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Pope Francis offers his personal blessings to Golden Rice

ASPB News



THE NEWSLETTER OF THE AMERICAN SOCIETY OF PLANT BIOLOGISTS

An Invitation to Plant Biology 2014

Welcome Message from ASPB and CSPB Presidents



Water Front Park, along the Willamette River, with a breathtaking view of Mount Hood.

PHOTO BY JIM FULLAN

It is with great excitement that we invite you to join us for Plant Biology 2014, the joint annual meeting of ASPB and the Canadian Society of Plant Biologists (CSPB), which will be held July 12–16 in Portland, Oregon, and which will highlight all aspects of plant biology. Every four years, our two

societies join together to host this conference, reinforcing the importance of international collaboration as we work to achieve our common goals.

This year will be no different, as more than 1,500 plant biologists from more than

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President's Letter

Celebrate Our Success

BY ALAN JONES
ASPB President
University of North Carolina



Alan Jones

I could not be more pleased by last year's recognition of three prominent members of our community for the World Food Prize. The 2013 Prize was awarded, *mirabile dictu*, to Marc Van Montagu,

Mary-Dell Chilton, and Robert Fraley "for their independent, individual breakthrough achievements in founding, developing, and applying modern agricultural biotechnology" (http://www.worldfoodprize.org/en/laureates/2013_laureates/). Some of our younger members may not know that these three scientists (and many others who are since deceased or worked outside the limelight)

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

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

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PRESIDENT'S LETTER
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began with a basic curiosity about *Agrobacterium* transformation of host cells in nature and foresaw a means to engineer plants, importantly crops, to display traits that benefit mankind. They struggled unwaveringly to work through the details that blocked their success. Yearly, over a 10-year span, their progress was chronicled by a series of papers in *Nature* and *Science*. I was in graduate school during the genesis and was too naïve to fully appreciate their type of transformational science; I even had opportunities to participate but eschewed them feeling that this kind of science was too much like engineering, not like discovery. But now much older, I realize that our profession, clearly evident by the expertise listed in the ASPB member directory, covers a continuum from the pursuit of basic knowledge to engineering discoveries that affect life on Earth. For the most part, we all have our own comfort zone, talents, and interests that place us at a narrow position along that continuum. What is remarkable about Marc, Mary-Dell, and Rob is that each of them individually covered the fundamental-to-applied continuum, and I cannot think of anything more fulfilling than advancing a basic observation of nature all the way to a major societal impact. I regret that I did not involve myself in that effort 30 years ago because so many people have benefited—

indeed, I would argue, are even alive today—because of the work of Marc, Mary-Dell, and Rob, as well as their colleagues and collaborators.

The World Food Prize, which was established in 1986, intends to recognize “the achievements of individuals who have advanced human development by improving the quality, quantity, or availability of food in the world” (<http://www.worldfoodprize.org/index.cfm?nodeID=25293>). However, the fact that the 2013 World Food Prize committee chose to recognize pioneers of agricultural biotechnology represents a historical deviation from the kinds of science typically recognized through this award as making an impact on agriculture. It was, in effect, an acknowledgment of the continuum of science undertaken and ongoing by members of our Society and plant scientists more generally. For example, prior awardees include not only scientists who followed in the footsteps of Norman

Borlaug by bringing state-of-the-art science to a particular crop, but also leaders of countries and foundations that promoted good agriculture. The recognition of agricultural biotechnology is a well-deserved laurel, a recognition I hope we will see again by the World Food Prize organization as well as other prominent international awards bodies (Hey, Alfred, are you reading this?).

But we cannot rely solely on international bodies to recognize the achievements of ASPB members and other plant scientists. Celebrate our community's successes now by nominating a deserving colleague for one of the many awards that your Society bestows. (See the November/December 2013 issue of the *ASPB News* for details regarding the awards that will be made this year.) The nominations are open and will remain open until February 14. That's just a couple weeks away, *so please don't procrastinate!* ASPB staff have made this process as easy as it can

be. Go to <http://awards.aspb.org/> and follow the two-step instructions. Letters of support are no longer required but are accepted.

Many of us measure our impact in our profession by our scholarship, and so it is not always so clear how to evaluate the contributions of those of us in nonacademic positions who work elsewhere along this continuum of ideas to developments. This applies, in particular, to our industry members, for whom publication is not the currency of success. If you know of an ASPB member in industry who is worthy of recognition for his or her work, please consider nominating him or her for the appropriate award. The ASPB nomination system makes it easy for you to justify your nominations, and the awards committees are primed to consider nominees from all walks of plant science.

I would like to end by thanking the ASPB awards committees for their work. There are about 60 members who sit on the 15 different awards committees, so unfortunately I cannot thank them individually here. But you can find their names at http://my.aspb.org/?G_Awards. They know the importance of professional recognition, and they take their job seriously. Finally, I thank *you* for taking the time to nominate a deserving ASPB member for one of the awards that I will have the privilege of presenting in Portland. See you there! ■

I am rather proud to have cosponsored an agenda item for our Executive Committee to consider establishing a new award dedicated to recognition exclusively of our members in industry and government. It does not have a formal name yet, but please stay tuned. The Executive Committee gave the green light and charged me to seek the funds to endow this biennial award. We are making progress, *but we still need your help*. If you would like to know more about this future award or have interest in giving or helping us build the endowment, please contact us at IndustryAward@aspb.org.

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C₄ plant drought stress

answer - PAR clip with OS1p or OS5p

C₃ plant drought stress

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

Nitrogen stress for: Rice, wheat, corn,
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Boron, chlorine, cobalt, copper, nickel, potassium, zinc -

OS1p or OS5p

Sulfur, iron, molybdenum, -

CCM-200plus, Lci-SD, LCpro-SD, *iFL*/LCpro-SD

Heat stress in C₃ & C₄ plants

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

Cold stress in C₃ & C₄ plants

All fluorometers and gas exchange systems
Best- Y(II) from the OS1p & OS5p along with *J/A* from *iFL*/LCpro-SD

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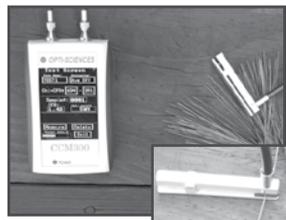
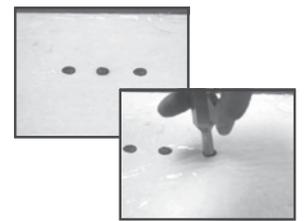
OS1p & PAR clip



OS5p & PAR clip



Burke Assay for C₃ plant drought stress



CCM-300 direct readout
in chlorophyll content



CCM-200plus
CCI for chlorophyll content



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



LCi-SD- ambient
IRGA system

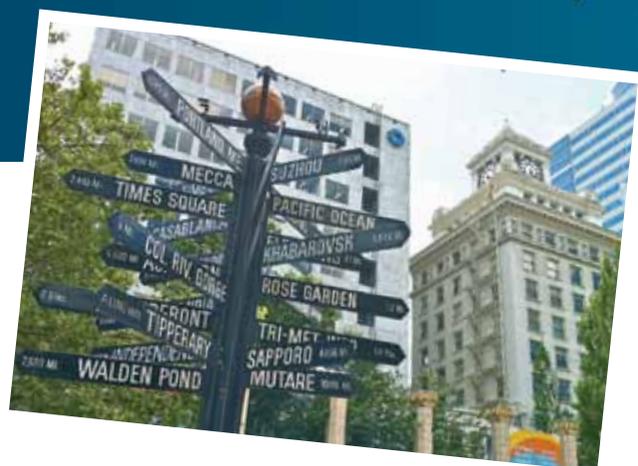


iFL / LCpro-SD - Integrated
Fluorometer & Gas Exchange
With all fluorescence and
IRGA parameters

Plant Biology²⁰¹⁴

JULY 12–16 PORTLAND, OREGON

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Postcards from Portland

A Saturday Shop and Stroll

BY CRISPIN TAYLOR

ASPB Executive Director

Our first target for our stroll was the Portland Saturday Market (<http://www.portlandsaturdaymarket.com>), which operates on Saturdays and Sundays from March through December. It's located close to the Burnside Bridge over the Willamette River, a pleasant walk (or short light rail ride) from the main part of downtown. Primarily a craft market, stalls also include jewelry, clothing, toys, souvenirs, and pretty much anything else that you might expect to find at such a venue—but all very compactly organized, pleasantly situated, and (true to Portland style) very laid back. There are also (of course!) food carts and live entertainment to keep you occupied while you are eating—or if you'd prefer to listen to music rather than shop.

Laden with a good number of unique purchases, we set off for the next stop on our tour: the Lan Su Chinese Garden (<http://www.lansugarden.org>).

