed with rare bipartisan support, with a Senate vote of 72–26 and a House vote of 342–85. The CR funds almost all federal agencies, associated programs, and projects at FY2016 levels and prohibits federal agencies from starting new programs, projects, or activities. With respect to the federal science agencies, any funding decisions and awards that require FY2017 funding will be delayed.

The CR includes $1.1 billion to respond to the Zika virus and $500 million in flood relief for Louisiana, West Virginia, and Maryland. The funding for Zika research is directed primarily to the Centers for Disease Control and Prevention to study the long-term health impacts of birth defects caused by the virus and to NIH to advance a potential vaccine through Phase II clinical trials.

Congress now has until December 9 to pass the remaining 11 FY2017 appropriations bills, another CR, or an omnibus bill—a large catchall spending bill. There is little support from House members, including Speaker of the House Paul Ryan (R-WI), for an omnibus bill, so a likely scenario may be passing a few minibuses—a package of three to four spending bills. If Congress does not pass these bills by December 9, it can pass another short-term CR to allow time for more negotiations. Two significant factors will influence the likelihood of completing FY2017 appropriations bills by the end of the year: (1) the outcome of the presidential election and (2) the party that gains control of the Senate. Some members may want to push funding decisions until 2017 if election outcomes improve their negotiating positions.

Source and Additional Information

- The House Appropriations Committee news release on the CR is available at http://tiny.cc/ddwjfy.

House Passes Global Development Lab Act

On September 21, the House of Representatives passed H.R. 3924, the Global Development Lab Act, by voice vote. Originally introduced in November 2015, the bill had bipartisan support from its cosponsors, Representatives Joaquin Castro (D-TX), Michael McCaul (R-TX), Brad Sherman (D-CA), Adam Kinzinger (R-IL), and David Cicilline (D-RI). The legislation formally authorizes the U.S. Agency for International Development's Global Development Lab program, launched by the Obama administration in 2014. The program fosters collaboration with diverse groups to accelerate tools and innovation to support effective and sustainable objectives in developing countries. Companion legislation has been introduced in the Senate and referred to the Committee on Foreign Relations.

Source and Additional Information

- Text and details on the bill are available at http://tiny.cc/72tjfy.

Senator Stabenow Announces Urban Farming Bill

On September 26, Senate Agriculture Committee Ranking Member Debbie Stabenow (D-MI) introduced the Urban Agriculture Act of 2016. The legislation aims to address the nontraditional needs of urban farmers by expanding existing USDA programs. Specifically, the bill would increase and expand USDA's authority to support programs and cooperatives for urban farms; develop urban agriculture policy; and support additional mentorship, research, and financial tools. The bill is a glimpse into Senator Stabenow's priorities and is likely to be incorporated into the next Farm Bill rather than advance as a standalone piece of legislation.

Recently, USDA established a working group on urban agriculture and created an Urban Agriculture Toolkit that provides information for urban farmers. The agency does not have a formal urban agriculture program at this time.

Sources and Additional Information

- A press release with additional details about the bill is available at http://tiny.cc/w3tjfy.
- More information on USDA efforts related to urban agriculture is available at http://bit.ly/1SyWhFO.

USAID: Food-Secure 2030 Report

In September, the U.S. Agency for International Development (USAID) released a new report, *A Food-Secure 2030: A Global Vision and Call to Action,* a month after Congress passed the Global Food Security Act (GFSA). The GFSA provided authorization legislation for USAID signature programs and initiatives, including the Feed the Future Innovation Labs. The *Food Secure 2030* report outlines 17 sustainable development goals for the global community to "raise incomes, improve nutrition, and increase resilience." This comprehensive report calls for stronger leadership from developing countries and engagement with the private sector, donors, development institutions, and civil society to collaborate against the threat of food insecurity.

Source and Additional Information

- The full report is available at http://tiny.cc/64tjfy.

FFAR Announces Rapid Outcomes from Agricultural Research Program

On September 26, the Foundation for Food and Agriculture Research

(FFAR) announced the launch of the Rapid Outcomes from Agricultural Research (ROAR) program, a new initiative focused on mitigating the spread of harmful pests and pathogens in agriculture. A response to the devastating outbreak of avian flu last year, ROAR is intended to increase emergency response capacity and strengthen engagement and collaboration with the agricultural community. With particular attention to situations that require rapid response, emergency grant proposals submitted under ROAR will be reviewed within a week of the submission date, with an expedited research and resource provision process for those that are approved.

This program is structured around industry coalitions. Commodity groups will enter into an agreement with FFAR prior to any proposal submission that will qualify them for the expedited review process and will be required to match FFAR funding up to $150,000 should their emergency request be accepted. The intention is that this preexisting agreement will streamline the application process and increase the speed and efficiency with which FFAR is able to provide the necessary resources.

Sources and Additional Information

- More information about the ROAR program is available at http://tiny.cc/75tjfy.
- The press release announcing this program is available at http://tiny.cc/e6tjfy.