Just a few blocks from the Portland Saturday Market, Lan

Su is an oasis of tranquility in an otherwise bustling city. Part museum that describes traditional Chinese approaches to the use of indoor and outdoor spaces and part botanical garden, Lan Su is 100% delightful. We spent a happy couple of hours strolling among the plants and buildings, admiring the architecture, sculptures, and—of course—the plants, taking pictures as we went.

All that shopping and strolling was making us hungry, so we set off from Lan Su with a view toward finding a bite to eat. By

happenstance (and just a few short blocks up N.W. Everett Street), we came upon the Local Choice Market (<http://www.localchoicemarket.com>). Thinking that we'd pop in to buy some snacks and fruit, we were very pleasantly surprised to find that, in addition to a grocery stocked with local produce, the market sported a full deli, a coffee shop, and a small wine bar. Perfect—especially when the deli manager was thrilled to take on the challenge of constructing an off-menu gluten-free Reuben sandwich! (Note: the

Local Choice Market operates seasonally; it's closed right now, but should be open again next summer.)

Well fueled by Reubens, salads, and (yes) some fine Oregon pinot, we began to wander back in the direction of our hotel. On the route (and not entirely by happenstance) was another Portland landmark—a block-sized bookshop named Powell's Books (<http://www.powells.com>).

There we literally lost ourselves—at least twice—while spending more than an hour browsing Powell's color-themed collections. Powell's shelves used and new copies of books together, and part of the thrill in shopping there (aside from the sheer volume of volumes—a bibliophile's delight!) is finding a used copy in good condition of exactly the title you're after. We also jumped at the opportunity to pick up some Dr. Who paraphernalia, which, for me, simply added to the sense of cool and represented a fine bookend to a great day out in Portland. ■



The Portland Saturday Market attracts an estimated 750,000 visitors a year and is accessible by foot, bicycle, and TriMet's MAX Light Rail line.

PHOTO BY JIM FULLAN.

Plant Biology 2014

JULY 12–16 PORTLAND, OREGON

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Broadening Access to Plant Science Annual Meetings

ASPB is delighted to announce that it has entered reciprocal agreements with five Pacific Rim societies regarding registration rates for our respective annual meetings in 2014 or 2015. Members of the Australian Society of Plant Scientists (ASPS), the Chinese Society of Plant Biologists (CSPB), the Japanese Society of Plant Physiologists (JSPP), the Korean Society of Plant Biologists (KSPB), and the New Zealand Society of Plant Biologists (NZSPB) will be able to register for Plant Biology 2014 in

Portland, Oregon, at ASPB member rates. Not only that, members of these societies will also be able to submit abstracts for presentation at Plant Biology 2014, a privilege that has heretofore been reserved for ASPB members only. (Honoring a long tradition of meeting together every four years, Plant Biology 2014 will be a joint meeting of the Canadian Society of Plant Biologists/Société Canadienne de Biologie Végétale, so members of the Canadian Society are already part of the mix!)

In return, ASPB members will be able to register for ASPS,

CSPB (China), KSPB, and NZSPB meetings in 2014 and for the JSPP meeting in 2015 at host society member rates.

Speaking of dates, the ASPS meeting (<http://www.asbmb.org.au/combio2014/registration.html>) is scheduled from September 28 to October 2 and will itself be a joint meeting (<http://www.asbmb.org.au/combio2014/index.html>) with the Australian Society for Biochemistry and Molecular Biology. The KSPB 2014 annual meeting will be held in November; the CSPB 2014 annual congress will be held in

Guizhou Province in August; and the NZSPB meeting will also be held next summer. The JSPP 2014 annual meeting is right around the corner—in March—so we have agreed with JSPP to hold off on the reciprocal arrangement until 2015, when the JSPP meeting will be held in Tokyo.

Please stay tuned for more details about our sibling society meetings, which we will share with you along with registration information and details as they become available. ■



AUSTRALIAN SOCIETY
OF PLANT SCIENTISTS



Looking across the Atlantic, the reciprocal registration plan will also be in place for the Society of Experimental Biology (SEB) membership and 2014 meeting in the United Kingdom. That meeting will be held July 1–4 in Manchester, UK.



SEB
Society for
Experimental Biology



The Grand Challenge of “Feeding the ¹⁰ Billion”

As the human population continues to grow and the availability of natural resources continues to diminish, solving the complex challenge of “feeding the 9 billion” becomes paramount (<http://www.un.org/apps/news/story.asp?NewsID=45165#Uq8lgmftNaQ>).

A multi-session joint symposium presented at Plant Biology 2014 in Portland, Oregon, by the editors of *Plant Physiology* and *The Plant Cell* will tackle this global challenge. The time to open the dialogue is now, says symposium co-organizer Michael Blatt, editor of *Plant Physiology*: “The topic of food security is at the very top of the list of grand challenges for the 21st century.”

ASPB and its journals are uniquely positioned to provide a forum to advance multidisciplinary discussions and influence this critical dialogue on a global scale. Indeed, this joint symposium will convene some of the world’s most influential and creative thinkers from government and finance to farming and environmental sustainability—as well as fundamental plant science researchers—to explore the interdependent facets underlying this

grand challenge. Engaging plant biologists in this exchange will serve to broaden the perspective on how plant science insights and advances can positively impact the solutions.

The first symposium session will focus on food and food security; the second will explore issues related to nutrition. Together, these sessions will offer insight into the economic, political, and logistical aspects of translating fundamental research into workable solutions with demonstrable societal benefits. As Cathie Martin, editor of *The Plant Cell*, says, “The Symposium will offer access to experts on food security with a broad range of expertise, to help plant biologists understand how best they can contribute to ensuring food security in the future.”

But the program goes beyond presentations to include valuable networking sessions that will facilitate meaningful connections among plant scientists and those from other disciplines who are working to address the grand challenge of feeding more than 9 billion people. These networking opportunities include the events in the sidebar.

21st Century Global Challenges Reception

(preregistration required)

Designed to connect symposium speakers, symposium organizers, and scientists whose research programs address food and nutrition challenges so that they may continue the dialogue.

21st Century Global Challenges Breakfast

(preregistration required)

Targeted to provide early-career plant biologists with an opportunity to engage with the speakers and others involved in meeting the “feeding the 9 billion” challenge.

Symposium III: 21st Century Challenge

Part A: Feeding the 9 Billion

Sunday, July 13, 2:15 – 5:15 p.m.

Organizer

Michael Blatt, University of Glasgow, Scotland

Speakers

Tim Benton, University of Leeds, United Kingdom

Mark Tester, University of Adelaide, Australia

Pamela Ronald, University of California, Davis

Philip Pardey, University of Minnesota, St. Paul

Derek Yach, PepsiCo, Purchase, New York

Symposium III: 21st Century Challenge

Part B: Nourishing the 9 Billion

Monday, July 14, 8:30 – 11:20 a.m.

Organizer

Cathie Martin, John Innes Centre, United Kingdom

Speakers

Anna Amtmann, University of Glasgow, Scotland

Alan de Brauw, International Food Policy Research Institute, Washington, D.C.

David Jenkins, University of Toronto, Canada

Cathie Martin, John Innes Centre, United Kingdom ■

Plant Biology 2014

JULY 12–16 PORTLAND, OREGON

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Plant Biology 2014 Highlights

Excitement Is Spreading . . . Catch It!

Register now for Plant Biology 2014

Join the American Society of Plant Biologists and the Canadian Society of Plant Biologists for the best joint meeting yet!

Consider. Cultivate. Connect.

The expanded program for Plant Biology 2014 offers something for everyone—science, symposia, networking, and socializing—all in the “Green City” of Portland.

Networking, Networking, and More Networking

We know that connecting with colleagues is key, so we’ve added numerous creative opportunities to meet and mingle at the conference and beyond.

Enhance your conference experience with some of these events:

- **New this year**—Welcoming coffee and brunch in a nearby park
- Rise-and-shine breakfast gatherings
- On-site lunch spots for connecting and knowledge exchange
- Shared-interest dinners—join a prearranged reservation or sign up on-site using the posted “dinner boards”
- Special opportunities to meet and interact with speakers

Amenities Abound

A variety of “special touches” have been added to enhance your conference experience as well as your stay in this spectacular city:

- Free wireless throughout the Conference Center and at the Portland Hilton and Doubletree Hotels
- New mobile app that better integrates abstract information to help you more easily plan and navigate the meeting
- Free passes for the Portland Light Rail, making it simple to get around town
- Option to “build your own” boxed lunch with preselected/prepurchased menu options
- Budget-friendly, subsidized child care, and special activities just for kids (see Special Events)

For Students and Postdocs Only

- Special minisymposium for hot topics from graduate students, highlighting new members of our scientific community and topics not covered by other minisymposia
- Undergraduate poster session where you can meet plant biology “thought leaders of the future” as undergraduate students discuss their novel research

Program Highlights

The Grand Challenge of “Feeding the 9 Billion”

Joint symposium from the editors of *Plant Physiology* and *The Plant Cell* (see page 7 for details)

Small College/PUI Networking Event

Saturday, July 12, 10:30 a.m.–noon (preregistration required)

Scientists working at or interested in primarily undergraduate institutions (PUIs) will want to take advantage of this chance to network, discuss common successes and challenges, find out about PUI-related opportunities, and provide feedback on ASPB PUI programs.

The “Flipped” Classroom Teaching Strategies

Sunday, July 13, 7:45–10:00 p.m. (free, preregistration required)

Review course content *before* this innovative session so that class time can be devoted to active (and interactive) learning through in-class assignments, projects, and discussions.

How to Publish

Sunday, July 13, 7:45–10:00 p.m. (free, preregistration required)

Learn from the experts as representatives from *The Plant Cell* and *Plant Physiology* explain what makes a successful paper. Presubmit questions or pose them during the Q&A session.



Mark Your Calendars

KEY DATES

Minisymposium consideration deadline
February 21

Final abstract submission deadline
June 1

REGISTRATION NOW OPEN
Early bird registration closes **May 11**
Online registration closes **June 1**

Special Events

Opening Mixer

Saturday, July 12, 6:45 – 8:00 p.m.
(free for attendees, \$15 guest tickets available, preregistration required)
Open to adults and teens (14+) only.
Light hors d'oeuvres and drinks

Science Party for Kids

Saturday, July 12, 6:30 – 8:30 p.m.
(for kids 2–13, \$15, preregistration required)
Just for kids and tweens! Licensed child care providers will entertain with science-related games and activities.

Evening Celebration

Tuesday, July 15, 7:30 – 11:30 p.m.
This closing evening social event at the World Forestry Center will be a night to remember. Conclude your conference experience by unwinding under the stars with an outdoor live band or visit the adjacent lodge for amusing and informative forestry encounters under the trees. ■

INVITATION TO PB14 *continued from page 1*

40 countries come together in the “Green City” of Portland to share their latest discoveries and connect with colleagues. As always, the science will be the hallmark of this meeting, with special symposia spotlighting the emerging topics most important to our field and our future.

A joint symposium organized by the editors-in-chief of ASPB’s journals, *Plant Physiology* and *The Plant Cell*, will focus on the grand challenge of “feeding the 9 billion.” This special session provides a unique forum for the world’s foremost thought leaders within and beyond plant science research to come together to share their perspectives on this critical global challenge. They will address how experts from economic, political, regulatory, logistical, and scientific arenas will need to advance the discussion—in one voice—on the role plant science will play in solving the global problem of food production. (See page 7 for more.)

As each of us reflects back on the paths that led us to this point in our careers, the influence of our participation in our professional associations is undeni-

able. Learning from and being mentored by well-established plant biologists had a significant impact on our professional growth and advancement. It is our goal to ensure that our colleagues new to the field are provided with the same opportunities. At Plant Biology 2014, students and postdocs will showcase their new discoveries and make the professional connections that may ultimately shape their careers.

There is so much in store in Portland—we hope you’re as excited about Plant Biology 2014 as we are. Additional updates on what’s happening at the conference will be included in upcoming issues of this newsletter and on the website, <http://Oregon2014.aspb.org>. We hope to see you in Portland for the latest and greatest science and the most effective networking that plant biology has to offer! ■

Alan Jones
ASPB President
University of North Carolina

Vince De Luca
CSPB President
Brock University



National Plant Science Council Holds Decadal Vision Briefing at AAAS

BY TYRONE SPADY

ASPB Legislative and Public Affairs Director

On December 3, 2013, the National Plant Science Council partnered with the American Chemical Society; the Alliance of Crop, Soil, and Environmental Science Societies; and ASPB to cohost a briefing on the report *Unleashing a Decade of Innovation in Plant Science: A Vision for 2015–2025* (<http://bit.ly/197Eph9>). The briefing was also supported by AAAS.

Taking place at the AAAS headquarters in Washington, D.C., the event featured David Stern of the Boyce Thompson Institute, Toni Kutchan of the Danforth Plant Science Center, and Pat Schnable of Iowa State University and was moderated by Sally Mackenzie of the University of Nebraska–Lincoln, all long-standing members of ASPB. There were 65 attendees, among whom were Jane Silverthorne (NSF), Sharlene Weatherwax (DOE), and the retired head of NSF’s Directorate for Biological Sciences, Mary Clutter. A host of staff from USDA, the State Department, and other federal agencies; representatives from scientific and professional organizations; researchers; and others also participated in the event.

The report, also known as the Decadal Vision, was developed to articulate the monumental advances in plant science research and technological innovation that will be required to address the increasingly pressing demands



Toni Kutchan

of burgeoning global population growth, climate change, and diminishing natural resources. The Decadal Vision is a community-driven report that articulates a path toward those monumental advances. The report describes a 10-year research agenda for plant science and its impacts on food, fuel, feed, fiber, pharmaceuticals, and American competitiveness.

The meat of the program started with David’s presentation. He gave an overview of the process by which the community came together to develop the Decadal Vision, which it did with the support of NSF, DOE, USDA, the Howard Hughes Medical Institute, and ASPB. He described the report’s impetus, as well as the five interwoven goals that emerged from the effort: (1) increase the ability to predict plant traits from plant genomes in diverse environ-



Pat Schnable

ments; (2) assemble plant traits in different ways to solve problems; (3) discover, catalog, and utilize plant-derived chemicals; (4) enhance the ability to find answers in a torrent of data; and (5) create a T-training environment for plant science doctoral students.

David was followed by Toni, who spoke about plant chemistry. Her talk emphasized the many critical plant-derived or plant-inspired compounds and products on which our lives depend. Whether it is plant-derived pharmaceuticals or cellulosic fibers, according to Toni plant chemistry has and will continue to play an essential role in our lives. She also highlighted that of the 400,000 species of flowering plants, 30 provide for 95% of our needs with regard to food and energy. And although more than 20,000 have been used medicinally, we are only beginning to scratch



David Stern



Sally Mackenzie

the surface. Toni’s talk also emphasized the current rapid extinction of plant and animal species and offered a powerful argument as to the functional importance of preserving biodiversity and the value of learning more about the chemistry of plants.

Pat’s presentation then covered why we need to devote more resources to understanding the relationship between plant traits and plant genomes in diverse environments and the attendant “big data” challenges. To illustrate, he spoke about his USDA-

continued on page 12

Pope Blesses Golden Rice

BY TYRONE SPADY

ASPB Legislative and Public Affairs Director

On November 7, 2013, Pope Francis gave his personal blessing to Golden Rice (GR). Why is this significant? Vitamin A deficiency (VAD) is responsible for 500,000 cases of irreversible blindness and up to 2 million deaths each year. Particularly susceptible are pregnant women and children. Across the globe, an estimated 19 million pregnant women and 190 million children suffer from the condition. The good news, however, is that dietary supplementation of vitamin A can eliminate VAD. One way that holds particular promise is the administration via GR, which had been engineered to produce large amounts of vitamin A. A 2012 study by Tang et al. (<http://bit.ly/1bc6FJx>) published in the *American Journal of Clinical Nutrition* found that 100–150 g of cooked GR provided 60% of the Chinese Recommended Intake of vitamin A. Estimates suggest that supplementing GR for 20% of the diet of children and 10% for pregnant women and mothers will be enough to combat the effects of VAD.

Unfortunately, public misconceptions about genetically modified (GM) organisms have prevented GR from being available to the countries most affected by VAD. One such country is the Philippines, where more than 80% of the population identifies as Roman Catholic and field trials of GR are nearing completion. An official blessing of the church, therefore, could do a great deal



ASPB member Ingo Potrykus shares a packet of GR with Pope Francis. In response, the pope offered his personal blessing.

to build support, allowing the Philippines to serve as a model for many of its neighbors on the potential health impacts of widespread availability and consumption of the golden grain.

Regrettably, the church did not provide an official endorsement. It turns out that there is quite a distinction between the pope's personal blessing and an official statement of support from the Vatican. To understand the nature of that distinction, we turned to the person who elicited the blessing, GR coinventor and ASPB member Ingo Potrykus. At the time of the blessing, Ingo, a member of the Pontifical Academy of Sciences, had been attending a meeting at the Vatican on the interaction of nutrition

and brain development. At the end of the meeting, he was able to meet Pope Francis and took the opportunity to share a packet of GR. In response, the pope offered his personal blessing. (If an official blessing of the Holy See was given, it would come from the Pontifical Council for Justice and Peace.) From Ingo's perspective, the pope is concerned that genetic modification technology primarily benefits big business and not the poor.