NSF Releases ADVANCE Program Solicitation

NSF released a solicitation for the new Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers (ADVANCE) Program. The goals of the ADVANCE Program are to "develop systemic approaches to increase the representation and advancement of women in academic science, technology, engineering, and mathematics (STEM) careers; to develop innovative and sustainable ways to promote gender equity that involve both men and women in the STEM academic workforce; and to contribute to the research knowledge base on gender equity and the intersection of gender and other identities in STEM academic careers." The program has three distinct tracks:

- the Institutional Transformation track, which will support "innovative organizational change" within a nonprofit two-year or four-year academic institution;
- the Adaptation track, which supports implementation of "evidence-based organizational change strategies, ideally from among those developed and implemented by ADVANCE projects"; and
- the Partnership track, which will support partnerships between two or more academic institutions.

NSF anticipates a total of $22 million available for 18 to 26 awards. Letters of intent are due on December 14, 2016.

Source and Additional Information

- The solicitation is available at http://tiny.cc/d7tjfy. ■

NSF Awards $24 Million to Launch the Center for Engineering Mechanobiology

A $24 million grant over five years from NSF will establish the Center for Engineering Mechanobiology (CEMB). This center is one of four new Science and Technology Centers supported by NSF. CEMB will investigate how mechanical forces affect the morphology and function of plant and animal cells and use this information to develop new technologies for better crop management and therapeutics. The center will also include an educational program to recruit students from minority-serving institutions and provide multidisciplinary training for the next generation of scientists.

The plant biology component of this center will be spearheaded by Ram Dixit, Guy Genin, Liz Haswell, Barbara Pickard, Lucia Strader, Marcus Foston, and Anders Carlsson from Washington University in St. Louis. Other partners of CEMB include the University of Pennsylvania, Boston University, New Jersey Institute of Technology, Bryn Mawr College, Alabama State University, and University of Maryland.

More information is available at http://www.nsf.gov/news/news_summ.jsp?cntn_id=189782.

Congress Ratifies International Plant Germplasm Treaty

BY TYRONE SPADY
ASPB Legislative and Public Affairs Director

After years of community advocacy, Congress finally passed the International Treaty on Plant Genetic Resources for Food and Agriculture (http://www.foreign.senate.gov/treaties/110-19). The treaty is a technical, international agreement that aims to enhance global food security through access to and exchange of materials used to improve crops. The treaty also standardizes the terms by which researchers can access these materials. First signed by President George W. Bush, the treaty took nearly 15 years to wind its way through the Byzantine U.S. Senate ratification process.

The story of ASPB's role in that process is particularly illustrative. Congressional action on nonappropriations (funding) bills can be characterized as punctuated equilibrium. Often there are long periods of marginal legislative activity on an issue. Days give way to weeks. Weeks give way to months. Months give way to years. In spite of congressional inaction, the advocacy community must push relentlessly, without knowing when or if an issue will see the light of day and ultimately get a vote.

Within the context of the treaty and for the past several years, ASPB worked with a coalition of more than 80 national grower groups, seed companies, and other scientific organizations in support of the treaty. The Society has written letters, the Science Policy Committee has met with staff of the Senate Foreign Relations and Agriculture Committees, and ASPB staff and the Society's government relations consultants (Lewis-Burke Associates) have lobbied key Senate offices.

By early summer, it was starting to look as if our collective efforts were bearing fruit. The Senate Foreign Relations Committee held a briefing for their colleagues on the Agriculture Committee and weeks later announced that the treaty would possibly come up for consideration during the week of Plant Biology 2016; it did.

As Plant Biology 2016 was concluding, we learned that Senator Rand Paul (KY) had thrown a wrench into the process by voicing an objection to the treaty. He was concerned that ratification might come with the burden of new federal programs. The Science Policy Committee rapidly swung into action and recommended the enlistment of five Kentucky plant scientists and the executive director of the state's corn growers association. Between scrambling to make flights and coordinating with our DC colleagues, ASPB staff and Lewis-Burke began to individually contact the plant scientists recommended to us by the committee. We asked them to contact Senator Paul's office and to urge their colleagues to do the same. According to Paul's staff, they received 8 to 12 emails about the treaty, and Senator Paul formally withdrew his opposition within 24 hours of receiving our first email. The senator's initial objection, however, resulted in a delay of the vote on the treaty until after the August recess.

None the less, the treaty was ultimately ratified thanks in large part to the quick and targeted mobilization of ASPB members and their extended community. Though much of the Society's legislative advocacy takes place behind the scenes, it could not happen without the dedication of the Science Policy Committee and willingness of ASPB members to heed the call. ■

Sharon B. Gray

1985–2016

BY SIOBHAN M. BRADY and KAISA KAJALA, University of California, Davis, and ANDREW D. B. LEAKEY, University of Illinois at Urbana–Champaign

Sharon B. Gray was born November 25, 1985, to Thomas and Pamela Gray in Carbondale, Illinois. She had three brothers and two sisters. Many of her formative years were spent in Lindenhurst, Illinois, where she attended Antioch High School, excelling academically and participating in gymnastics and charitable activities. Sharon credited her parents with instilling strong environmental awareness and scientific interest in her as a child. In particular, family camping and hiking trips were formative experiences.