The most immediate hurdle to the usage of GR, according to Ingo, is the impending deregulation by the Philippine Department of Agriculture. Although no damage has been reported from the recent typhoon (Haiyan) that struck this part of

the world, the fields had already been harvested. Philippine officials have been following GR development and field trials for several years, and Ingo believes that the government will ultimately give "the green light." He expects that deregulation will occur in two phases: first consumption, then planting. The consumption phase will require a two-year study of the impacts of GR consumption on VAD in Philippine children. The study will be conducted by the Helen Keller Foundation for Research and Education (<http://bit.ly/1bXh9AX>), which has expertise in VAD and blindness. Only after the study will farmers be allowed to plant GR, said Ingo.

GR distribution will be carried out by existing small-scale operations. Further, it will be sold at the same price as conventional cultivars. It is believed that this will help to facilitate adoption. In addition to vitamin A production, Ingo believes that other agronomic improvements, such as increased pest resistance and yield, will further increase the attractiveness of GR to farmers.

While not a full-throated endorsement of GR or GM, the pope's blessing is a step in the right direction. It is also an important indicator of slowly shifting global attitudes regarding the role that GM foods will play in the world's long-term food security.

To learn more about GR, please visit <http://www.goldenrice.org>. ■

From Around the Web

On the genetically modified (GM) organism front, the General Court of the European Union reversed the European Commission's authorization allowing the planting and selling of BASF Plant Science's Amflora, a GM potato engineered to produce a starch used to make glue and animal feed. BASF had already pulled the product out of the European market, but the court's decision may hint at some of the difficulties other GM crops may face (<http://reut.rs/18pP0mO>).

In a major reversal, *Food and Chemical Toxicology* retracted the controversial 2012 paper that claimed GM corn caused tumors in rats, despite the protest of the study's lead author, Giles-Eric Séralini of the University of Caen, France. The journal's publisher, Elsevier, released a statement

saying that the paper showed “no evidence of fraud or intentional misrepresentation of the data,” but “no definitive conclusions can be reached” because of the small sample size and the use of a rat strain known for high tumor incidence (<http://bit.ly/19sa8DW>).

Several plant biologists have been recognized over the past few months. Among them, three ASPB members have been named fellows of AAAS (<http://bit.ly/19A6BDH>). This year's inductees will be recognized at a ceremony February 15 at the AAAS annual meeting in Chicago:

- John Jelesko, Virginia Polytechnic Institute and State University
- James J. Giovannoni, USDA-ARS/Boyce Thompson Institute
- Debra Mohnen, University of Georgia

ASBP member Sarah Hake was inducted into the ARS Science Hall of Fame for her contributions to deepening our understanding of plant biology (<http://1.usa.gov/1fkDZCu>). ARS is the chief intramural scientific research agency of USDA and “established its Science Hall of Fame in 1986 to recognize agency researchers for outstanding, life-long achievements in agricultural sciences and technology.” Sarah, who directs the ARS Plant Gene Expression Center in Albany, California, is credited with being the first researcher “to clone a developmental gene using a transposable or ‘jumping’ gene, and the first to identify a class of genes in plants that activate a cascade of other genes.”

Congratulations are in order for ASPB member Marian Quain,

a senior research scientist at Ghana's Council for Scientific and Industrial Research, Crops Research Institute. Marian won the 2013 Researcher of the Year award in Ghana for her work to address malnutrition in developing countries through the cultivation of nutrient-enriched sweet potatoes. She is also the recipient of a 2013 ASPB Education Foundation Grant.

Finally, on December 4, 2013, ASPB member Elliot Meyerowitz, George W. Beadle Professor of Biology at California Institute of Technology, was awarded the Dawson Prize in Genetics (<http://bit.ly/1kT3LyZ>). The award is given to geneticists of international prominence. Elliot was recognized for his “seminal contributions to plant genetics.” ■

DECADAL VISION BRIEFING *continued from page 10*

supported work to design and build a phenotyping robot. For Pat, the utilization of robotics has dramatically enhanced his ability to collect data. The increasing utilization of automated phenotyping approaches coupled with the plummeting cost and increasing speed of sequencing and genotyping technologies has created a “perfect storm” of data generation. To address the societal changes related to climate change, global food security, diminishing natural resources, and the growth of the

human population, the Decadal Vision argues for the development of new capabilities of curation, data sharing, and analysis.

Along with the need to address these issues using multidisciplinary approaches will come the need to reengineer the training of plant science doctoral students, Sally argued. To tackle the challenges of the Decadal Vision will require subsequent generations of trainees to be facile in data and Internet-driven research, statistical analysis, visualization, and online collaboration. She also argued that training experiences of plant scientists must prepare them for

multiple career paths, as only one in six PhDs will become academic faculty. The remaining trainees, she said, will play critical roles in other aspects of the scientific enterprise, from working to help policy makers understand the importance of plant science to working in industry.

A true measure of the immediate success of the briefing, almost the entire audience stayed through all of the presentations as well as the Q&A session that followed. Further, the audience was actively engaged. They asked questions ranging from the role and placement of the microbiome within the

context of the Decadal Vision to the engagement of citizen scientists as a means to reach urbanites regarding the value of plant science.

The briefing at AAAS was the first in a series of events aimed at introducing the Decadal Vision to funding agencies, the science policy advocacy community, and federal policy makers. The next event will specifically target members of Congress and their aides. A video of the event can be viewed on the ASPB YouTube channel (<http://bit.ly/1coDB2v>) and press coverage can be accessed via the AgriPulse website (<http://bit.ly/JezXl3>). ■

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

Elizabeth Van Volkenburgh

Professor, University of Washington



BY KEUM YOUNG LEE

ASPB Student Ambassador, PhD Candidate in the School of Environmental and Forest Sciences, University of Washington

Elizabeth Van Volkenburgh has been a faculty member in the Botany and Biology Departments, with an adjunct appointment in the School of Environmental and Forest Sciences, at the University of Washington since 1987. She also served as divisional dean for research, College of Arts and Sciences (2004–2006).

Elizabeth has a long history as an expert in the field of plant physiology. After receiving her BS in botany in 1973 from Duke University, she went on to get her PhD in plant physiology at the University of Washington, where she focused on leaf growth response to light. Prior to entering graduate school, she worked as a technician at the Smithsonian Institution Botany Department and at the Duke University Phytotron. She did postdoctoral work at the University of Illinois at Champaign–Urbana, the University of Lancaster in England, and the University of Washington and eventually found her way to a faculty position in the Botany and Biology Departments at the University of Washington.

On a beautiful sunny day in



Elizabeth Van Volkenburgh

Seattle, she was kind enough to take time out of her hectic schedule to answer a few questions about her many projects designed to discover how plants respond and adapt to their environment.

You received your BS in botany in 1973. If you look back, do you remember what made you choose botany as your major? What made you go into plant science?

When I was an undergraduate, I tried very hard to major in economics and political science. That’s because my mother encouraged me to become a lawyer. I thought that those were subjects

to learn to become a lawyer, but I didn’t do very well because I didn’t understand the content. I had done very well in biology in high school, and also my freshman year in college I took biology because I knew I would do well. So by the end of my second year in college, I had some biology courses where I had good grades and the other courses where I had not-so-good grades, so I switched. I chose plants in part to avoid the premedical students, who were so intense and very competitive.

You are most interested in the relationship between plants and their environment. In your opinion, why is asking how plants “behave” in response to their environment so important?

My interest in plants is mostly in how they work. Maybe the best way to find out how they work (or how anything else works) is to perturb them, to give them a problem to solve. I am really interested in growth and regulation of growth rate, but if you stress a plant, it might grow slower, or maybe grow better, having solved the problem of the stress, so then the stress or

the environmental signal is a way of perturbing the system to ask what’s going on underneath. That’s probably why I do it. In between college and graduate school, I worked as a lab technician for one year. Dr. Paul Kramer’s group was working on drought stress. That’s probably how I was introduced to the idea of looking at how plants adapt to drought. Even though I am interested in basic cell physiology, I have always been treating my plants to one type of stress or another just to test them. In my PhD work, I was interested in knowing what regulates leaf expansion. One way to ask was to use light as a tool, because it was known that light would make leaves grow faster. We could compare slower growth in the dark and faster growth in the light to find out how growth rate is regulated.

What’s your central focus on plant behaviors regulated by various environmental factors? (What do you measure to discover the mechanisms, and why?)

My central focus is always growth rate, and growth always means cell

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LUMINARIES

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expansion. It may also involve cell division, but I am not studying the process of cell division or mitosis, only the increase in volume of cells, so cell expansion. We measure the size of the plant with a ruler or microscope or sometimes by weighing with a balance. Often we are working on whole leaves or excised pieces of leaf and sometimes single leaf cells. We measure their size, either their dimensions or their weights, and then we also measure the physiological processes likely to be regulating their change in size. Early on, I was interested in cell wall extensibility. Now I am more interested in ion flux across the plasma membrane. For this we use pH electrode, microelectrode, or other electrophysiological methods.

Regarding leaf growth physiology responding to a variety of environmental cues, what are some of the highlights at this point?

For me the highlights are always the biggest unanswered questions. I would answer you by saying what are the biggest mysteries that attract me rather than what the most recent discoveries are. We know a little bit about membrane transport in a growing leaf cell involving the proton pump and potassium ion channels and probably also sucrose transporters. Just focusing on those three transporters, the questions that puzzle me are how light, specifically blue light or red light, interacts with those transporters and whether or not the hormone auxin is in some way involved in the growth rate control of leaf cells. The role of auxin seems to be debated,



Elizabeth Van Volkenburgh with the interviewer, Keum Young Lee, in her office in the Department of Biology at the University of Washington.

but I say “yes.” I am approaching the question slowly with auxin since the literature is conflicted. Some evidence exists for the role of auxin and growing leaves, and other evidence says either auxin is inhibitory or has no role at all. I am reading the literature first.

Originally my idea was to use different wavelengths of light as handles to get at some molecules or biochemical processes that regulate cell growth, and we got close, but what we don't know, for example, is whether or not blue light is perceived by chlorophyll, cryptochrome, or phototropin. If we guess phototropin, we don't know what phototropin is interacting with: proton pump, potassium channel, or auxin transport. If we say phototropin is working with auxin transport, we run into the problem that nobody knows whether or not auxin is really playing a role in leaf cell growth. There are a number of things to test and untangle. The reason I want to know more generally is that the plant has to make its leaves in order to collect enough carbon to feed seed production. Whatever is limiting leaf expansion ultimately limits yield of the plant. So it turns out that leaves are highly

integrated; they use probably every signaling system in the plant to tell them how fast to grow and end up being complicated.

Part of your research deals with light perception by two photoreceptor systems (one being the family of phytochromes and the other being the yet uncharacterized family of blue light photoreceptors). Can you briefly explain the importance of this research and any breakthroughs you may have had?

I haven't actually been working on that for a number of years, so there aren't any recent breakthroughs from me. There has been work by other people focusing on phototropin in leaf growth, but the results and the conclusions for me confuse phototropin with photosynthetic output. When I started thinking about blue light stimulating leaf expansion, we used seedlings that were still partially etiolated and thus relying on photoreceptors more. Another thing that is important to do, and we've done, is to show that these phytochromes and blue light photoreceptors are operating normally in green leaves beyond the seedling stage. Then

they are helping the leaf reach an appropriate size at the same time as chlorophyll is absorbing light for photosynthesis. The connection between those three kinds of photoreceptors is interesting to me.

There is another aspect to work that we've done more recently, which is considering how leaves maintain themselves as flat structures rather than curling under in epinasty or curling up in hyponasty. There is some evidence showing auxin and ethylene are involved in the process. We have evidence that auxin is involved even without ethylene. There is other work that shows if we remove the phototropin from Arabidopsis, leaves are curled, so the phototropin probably has something to do with the maintenance of flat structure. It could be, although I haven't tested it directly, that the maintenance of flat structure will contribute to the rate of growth, and the leaf will grow faster if the mechanism for keeping it flat isn't compromised. If whatever keeps it flat is broken, so that it is curling, then the rate of expansion would be reduced as well. With Bob Cleland and Rainer Stahlberg, we are working on the maintenance of flat structure in leaves, and that isn't published yet.

Your “microevolution” study using corn addressed the physiological basis of high yield in newer corn hybrids. Would you explain the mechanisms by which newer varieties withstand density stress?

My collaborator, E. David Ford, and I looked at corn plants that were developed over 70 or 80 years. As corn breeders selected high-yielding lines of corn, they

improved the corn steadily over time. We compared the different lines to see what was the characteristic of the modern corn compared to the older lines. There were two major findings. It had already been recognized that the modern corn hybrids hold their leaves more erect, so they don't shade each other. When these varieties are planted very densely, each plant occupies less footprint, so the plant shades itself and shades its neighbors less. We wanted to know a little bit about how the plant holds its leaves up. We did some biomechanical studies to look at strength of the leaves and so on. For wild plants, also older corn plants, if they detect far red light as they would if they detect their neighbor, they respond by holding their leaves upright. The modern hybrids will also move their leaves a little bit from less erect to more erect, but the modern hybrids are hard-wired to have their leaves more erect to begin with. So they don't shade themselves as much. That gave us the idea that something was broken in the modern hybrids. They were less flexible, less responsive to the environment. Perhaps we could consider them to be hard-wired for stress tolerance. We started looking at seedlings and seedling growth, which we understood a little bit better. With Martin Fellner, we investigated the effect of light on elongation of seedlings and found that in the modern hybrids they are less sensitive to light because they were also less sensitive to auxin. It turned out when Martin looked at the expression of auxin binding proteins, there was a difference between the modern hybrids and older hybrids. It suggests that in the wild, plant phytochrome interacts with auxin signaling and

that causes leaves to grow more upright, but in the modern hybrids the light can interact with auxin signaling, except the auxin signaling pathway itself is different and it doesn't change the morphology of the leaves. The morphology of the leaves is one thing, but another thing that happens to plants when they are crowded and they sense neighbors is that they stop reproducing. It seems that the modern hybrids in corn, because their signaling with auxin is altered, don't down-regulate reproduction, so they go ahead and make the ears even when crowded.

You are also looking for the biomechanics of free-coiling in cucumber. How are you addressing this issue? What is the physiological and perhaps developmental basis for tissue changes that lead to coiling?

This is a really fun project. It started when Annika Eberle came to the University of Washington to work as a graduate student in mechanical engineering, and she asked me to coadvise her with Professor Minoru Taya. Since they are mechanical engineers, they don't have a lot of education or much intuition about the physiology of the plants. We were really lucky to have a biology undergraduate, Chris Stripinis, who came in to work with us. Chris ended up integrating the biology from me and the engineering from the engineers and tried to assemble ideas in his own thinking. It was wonderful to watch. The only way we could have group meetings was with a fake tendril, a swim noodle. Then we could make this thing turn and imagine the cells that were inside if it were really a tendril,

and figure out where the stresses are, what caused it to bend and move, and what prevented bending. That was how we communicated between the biology and engineering. My thinking of the tendril was that it was growing like a stem, and I kind of know how stems grow compared to how leaf grows. In a way it is similar to the question of how a leaf grows flat. We think a reason a leaf is flat is because both of the epidermal layers grow at the same rate, but if the upper epidermal cells grow faster than lower, it's going to be curved. If the vein grows faster than the leaves, it is going to tear, and if the vein grows slower than the leaves, it is going to wrinkle. In the same way, we can think about the tendril. It is going to coil if one side grows faster than the other side. You can imagine it's sort of like phototropism where auxin is transported laterally. The engineers pointed out to me that that would cause a circle, but it won't spiral, and in order to have a spiral, there has to be something asymmetric inside that keeps the whole thing from landing on itself and instead making a helix. We don't know how the tendril does it. The literature we found suggested that the coil was related to one layer of cells, which then becomes lignified, but we found another paper and also our own work that shows that the coil happens first and then lignifica-

tion happens later. Perhaps stem circumnutation is a good model. Probably the coil of tendril has a flow of auxin from the tip down the tendril, but it's not coming straight down the tendril—it's coming in a twist. When we looked down the surface of the tendril, we found that the epidermal cells actually accomplished twist, and that would be asymmetry, but we are not yet in agreement between the engineers and the biologists over whether or not that's enough of a twist. It would be fabulous to visualize auxin transport inside the organ.

Any final words you'd like to leave us with?

I really enjoy investigating plants, and I like designing experiments. This is an activity that so many people could do and would find fun to do if they were given access through their biology education. Sometimes it's not the "A" student who is the best designer of experiments. I wish we could attract a wider range of question-askers, because questions are there and they need to be approached with different methods and take different kinds of models and characters to do it. It can be a lot of fun—not always a high-stress activity. My final words would be to encourage all comers to try out the fun of asking how plants behave. ■

About the interviewer

Keum Young Lee was selected as a student ambassador by ASPB in July 2010—one of nine students selected nationwide. She is a PhD candidate in the School of Environmental and Forest Sciences at the University of Washington. She has been working on phytoremediation of insecticide chlorpyrifos, which is the use of plants to clean up the environment, under the supervision of Sharon Doty and Stuart Strand.