These activities were a lifelong passion for Sharon that only grew further through her relationship with her husband, Robert Cody Markelz, on trips across the United States and to Australia. They also informed her personal and professional philosophy. In one fellowship application, Sharon wrote, "I feel that when the human race acquired the technology and evolved the intelligence necessary to build an industrial society, it also acquired the moral obligation to understand and monitor its impact on the rest of the world."

This belief led her to study the response of plants to global environmental change. She did so with a particular passion for integrating across disciplines, including plant physiology, molecular biology, development, and ecology. At the time of her death, she was uniquely poised to lead her own group and to make important contributions to understanding and improving plant stress tolerance in a changing environment.

Undergraduate Accomplishments

Sharon earned her BS in integrative biology, with distinction, from the University of Illinois at Urbana–Champaign (UIUC) in 2006. She began her research career during her sophomore year through an independent study with Dr. Evan DeLucia. Foreseeing many current explorations into high-throughput phenotyping, Sharon demonstrated that rapid measurements of canopy reflectance spectra reflected structural and physiological effects of changing tropospheric chemistry on soybean growing in a field setting. Sharon published her undergraduate research project in the *Journal of Experimental Botany*.

She then made the strategic decision to gain more research experience before starting graduate school and won a Global Change Education Program (GCEP) fellowship from DOE to work with Dr. Aimee Classen at Oak Ridge National Laboratory. There Sharon studied the effects of global environmental change on the soil microbial community and soil respiration. Sharon continued this research with a second GCEP fellowship to work with Dr. Michael Miller at Argonne National Laboratory and published her findings in the *Soil Science Society of America Journal*. Thus, before beginning graduate school, Sharon was the first author on two publications and was demonstrating her skill and commitment as a mentor by working with other undergraduate fellows in the research groups.

Sharon presenting her work at the UC Davis Postdoctoral Research Symposium in May 2016.

PhD Accomplishments

In 2008, Sharon returned to UIUC to begin graduate studies in the research group of Dr. Andrew Leakey. Her research was based at the Soybean Free-Air CO_2 Enrichment (SoyFACE) facility and supported by a Graduate Research on the Environment Fellowship from DOE. Sharon assembled a substantial and multifaceted eight-year dataset combining her own observations with those of collaborators. It revealed that the expected stimulation of soybean yield at elevated CO_2 was lost as drought intensified. This new evidence from a field study in the primary area of soybean production contrasted strongly with the prevailing view in the literature that elevated CO_2 in the future would ameliorate drought stress.

She also identified three mechanisms that combined to

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SHARON GRAY
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drive the observed yield response. This work involved analyses of root-to-shoot hormone signals, metabolic fluxes, root and nodule distributions, tissue composition, canopy dynamics, and micrometeorology, demonstrating Sharon's exceptional ability to integrate across biological levels and to collaborate. She led teams of up to 12 undergraduates, graduate students, postdocs, and faculty members on large field sampling campaigns and coordinated data exchanges with nine coauthors for her analysis.

The novelty and significance of her findings resulted in papers published in *Nature Plants* and *Functional Plant Biology*. In addition, Sharon won the Govindjee Award for Excellence in the Biological Sciences at UIUC and the Robert Emerson Award for most meritorious thesis in integrative biology at UIUC, and she was invited to present her work in a Keystone Symposium.

Sharon's contributions as a PhD student went well beyond her academic and research successes. She used her warm and engaging personality to great effect as an award-winning teacher in formal university settings and in numerous outreach activities to diverse audiences. Sharon was part of the graduate student team that conceived and initiated the Plants iView project as a new outreach program on plant biology for middle school students, with funding from the ASPB Education Foundation and UIUC. The program is still active and student-led five years later. Within the Leakey research group, Sharon achieved her own research goals while making time to mentor eight undergraduate students doing independent research projects, some of whom went on to their own graduate careers at UIUC, Penn State, and the University of Minnesota.

Sharon measuring leaf photosynthetic gas exchange of soybean in an experiment at the Soybean Free Air Concentration Enrichment (SoyFACE) *facility at University of Illinois at Urbana–Champaign.*

But Sharon's ability to relate and connect with people from all backgrounds was perhaps best on display through the friendship she forged with Jo Pride. Jo was part of the inaugural class of senior citizens that regularly visited the Institute for Genomic Biology at UIUC from the Osher Lifelong Learning Institute. Over several years, Sharon and Jo teamed up to perform experiments and to discuss the relationship between cutting-edge scientific research and the grand challenges facing society today. Their technical and philosophical conversations often slipped into conversations about the plans for Sharon's upcoming wedding or Jo's family history and embodied the way that science and life are inseparably intertwined.

The memory of Sharon as an exemplary academic researcher, teacher, and mentor who enriched the lives of all who encountered her—from one-time interactions at conferences to long-term professional relationships and friendships—will remain strong and positive, just like Sharon herself.