**New
Articles!**

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

Founded by Chris Somerville and Elliot Meyerowitz, TAB now has more than 100 articles online.

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

Keiko Torii (*editor-in-chief*)
University of Washington

Caren Chang
University of Maryland

Gitta Coaker
University of California, Davis

Luca Comai
University of California, Davis

Georg Jander
Boyce Thompson Institute

Dan Kliebenstein
University of California, Davis

Rob Last
Michigan State University

Ryan Lister
University of Western Australia

Rob McClung
Dartmouth College

Harvey Millar
University of Western Australia

Libo Shan
Texas A&M University

Doris Wagner
University of Pennsylvania

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

The Arabidopsis Book Posts New Content!

Cellulose Synthesis and Its Regulation

Shundai Li, Logan Bashline, Lei Lei, and Ying Gu
January 13, 2014. Edited by Keiko Torii.

Cytokinins (update)

Joseph J. Kieber and G. Eric Schaller
January 13, 2014. Edited by Caren Chang.

Apoplasmic Diffusion Barriers in Arabidopsis

Christiane Nawrath, Lukas Schreiber, Rochus Benni Franke, Niko Geldner, José J. Reina-Pinto, and Ljerka Kunst
December 27, 2013. Edited by Robert Last.

Abscisic Acid Synthesis and Response (update)

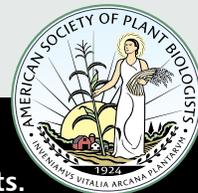
Ruth Finkelstein
November 1, 2013. Edited by Caren Chang.

Translational Regulation of Cytoplasmic mRNAs

Bijoyita Roy and Albrecht G. von Arnim
July 18, 2013. Edited by Caren Chang.

As part of continuing initiatives to improve the quality and visibility of The Arabidopsis Book and its content, PubMed is now indexing past and future articles.

TAB is hosted in partnership with BioOne
(www.bioone.org) in HTML and PDF formats.



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



Mohamed M. Ibrahim

Professional Title: Professor

Member since: 2009

Place of work: Alexandria University

Research area: Molecular plant physiology

Why has being a member of ASPB been important?

It has been important because ASPB has provided excellent opportunities for me to be a part of a unique worldwide community, which allows me to interact with other colleagues and provides resources I can use throughout my career development. The annual meeting and ASPB resources on the website, as well as *The Plant Cell* and *Plant Physiology*, are helpful in my research, enabling me to work more efficiently and effectively. The *ASPB News* also helps me keep up with new findings in the field of plant biology.

What would you tell colleagues to encourage them to join?

Based on my own experience, I would say that by being a member of ASPB, you could expect great opportunities to learn and interact with other colleagues in plant biology. Also, the ASPB website provides members with the new technology and research in addition to resources that are useful for members.

Was someone instrumental in getting you to join ASPB?

No, not particularly, although I had talked with a few colleagues who were members and who suggested that I join.

Has the ASPB network (job bank website functions, ASPB sectional gatherings or national meetings, ASPB committee functions, etc.) helped you find a job or hire anyone?

No, not yet.

Do you read print journals? If so, where do you usually read them?

Yes, I read the print and online journals on a regular basis and particularly enjoy reading them every time.

What are your hobbies?

My hobbies include traveling, reading, and swimming. I also enjoy discussions with my lovely family.

What do you still have left to learn?

I have many things to learn, particularly with regard to my research. I need to learn more and more to participate in solving the world food shortage and to help poor people obtain food.

What could ASPB do better?

My hope is that in the future ASPB would provide greater opportunities to support joint projects between members of different countries, increasing the chances of collaboration between professors at American universities and faculty members at universities in other countries.

What is your most treasured possession?

My lovely family, because they give me many things—especially love.

What person, living or deceased, do you most admire?

There are many people who have done amazing things. Several people come to mind, including Professor Salah Barakat and Professor Hatata. Both of them taught me many things.

What are you reading these days?

Beyond my field, I am reading a book and papers on molecular biology. ■

Policy Update

BY BRIDGET KRIEGER
Lewis-Burke Associates, LLC

FY 2014 Appropriations Update

On December 18, the U.S. Senate gave final approval to a modest bipartisan budget agreement that will restore funding to the appropriations process for both fiscal year (FY) 2014 and 2015 and avoid further threat of a government shutdown. Twelve Senate Republicans joined all Senate Democrats and two Independents in providing the super-majority vote to end debate on the Continuing Resolution (H.J. Res. 59) that carried the final budget agreement. The budget agreement was then adopted by the Senate on a 64 to 36 vote, clearing the measure for President Obama to sign the bill. In a dramatic reversal from the 16-day government shutdown in October, on December 12 the U.S. House of Representatives overwhelmingly passed the budget agreement on a 332 to 94 vote.

The bipartisan budget agreement provides \$63 billion over two years above the potential sequester to the House and Senate Appropriations Committees for purposes of writing the FY 2014 and FY 2015 spending bills. These funds would be split evenly between defense and non-defense spending. The new spending level provides flexibility to the Appropriations Committees to sustain funding for federal science agencies and education programs, including student aid. Even with budget constraints, federal science agencies such as the NSF and the Department of Energy Office of Science have received strong bipartisan support, and the budget agreement alleviates pressure on domestic spending overall.

At the time of this writing, the House and Senate Appropriations Committees are negotiating a final FY 2014 Continuing

Resolution (CR)/omnibus appropriations bill before the current CR expires on January 15.

Farm Bill Update

Although there were high hopes for Congress to complete its work on the Farm Bill in 2013, time eventually ran out with negotiations carrying over to 2014. However, at the time of this writing, there is optimism that a Farm Bill will be passed in January 2014.

Details of the compromise legislation have not been made public, with the most problematic issue being the Supplemental Nutrition Assistance Program (SNAP). The House version of the bill proposes to cut \$40 billion from SNAP over 10 years, whereas the Senate bill proposes to cut about \$4.5 billion over 10 years. However, as noted in past issues of the *ASPB News*, both the House and Senate versions of the

Farm Bill protect USDA's research programs.

Key Federal Agency Nominations

At the time of this writing, both France Córdova, nominee to serve as NSF director, and Jo Handelsman, nominee to be the associate director for science within the White House Office of Science and Technology Policy, are still awaiting Senate confirmation.

Dr. Córdova is an astrophysicist who previously served as the president of Purdue University and chancellor of the University of California, Riverside. Dr. Handelsman, a plant pathologist, is a professor in the Department of Molecular, Cellular, and Developmental Biology at Yale University. ■

ASPB Sparkles at the NABT Diamond Anniversary



BY SCOTT WOODY, University of Wisconsin–Madison,
and KATIE ENGEN, ASPB Education Coordinator

The membership of ASPB was well represented at the National Association of Biology Teachers (NABT) professional development conference in Atlanta, Georgia, November 20–23 (<http://www.nabt.org>). The conference theme was Looking Back and Leaping Forward, and the NABT membership celebrated the 75th anniversary of NABT by doing what all top-notch teachers do: they traveled from near and far to attend workshops and other sessions at which they could learn not only about recent advances in the biological sciences, but also about more effective ways to convey biological principles to their students. And they enjoyed some anniversary cake.

As has been our practice dating to the 2006 NABT conference, the ASPB Education Committee hosted a booth in the exhibition hall to feature some of the best plant-based teaching tools and

approaches to education in the biological sciences. Committee member Scott Woody (University of Wisconsin–Madison) served as booth organizer and also brought the latest in a growing collection of FPsc (“Fast Plants, self-compatible”) resources useful

for hands-on exploration of genetics. A new and evidently popular addition to the FPsc portfolio were cartoons drawn by ASPB member Ed Himelblau that provide whimsical illustrations of several genetic analogies. Scott developed these analogies over time to convey to

students the distinction between loci and alleles and between dominant and recessive alleles. The illustrations were excerpted from an article Scott and Ed coauthored that is available in the November/December 2013 “genetics emphasis” issue of *American Biology Teacher*, the flagship journal of NABT (good timing, that).