Postdoctoral Accomplishments

At the completion of her PhD, Sharon knew that she wanted to expand her skill set in two fields of research—developmental biology and molecular biology. A central result of her PhD research was that root system architecture in soybean had changed in response to drought and elevated CO_2 in unexpected ways. Sharon wanted to further understand the underlying mechanistic events that could give rise to these changes. Sharon interviewed for a postdoctoral position at the University of California, Davis, in 2012 and presented an inspiring seminar. She answered very critical and probing questions with patience and determination. She very clearly expressed the skills she wished to learn and her desire to obtain an academic position in the future.

At that moment, it was clear to all in the room that Sharon was going to fill a strategic and important niche in the field of plant biology—a nexus between physiology and molecular developmental biology. In order to pursue this avenue of research, she successfully wrote and received one of the first NSF Plant Genome Research Program Postdoctoral Fellowships. This cohort of postdoctoral fellows remains active, and Sharon was a central figure in this tight-knit group.

According to Sharon, her first months of postdoctoral research were challenging and the learning curve steep. However, those around her would not have known that she ever struggled. She embraced every possible opportunity available to her—and even created others. She learned how to prep RNAseq libraries in parallel and how to carry out immunoprecipitations, and she read literature about all the central genes and hormones involved in plant root and vascular development. She learned how to perform cross-sections of roots in very high throughput, and she could name the different cell types of a root and draw them out on command. We experimented with dyes to stain for suberin and lignin, and she trained a cohort of undergraduates while giving them each unique research projects that both assisted her and developed

their research skills in a way that would help them fulfill their future aspirations. One undergraduate recently shared with me (SMB) that she couldn't wait to finish her PhD and do a postdoc with Sharon.

Sharon participated in hackathons and R club, and she went to Germany for a month to learn metabolite profiling (and embrace glühwein and Christmas markets). She was continually trying to better herself, to prepare for an independent academic position, and to balance work and family, and she endeavored to spend time skiing and exploring all that California offered with her husband and best friend. Through all this, we learned of her enormous beloved family, her nieces and nephews, and her chemist father and mother who managed to homeschool a bevy of six spirited children. She had self-confidence and poise and even managed to count an NSF program director as an important mentor.

Sharon was at a critical transition point in her career; she was so excited and determined to obtain an independent academic position. She lived in a gray area between plant physiology, climate change, and developmental biology and understood all the questions that remained to be answered. In parallel to completing her NSF PGRP-funded project, she was coordinating a field experiment in the summer of 2016 (both in her home garden and in UC Davis fields) to test how molecular signatures in individual cell types changed in the field relative to the greenhouse.

In the presumed last year of her postdoc, I (SMB) appointed her as the key scientist in an exciting project to study the influence of microbes on the parasitism of sorghum by *Striga*. Above all else, Sharon was inspired to perform research to facilitate change, both global and local. The experiments to be performed in Ethiopia drew directly on the tools and skills she had developed in her NSF PGRP project. This project was a perfect fit for her—it involved extensive organization, mentorship with a diverse group of scientists, and most importantly the ability to transition into a role of leadership. Within the first 24 hours of her time in Ethiopia, the group of researchers, who had never met her, loved her. She cracked jokes, was consulted for her research expertise, and managed to always be the first to spot exotic animals. She had an extraordinarily bright career ahead of her. She was sure to be a leader and a beloved mentor to her future research group.

A particularly difficult moment for Sharon during our time in Ethiopia was when she realized the challenges facing Ethiopian scientists and, in particular, the very small (but growing) number of female scientists. A fund has been developed in her honor to promote women at an early career stage in science, with hopes to train Ethiopian scientists in skills that they are unable to learn given the current infrastructure (https://www.gofundme.com/sharonbethgray).

Sharon will be deeply missed by many—her light, her determination, her knowledge, her laughter and friendship. Those of us who knew her are dedicated to honoring her memory and to completing her work and will strive to meet each challenge as she did—with patience, empathy, creativity, diligence, enthusiasm, and respect. ■

Kentaro Inoue

1968–2016

BY STEVE THEG, University of California, Davis; KEN KEEGSTRA, Michigan State University; and REBECCA ROSTON, University of Nebraska–Lincoln

On August 31, 2016, we lost our colleague and friend Kentaro Inoue in a tragic bicycling accident.

Kentaro was born in 1968 in Fukuyama, Japan, to scientist parents and spent his early years in Niihama. He received his PhD in 1996 from the School of Pharmaceutical Sciences at the University of Tokyo, working with Yutaka Ebizuka on a novel plant enzyme involved in the synthesis of plant steroids. His studies included detection of the enzyme, purification of the protein, and molecular cloning of the gene. Professor Ebizuka recently described Kentaro as a much beloved student, friendly to all and full of jokes and laughter.

Kentaro performed postdoctoral research with Rick Dixon at the Samuel Roberts Noble Foundation in Ardmore, Oklahoma, where he studied enzymes involved in lignin biosynthesis. During a second postdoc with Ken Keegstra in the Plant Research Laboratory at Michigan State University, Kentaro began studying chloroplast biogenesis, a topic he would pursue for the remainder of his extremely successful scientific career. His early studies focused on biophysical aspects of the interaction between precursor proteins and the surface of chloroplasts, and he later moved into investigating other aspects of the protein import process.

Kentaro enjoying the mountains and smiling as usual.

In 2002 Kentaro took a position as assistant professor in the Pomology Department at the University of California, Davis. He brought with him a project that seemed at the time both exciting and unexpected. He had described a protein in the chloroplast outer envelope membrane (OEM), Toc75, that appeared unique in that it had a cleavable transit peptide. Even today it remains one of only a few such OEM proteins. More surprising still, the enzyme that cleaved the transit peptide had already been described as residing in the thylakoid membrane, where it processed proteins as they entered the lumen. Either Toc75 visited the thylakoid lumen space on its way to residency in the OEM (a crazy idea advocated to Kentaro by Steve Theg), or the processing enzyme resided in two locations in the chloroplast (an equally crazy notion at the time, and advocated by Kentaro).

During this time, the unorthodox idea that proteins from single transcripts could take up dual positions in both the mitochondria and chloroplast was being developed. But a protein with dual locations within a single organelle was unheard of. As Kentaro built his lab at UC Davis, he stuck with his instincts, and with his students produced the data to prove that this was indeed the case with Plsp1. Always the gentleman and friend, he never mentioned that Steve had been wrong and he had been right.

While this work was progressing, Kentaro also started looking into the evolution of the machinery that translocates proteins into the chloroplast, and this became the second major focus of his lab. In particular, he investigated the evolutionary relationships between Toc75 and a related protein, OEP80, and their relationships to orthologous β-barrel proteins in mitochondria and bacteria. Through these projects, Kentaro became one of the world's experts on organellar β-barrel proteins, and he established many fruitful collaborations with colleagues at UC Davis and around the globe.

As a mentor, Kentaro constantly urged his students to become outstanding scientists. This drive for excellence applied not only to his students, but also to himself. If his students were expected to work hard, Kentaro expected himself to work harder. He was an excellent teacher of lab techniques, literature critique, protocol development, and scientific presentations. He shared his time and energy generously with both his current and former students and colleagues, and he never hesitated to perform any task he thought would benefit them. Kentaro's hard work, his leadership by example, his commitment to mentorship, and his consistent adherence to scien-

Akira Tanaka

1924–2016

The following article first appeared in the September 2016 issue (http://bit.ly/2fice3J) of the IUSS Alert. It is reprinted here with permission from the International Union of Soil Sciences.

Akira Tanaka passed away on August 22, 2016, at the age of 91. He was president of the International Union of Soil Sciences from 1986 to 1990 and of the Japanese Society of Soil Science and Plant Nutrition in 1980–1981.

Akira, emeritus professor at Hokkaido University, devoted a large part of his life to research in soil science and plant physiology. One of his distinguished achievements was a great contribution to the rice production boost in Asia that people call the "green revolution." During his stay at the International Rice Research Institute from 1962 to 1966, Akira proposed an ideal plant type concept of tropical rice plants based on theoretical and practical experiments. His proposal was eventually realized as modern, high-yielding cultivars through close collaboration with breeders. At the same time, Akira surveyed the fertility of various soils, especially in Asian countries, and contributed to establishment of an appropriate fertilizer manipulation.

Akira Tanaka

Akira published nearly 200 research papers, many reviews, and several monographs, and he gave academic speeches at various international meetings and symposia. He participated actively in international and national organizations such as the Food and Agriculture Organization, the Consultative Group for International Agricultural Research, the World Vegetable Center, and the Chinese Academy of Sciences. He received the Japan Academy Prize and Japan Prize for agriculture in 1975, was awarded Corresponding Membership by ASPB in 1984, and served on the committee of the 2004 International Year of Rice. ■

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tific integrity remain an inspiration to all those who knew him.

Kentaro's friends and students describe his terrific sense of humor and impeccable comedic timing. He was a master at teasing us with a straight face, and he used both his Japanese accent and odd English turns of phrase to keep us on our toes. When he first arrived at UC Davis, for instance, he stated to at least two new colleagues that he was from France with such a serious demeanor that he was believed, and only much later after a "wait-a-minute" moment did they realize that of course he was from Japan. This humor permeated all he did, and his research seminars were brilliant combinations of first-rate science punctuated with moments that had the audience holding their sides in laughter.

Kentaro was an avid cyclist, both on the road and off. Even as a postdoc in Ardmore, where there are no mountains, Rick Dixon suggests he found more mountain biking trails than anyone in Oklahoma knew existed. In Michigan he remained an avid biker and not only rode the trails but helped build and maintain them as well; one advanced trail in Burchfield Park in Mason, Michigan, bears his name today—Kentaro's Monster. He rode with the Davis Bicycling Club and was known for both his toughness and generosity in taking the harder positions during long rides, with his lightness of spirit and sense of humor always in evidence.