Other ASPB booth stations of note were those featuring offerings from the impressive collection of teaching resources developed by other ASPB members or on offer from ASPB on their behalf. *My Life as a Plant* (<http://tinyurl.com/AmazonMyLifeAsAPlant> or www.aspb.org/coloringbook), an activity/coloring book based on the 12 Principles of Plant Biology and created by Jane Ellis and Alan Jones, once again proved quite popular among teachers, as were the oversized prints of cover photos taken from ASPB’s

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DNA is not a blueprint. It is more analogous to a musical score. This analogy injects a dynamic sense to patterns of gene expression and the arrangement of biological processes that program growth and development. It is also quite flexible and can include notions of harmonic—or not so harmonic—interplay among different musical sections.



Scott Woody (second from right) and Jane Ellis (third from right). PHOTO BY MATT ALEXANDRE AND COURTESY OF NABT AND TAKE.



Caitlin Conn

ASPB Member Jane Ellis to Serve as NABT President-elect in 2014

BY SCOTT WOODY
University of Wisconsin–Madison

The ASPB Education Committee is proud to announce that former chair Jane Ellis has been elected by the members of the National Association of Biology Teachers (NABT) to serve as president-elect in 2014; she will assume the responsibilities of NABT president in 2015. Jane is a veteran science educator at both the high school and undergraduate levels. Just as important, her career has been passionately focused on “teaching the teachers.”

Jane has been a member of NABT for more than 25 years, rising through the ranks to assume multiple leadership positions. She was elected to the NABT board of directors in 2001 and has been a member of the NABT Constitution and Bylaws Committee since 2006. She was asked to serve as the NABT Four-Year College and University Section Convention chair and was then elected chair of the section in 2003. She has also been active in the South Carolina Academy of Science—elected president in 1999, and in 2009, awarded the Certificate of Commendation and Appointment as



Jane Ellis

Distinguished Lifetime Member. Concurrently, Jane has served as a valued member and leader in ASPB, having been appointed Education Committee chair in 2007 and serving on the Executive Committee from 2007 to 2009. In 2010, she was presented the ASPB Excellence in Education Award.

Exemplifying the “boots-on-the-ground” approach, Jane has been instrumental in the development of a large number of educational resources including inquiry-based investigations covering the 12 Principles of Plant Biology (www.aspb.org/12principles), most specifically the 12 *Activities for 12 Principles of Plant Biology* resource (www.aspb.org/12labs), coauthored with ASPB members Jeffrey Coker (Elon University) and Mary Williams (now ASPB staff), and most recently the

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journals *Plant Physiology* and *The Plant Cell*. The prints served as icebreakers in conversations between visitors and ASPB volunteers to further discussions about plant biology in general and the online access granted by ASPB to U.S.-based high school teachers and public librarians to the content and teaching tools in the

journals (<http://journalaccess.aspb.org>).

Also in keeping with practice at such events, ASPB educational dissemination efforts at NABT were enabled and invigorated by the welcome participation of local volunteers new to the routine as well as veteran outreach experts. Among the former were Nitya Jacob (Emory University), Mentewab Ayalew (Spelman College), Dave Nelson,

John Stanga, and Caitlin Conn (University of Georgia). We hope that each came away with something approaching the sentiment expressed by Caitlin in an e-mail exchange after the event: “I was thrilled by the level of interest that the teachers in attendance showed, and I enjoyed hearing many of them talk about how they’ve used ASPB resources

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(right) John Stenga



(left) Dave Nelson



CourseSource, of Course!

BY KATIE ENGEN

ASPB Education Coordinator

CourseSource is a peer-reviewed, online journal of education resources designed to help biology faculty implement evidence-based instruction to facilitate student-centered learning in inquiry-oriented environments. This pedagogical approach is known as Scientific Teaching. More specifically (and as noted on its blog), CourseSource publishes original, peer-reviewed biology teaching and learning resources that

- apply current understanding of how people learn;
- embrace the curricular design approach of backward design and Scientific Teaching (see <http://newsletter.aspb.org/2013/septoct13.pdf#page=28> for more on backward design);

- are organized into commonly taught college biology courses, with learning goals determined by corresponding professional societies; and
- prompt different levels of thinking from learners (think of Bloom's Taxonomy [<http://tinyurl.com/BloomInfographs>]).

CourseSource editor-in-chief Robin Wright and her team are organizing the journal's articles around content being developed across the life sciences in response to the Vision and Change initiatives (summarized at <http://tinyurl.com/V-Csummary> [a PDF]). For example, in 2012 ASPB and the Botanical Society of America (BSA) coauthored a set of concepts and learning objectives for use in undergraduate plant

biology (<http://www.aspb.org/PlantBioCoreConcepts>). Along with similar content from other science specialties, this input from ASPB and BSA has been fundamental to informing CourseSource articles and learning activities.

Managing editor Jessamina Blum invites the plant biology community to disseminate information about CourseSource throughout their campus and professional communities. As more faculty use or submit to CourseSource, the goals set out by Vision and Change will be that much more attainable.

Submit or Review Materials

The CourseSource blog, <http://coursourcesourcejournal.wordpress.com/>, offers detailed directions,

templates, and lesson samples for submitting to and publishing in the journal. Check the "Become a Reviewer" tab at the same link if you wish to become involved with article selection.

Howard Hughes Medical Institute (HHMI), is the initial funder of CourseSource and has supported the journal through the development and launch process, which culminated with the official website launch on January 2, 2014. Some functions currently on the blog will work in tandem with or transition to the main website. The timing of any such transitions and the main website URL were not available at press time. ■

NABT

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in their classrooms already. I would advise future volunteers to emphasize the diversity of teaching tools that ASPB offers and to show interested teachers how powerful these tools are in facilitating student learning." Among veteran outreach

specialists in the ASPB booth were Erin Dolan (University of Georgia), Jane Ellis (College of Charleston), and Jan Haldeman (Erskine College, emeritus). Thanks to their direct involvement with the creation of many of the educational resources on offer in the ASPB booth, their expertise and experience, and their familiarity with the materi-

als and with many of the visitors, the ASPB booth remains atop many teachers' lists of "must-see" destinations at NABT. Jane's participation in the booth during the 2013 conference was especially welcome, given her recent election as president-elect of NABT in 2014 (see related article about Jane on page 20). In that sense our booth was graced by

royalty of sorts, making the event akin to a Diamond Jubilee for ASPB. Congratulations to Jane, congratulations to NABT on its 75th anniversary, and long live the fruitful collaboration between ASPB and NABT! ■

Are You Ready to Flip Out?

Discover “flipped classroom” strategies at the PB14 Education Workshop

BY KATHLEEN ARCHER
Trinity College

In traditional lecture courses, class time is spent delivering information to students. Students typically work outside of class time on assignments and homework problems. In the “flipped” classroom, students study assigned content delivered by videos or web pages on their own time. Class time is spent in discussion; working through more difficult concepts; and en-

gaging with problems, cases, or projects that require students to use their new knowledge.

The flipped classroom incorporates many teaching strategies that have been demonstrated to be effective at promoting learning. Therefore, class time is highly active and often collaborative, with students working together and talking to each other about the material. Instructors clarify

challenging topics, circulate, and offer help. The instructor’s role is to facilitate learning, making the class period a time of working more directly with students, often one-on-one or in small groups.

So, get ready to flip!

- Visit the Michigan State University website at <http://fod.msu.edu/oir/flipped-classroom> to gain insight to this strategy and related research.

- Register for the Plant Biology 2014 education workshop, The “Flipped” Classroom Teaching Strategy (Sunday, July 13, at 7:45 p.m.; <http://my.aspb.org/page/registration>) so you can discuss details, analyze concepts, and collaborate on problems related to this exciting, effective teaching and learning strategy. ■

JANE ELLIS
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My Life as a Plant activity/coloring book that she coauthored with ASPB President Alan Jones.

Likewise, and as noted elsewhere in these pages, Jane remains very active in public outreach to science educators. One classic example particularly germane in this NABT anniversary year is that alongside other “gold star” science educators from ASPB—Paul and Coe Williams and Jan Haldeman—Jane staffed the inaugural ASPB booth at NABT in 2006. Perhaps more to the point, Jane has participated regularly in the years since then.

When asked via e-mail about her priorities as NABT president, Jane wrote:

“When I was on the ASPB Education Committee, I was a member of the ASPB team to at-

tend two AAAS, NSF, and HHMI “conversations” held in Washington on implementing change in undergraduate biology education (Vision and Change). I saw that NABT was a national leader supporting this initiative. It is imperative that NABT continue to support awareness of national efforts in undergraduate STEM education reform, “Vision and Change,” and PULSE [Partnership for Undergraduate Life Science Education]. It will also be important for NABT to continue developing closer relationships with societies such as ASPB because of the expertise, experience, and knowledge these societies can provide to the educators we represent.”