Compounding our loss in the plant biology community, Kentaro was recently married to Amy Brown, a Roseville, California, veterinarian. They met at the UC Davis Arboretum, and true to their love of the mountains, he proposed to Amy in an alpine meadow next to a glacier in the Canadian Rockies. They were married in February in a small ceremony in the snow in Yosemite. A collection has been started to place a memorial bench in Kentaro's name in the UC Davis Arboretum.

Kentaro is survived by his wife Amy, his parents Yasuhiko and Yuko Inoue, and his sister Meiko Inoue. He was an extraordinary scientist, a dedicated mentor and teacher, and a fun-loving friend. The accident that ended his life was a tragedy felt by the plant biology community around the world, and he will be sorely missed by so many of us who knew, respected, admired, and loved him. ■

The link below is provided for anyone who wishes to make a contribution towards Kentaro's Scholarship Fund to support grad and undergrad students: https://give.ucdavis.edu/Go/InoueScholarship.

A Tribute to Roger Y. Tsien

1952–2016

BY JULIAN I. SCHROEDER, University of California, San Diego
and PETER K. HEPLER, University of Massachusetts

Roger Y. Tsien passed away on August 24, 2016. His wife, Wendy Tsien, informed us that he suffered a medical event while cycling on a trail in Oregon. Although Roger was not a member of ASPB, his impact on plant biology has been profound and far-reaching. Moreover, he was very interested in plant biology and fascinated by the plant biological questions that were addressed or resolved by the tools he had developed.

Roger is widely known for his research at the University of California, San Diego, where he transformed the green fluorescent protein (GFP), rendering it the powerful tool it is today. Following structural analyses of GFP, he eventually created fluorescent proteins that emit light at virtually every wavelength of the visible spectrum. In his most recent publication, Roger and his collaborators reported the development of a far red fluorescent protein, an optically desirable wavelength for many experiments and applications, using a phycobiliprotein. Roger's motto in biology was "seeing is believing," and he enabled many scientists around the world to see their favorite proteins at work in real time in living cells and organisms. He shared the Nobel Prize in Chemistry in 2008 for his development of these elegant and powerful fluorescent proteins.

Roger Tsien at the University of California, San Diego, on the day the Nobel Prize was announced in October 2008.

Roger made seminal contributions to major areas of research in chemical biology and signal transduction. He was a self-described biomolecular engineer. Roger's contributions began during his PhD research in Cambridge, England, with the rational design and synthesis of extremely useful Ca^{2+} chelators, including BAPTA, and an intracellular calcium Ca^{2+} indicator (quin2).

Among Roger's early studies as a faculty member at UC Berkeley, the 1985 publication reporting the synthesis and characterization of the Ca^{2+} reporters fura-2 and indo-1 stands out as a towering achievement. These dyes allow scientists to quantitatively track stimulus-dependent Ca^{2+} changes in almost any given cell type, including plant cells, and even in networks of cells, and to noninvasively (i.e., without electrodes) monitor their activity in real time. The use of fura-2 and indo-1 spread like wildfire in the cell biology and cell signaling communities, and early adopters in plant biology included Russell Jones, Doug Bush, and one of us (PKH). Before commercial setups became available for using this technology, cell biologists would rig electric motors that drove filter wheels (in some cases driven by a household rubber band, as accomplished by one of our advisers, Erwin Neher). Indeed, given the enormous impact of this technology, many in the cell signaling and physiology communities anticipated that this work would be recognized by the Nobel committee.

In the 1980s at Berkeley and the 1990s and thereafter at UC San Diego, Roger's laboratory designed chelators that release or remove free Ca^{2+} upon photoactivation and organic molecules to release nitric oxide intracellularly upon photoactivation. He developed a general approach to make membrane-permeant derivatives of intracellular messengers for noninvasive cellular loading, caged molecules that can perturb signal transduction with unprecedented three-dimensional spatial resolution, and more recently a novel strategy for in vivo targeting of therapeutic agents to tissues (especially tumors) that express specific protease activities. His group also pioneered the first fluorescence resonance energy transfer (FRET) reporters for biological signaling, including Ca^{2+}, cAMP, and membrane potential, that provide fast optical signals.

Roger is also widely known in the area of protein engineering. His lab made impressive gains toward understanding, improving, and extending the usefulness of GFP. Most of the huge number of applications of GFP in biology use mutations developed in his lab to confer improved spectral properties or altered colors. His

group used pairs of differently colored GFPs to build the first genetically transformable fluorescent indicators of cytosolic and organellar Ca^{2+} (the "Cameleons," well known in the plant sciences). He also developed reporters for kinase activities and for monitoring dynamic protein–protein interactions, all in individual live cells in real time.

Meanwhile, Roger led the development of the next generation of molecules beyond GFP. His group discovered the chromophore structure and tetrameric nature of red fluorescent proteins, then introduced 33 mutations to make them monomeric (a feat deemed not possible by some experts). Other creations include the report in 1998 of a ß-lactamase–based system that allows for ultra-high-throughput/high-resolution identification of drugs that activate or inhibit transcription of specific genes at a resolution >3 orders of magnitude than GFP and with ratiometric quantitation. He also developed a tiny tetracysteine motif that can target organic fluorophores to specific proteins in live cells and reveal the proteins' age in the cell and electron microscopic location or mediate rapid photoinactivation.

Roger's molecules are comparable with patch clamping or the polymerase chain reaction in their impact on modern biology. For example, his fluorescent indicators for Ca^{2+} were crucial to the discovery of many important ligand-activated receptors, because these were found by screening expression libraries for cells that elevated Ca^{2+} in response to appropriate stimuli. Conversely, when the target protein or signaling pathway is known, Roger's indicators enable ultra-high-throughput screening of large numbers of candidate agonists or antagonists and thus continue to revolutionize the pharmaceutical drug discovery process.

In addition to being a molecule builder, Roger was a leader in the cell biology of signal transduction. Among his many major accomplishments in this area are the first direct measurements of the increases in cytosolic free Ca^{2+} associated with immune cell activation, secretion, and the cell cycle; pioneering investigations into the occurrence and mechanism of Ca^{2+} oscillations; evidence that a major function of such oscillations may be to optimize gene expression; the discovery of intracellular Ca^{2+} gradients correlated with the directionality of toxin secretion from cytotoxic T lymphocytes; and the first direct evidence in the retina that cytosolic Ca^{2+} falls during illumination, contributing to the revised present model for phototransduction and the characterization (in collaboration with Susan Taylor's group) of signals for protein export from the nucleus.

Roger's originality and independence greatly influenced the members of his lab, who roamed the interface of chemistry and the life sciences freely and without haste. One reason his lab often appeared relaxed and a creative hub may have been that projects were often thought up 10 years before they became published and pressing topics. Roger had a knack for thinking what might be needed down the road and coming up with feasible and widely useful solutions.

In his most recent work, Roger developed a new, fascinating, and testable theory on long-term memory. In a recent email exchange with one of us (JIS), he stated with his usual modesty that the next generation of scientists would have to test it (all too true now), although his lab and collaborators were well on the way to testing some of the tenets of this "Tsien theory."

In summary, Roger emerged as one of the foremost cell and molecular biologists of our day. For those who knew him personally, he was generous with his tools and advice. When one of us (JIS) was outlining new projects in which new imaging had potential, Roger was available. We met, and the discussion often went back and forth, reaching to many options (*Roger:* "Try this." *JIS:* "But plant cells have this limitation. What about . . . ?" *Roger:* "Yes, but . . . "). We would often settle on some high-risk but potentially valuable approach. I often brought a postdoc along who was interested in the project to experience these discussions, and the postdoc would later be allowed to use Roger's many instruments freely.

Roger and Wendy have shone through their kindness and humanist activities, whether through adoption of a three-legged dog from the humane society or their deep interest in the arts. Regarding art, at a FASEB conference in Saxtons River, Vermont, in 1996 that we both attended, one of us (PKH), on learning of Roger's interest, was able to tell him about the unique offerings nearby in western Massachusetts. Just by chance, some years later while visiting the Massachusetts Museum of Contemporary Art in North Adams, I ran into Roger, who mentioned that he had just been at a Gordon Research Conference and was on detour through the museums in western Massachusetts.

On a personal level, Roger was thoughtful and generous. In one example, when he was awarded the Nobel Prize, he learned that Douglas Prasher, who had cloned the original GFP, had since become an airport van driver in Alabama (triggered by lack of grant funding). Roger and his corecipients invited Prasher to attend the Nobel ceremony, where Prasher's contributions were highlighted. Later, Prasher reentered science when Roger generously invited him to join his lab.

Roger was brilliant, seemingly constantly pulling together observations and knowledge from disparate fields spanning quantum mechanics to cancer surgery, coming up with innovative ideas on how to solve vexing problems. As we hear repeated, many who knew him state, "He is the smartest person I have ever met." He entered Harvard University as a 16-year-old undergraduate in chemistry and physics, after having won the prestigious nationwide Westinghouse Talent Search prize for a chemistry project he cooked up in his family's basement. He became attracted to biological questions. Roger had a wonderful sense of humor and quipped how early on biologists rejected him as a chemist and chemists rejected him as a biologist. He beautifully bridged the two communities. His ability to make molecules and apply chemical principles to them to address biological questions seemed endless, and he has inspired many who are following in his tracks.

One of his well-respected (and much anticipated) scientific exer-

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cises was to attend science seminars spanning diverse disciplines. During the seminars, he would look off to the side, seemingly thinking of some other matter, and then in the discussion ask razor-sharp questions, often coming close to cutting a significant hole in the speaker's model. Both of us had the opportunity to get to know Roger well when we attended a workshop on calcium research in plants in January 1989 in Kona, Hawaii. The positive impact of his presence was felt by all the attendees as he became involved in the frequent open discussions. Indeed, we recall the lively exchanges between Roger and Lionel Jaffe that focused on the positive and negative properties of fura-2 versus aequorin for detection of intracellular Ca^{2+}. It was also at this meeting that Roger and one of us (PKH) played piano four hands. I had not realized, however, that Roger had seriously considered a career as a concert pianist. There was thus a considerable difference in our abilities, but he was gracious. Wendy tells us he opted for science over concert piano because "he felt he had a chance of doing not too badly." Roger loved cycling, hiking, and the outdoors, where, as in science, he would also venture on unbeaten paths.

Roger was a trailblazer and a pioneer. He advised young scientists to find straightforward new approaches to difficult problems. The life sciences are permanently changed by the numerous masterpieces he left for us all. Roger is survived by his wife Wendy, his stepson Max, and his brothers Richard and Louis. ■

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Milton Zaitlin

1927–2016

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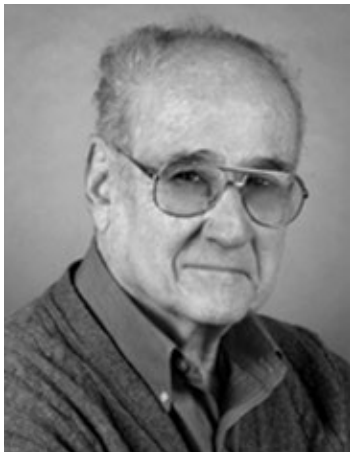
Milton Zaitlin is recognized as an influential pioneer of plant virology who also was a valued mentor and a master of university instruction in the plant sciences. He was born in Mount Vernon, New York, on April 2, 1927. In 1949, he obtained a BS in plant pathology from the University of California, Berkeley. After conducting research on the use of plants as a bioassay for smog formation in 1949–1950 at Caltech, he began graduate study at the University of California, Los Angeles, under Samuel G. Wildman in botanical sciences. There he developed a serological virus detection system that was used commercially in Hawaii for several years. He was awarded a PhD in 1954.

From 1954 through 1958, Milt was a research officer at the Microbiology Section, Division of Plant Industry, CSIRO, Canberra, Australia, where he directed his attention to virus replication and the investigation of virus mutants. He moved as a postdoctoral researcher to the Department of Horticulture, University of Missouri, Columbia, in 1958 and in 1960 accepted a position in the Department of Agricultural Biochemistry at the University of Arizona, Tucson, where he rose to the rank of full professor. He moved to the Cornell University Department of Plant Pathology in 1973 and became professor emeritus in 1997.



Milton Zaitlin

Milt was both a Fulbright Scholar and a Guggenheim Fellow during his sabbatical leave in 1966–1967 with Paul Whitfeld at the Division of Plant Industry, CSIRO. He was visiting scientist at the John Innes Centre, Norwich, U.K., in 1986 and visiting research scientist, Department of Biochemistry and Biophysics, UC Davis, in 1979–1980. He was elected a fellow of AAAS in 1969 and a fellow of The American Phytopathological Society in 1978.

Milt is well known for his studies on virus strains and mutants, mixtures thereof, defective viruses, and their phenotypes. He devoted considerable effort to devising plant single-cell systems as virus hosts. After developing tools for evaluating the accumulation of specific virus proteins and RNA in virus-infected cells, he published an extensive series of papers on virus RNA replication and on *Tobacco mosaic virus* (TMV) genome organization and gene expression. Before Milt's 1972 paper, no TMV protein other than coat protein had been demonstrated. Later, careful peptide mapping revealed that a high molecular weight protein he observed was indeed, as he had postulated, a TMV-specified replicase protein. Using a variety of clever hybridization and other techniques, he was able to elucidate the genetic map of TMV six years before the nucleotide sequence of the TMV genome was available.

Milt is the author of more than 30 review articles, many of which influenced directly or indirectly the development of plant virology. David Baulcombe of the Sainsbury Laboratory stated that Milt's *Annual Review of Plant Physiology* article with Roger Hull was a "key text" for him when he was entering the virology field.

Milt was committed to good teaching based on careful preparation and organization. His classroom and other lectures were characterized by clarity and precise expression in a pleasant and friendly atmosphere that never neglected critical thinking. He was an outstanding mentor to the many graduate students and postdoctoral associates. Roger Beachy, president of the Danforth Plant Science Center, stated that "Milt was perhaps the most influential mentor in my career in science in general, and in plant virology in particular. His willingness to encourage, critique, and advise was part of a collegial relationship that fostered confidence and innovation while demanding critical thinking."

Milt served as an editor of several journals and was a member of the group that formed the American Society for Virology in 1982. He was the associate director of the Cornell biotechnology program (New York State Center for Advanced Technology) from 1983 to 1990 and was director in 1990–1991. He is widely recognized for his success in obtaining support for biotechnology research, facilitating communication among biotechnology researchers, and informing the public on biotechnology issues. ■

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