At the same time we congratulate the members of NABT on the occasion of the organization’s 75th anniversary, we commend them for their selection of Jane to assume leadership of the association. ■



2014 Plant Proteomics Workshop

University of Wisconsin, Madison, WI
<http://www.biotech.wisc.edu/ppw>

Who: Interested plant biologists

What: A 1-week, hands-on lab workshop on quantitative proteomics

When: July 21–25, 2014

Where: University of Wisconsin Biotechnology Center

How: See website for details and application, or email the organizers at: ppw@biotech.wisc.edu
Enrollment is limited, and the application is due no later than April 1, 2014.

Organizers:



Michael R. Sussman
Professor of Biochemistry and
Director, UW Biotechnology Center
University of Wisconsin-Madison



Joshua J. Coon
Professor of Chemistry and
Biomolecular Chemistry
University of Wisconsin-Madison



Jean-Michel Ané
Associate Professor of Agronomy
University of Wisconsin-Madison

The Wisconsin Medicago Group cordially invites applications to attend the 2nd annual Plant Proteomics Workshop at the University of Wisconsin. The goal of the workshop is to provide researchers in the plant community with an introduction to cutting-edge quantitative proteomics techniques. The workshop consists of a week-long, laboratory based training on mass spectrometric techniques, post-translational modification identification, and global proteome quantification.



15th Annual ASPB Education Booth Competition for Innovative Instruction

Apply now to present at Plant Biology 2014 (Portland, Oregon)

Opening Date: January 2

Deadline: March 7

Have you developed effective curricula or activities using plants as model systems that you'd like to share? The Education Committee invites you to present them in the Plant Biology 2014 Education Booth through the 2014 Plant Biology Education Booth Competition for Innovative Instruction.

Rationale: The ASPB Education Committee seeks to highlight new and creative techniques, technologies, or strategies developed by ASPB members for teaching and learning plant science in the laboratory, the classroom, or public education venues such as a science center or library. Newly established and emerging reforms are changing the face of science education across the K–16 landscape. A common element of these initiatives is a reorganization of the curriculum to help students focus on “big ideas,” such as evolution, that unify and explain seemingly disparate biological processes. Those welcome curricular changes must be supported by complementary exercises that promote inquiry-based, active-learning approaches and help students and the general public appreciate the nature of genuine scientific practice.

Review criteria: The ASPB Education Committee will give priority to those proposals that

- Offer plant-based exercises useful in laboratory, classroom, or public education settings that support the revised educational objectives and pedagogical approaches recommended in, for example, the revised AP Biology curriculum (<http://tinyurl.com/kywsdbf>), the Vision and Change in Undergraduate Education model (<http://visionandchange.org/>), the new Core Concepts in Plant Biology (<http://tinyurl.com/m5wr9t8>), and the K–12 Next Generation Science Standards (<http://www.nextgenscience.org/>). Standards for learning science in informal environments (<http://tinyurl.com/7mc8sr>) also should be considered. Proposals must make clear how the instructional innovation(s) align with the standards or research-based pedagogy selected by the PI. This selection may come from the aforementioned examples or similarly valid source.
- Are most readily implemented by educators in typical high school, undergraduate, or public outreach settings. “Readily implemented” means using resources typically available to the intended deliverer of the instruction. For example, if the program is designed for high school teachers to offer in school, then it should engage teens and not rely heavily on university-level lab supplies.

- Have features that can effectively engage visitors (your professional peers) to the Plant Biology 2014 booth for relatively brief introductory encounters (~3 minutes) as well as more in-depth explorations (10+ minutes). Keep in mind that these booth visitors may or may not be experienced with innovative instruction or outreach strategies, yet they will be content-expert scientists ready to be convinced by the PI's experience; dynamism; and data about the value, transferability, and sustainability of the resources being offered.

Award logistics: Two proposals will be funded. Each winning project will receive one cash grant of \$500. Up to three presenters per winning project will receive free conference registration for Plant Biology 2014 in Portland, Oregon (this does not include special ticketed events or meals). Winners will exhibit their materials and methods to the ASPB membership as part of the Education Booth at the conference. Awardees are expected to staff their exhibit at all times when the Education Booth is open.

Proposal requirements:

1. Limit your proposal to four double-spaced pages.
2. Include a project title. List presenter name(s) and complete contact information, including e-mail.
3. State a clear rationale for the exercise: What are the anticipated learning outcomes? How do those outcomes align with the newly validated science education standards?
4. Describe the materials and time expected of educators to implement the exercise.
5. How are the materials or strategies featured in the exhibit exciting and new? Highlight the use of innovative techniques, pedagogies, instructional materials, and/or technologies.
6. Provide a clear and detailed summary of how the exhibit at Plant Biology 2014 will function and how visitors will interact with the exhibit. A diagram or picture would be helpful. Exhibit space should take up no more than two tables (up to ~ 8 foot × 10 foot floor space). Final layout will be coordinated with Scott Woody, the booth organizer.
7. Include a specific and complete list of equipment required for the exhibit (DVD player, monitor, Internet connection, etc.). The

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Many thanks to our Italian translators:

Emanuela Pedrazzini and Alessandro Vitale (Istituto di Biologia e Biotecnologia Agraria, Consiglio Nazionale delle Ricerche)

Free PDFs of each translation are available at http://my.aspb.org/?page=My_Life_As_A_Plant.



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Plant BLOOME 2014

ASPB Plant Biology Learning Objectives, Outreach Materials, & Education Grant

(formerly Education Foundation Grant)

Applications accepted February 3 – April 15, 2014

<http://bloome.aspb.org>

Maximum funding: \$50,000

2007–2013 average award size: ~\$27,000 (includes \$30,000 maximum for 2007–2012)

In 1995, ASPB established this grant program with the goal to enhance public awareness and understanding of the role of plants in all areas of life. Over the years (and under various names) this grant program has helped germinate many successful education and outreach resources.

Plant BLOOME 2014 is open to ASPB members with **education and outreach** projects that advance youth, student, and general public knowledge and appreciation of plant biology. These projects should strive to promote varying facets of the

- importance of plants for the sustainable production of medicine, food, fibers, and fuels;
- critical role plants play in sustaining functional ecosystems in changing environments;
- latest developments in plant biotechnologies, including genetic modifications that improve the quality and disease- and stress-resistance of crops;
- discoveries made in plants that have led to improved human health and well-being; and
- range of careers related to plant biology or available to plant biologists.

Plant BLOOME does NOT support lab or field plant science.

research projects. Priority will be given to **education and outreach** projects with goals that include, but are not limited to, the development, implementation, and evaluation of

- innovative instructional materials or strategies in K–12 or undergraduate settings, science centers and museums, after-school science clubs, and so on;
- professional development about plant biology for educators (e.g., teachers, museum educators, 4-H agents);
- professional development about education and outreach for plant biologists and plant biologists in training;
- educational exhibits or displays in science museums, science centers, libraries, and other public venues;
- multimedia educational resources, such as radio or video pieces, websites, applications for electronic devices (“apps”), and animations; and
- education and outreach collaborations between plant biologists and educators.

A maximum award size of \$50,000 can be requested for the one-year funding cycle. Projects can begin any time after recipients are notified.

Funds are released by mid-August and should be spent by the anniversary date, September 2, 2015. In special cases a no-cost extension may be approved (request deadline August 1, 2015). Proposals are encouraged from ASPB members from both within and outside the United States, and projects may serve communities from any country. Proposals that leverage the Society’s funds with support from other sources are encouraged, particularly for proposals requesting a full \$50,000 budget.

Application Logistics

- The 2014 application opens February 3.
- Proposals must be submitted to <http://bloome.aspb.org> by April 15.
- Reviewing begins after the closing date. Awardees will be notified by e-mail.
- Questions? Contact katie@aspb.org.

Each eight-page grant proposal should include

1. Cover page

- project title
- 300-word abstract that summarizes the project goals, methods, anticipated outcomes, and evaluation and dissemination plans
- principal investigator’s name and affiliation
- address, phone, e-mail, and fax
- coinvestigator name(s) and institutional affiliation(s) (if any)

2. Project description format

There are seven required elements (details below). The project description is limited to **five pages**, including references, figures, and images. Text should be **single spaced, 12-point font**, with at least **one-inch margins**.

3. Project description with review criteria

The seven elements of the project description will be reviewed for:

- **Goals and objectives:** What is this education/outreach project trying to achieve? Why is the project important and innovative? What previous work education/outreach work has been done by the investigator(s) or others that lays the groundwork for the project? In what ways do the project goals and objectives align with the initiatives or resources promoted by ASPB?

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BOOTH COMPETITION

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Education Committee will make every effort to meet your needs, subject to cost and space limitations. (Please note that the list of display equipment requested from ASPB cannot be changed after the proposal is submitted.)

8. Submit your exhibit proposal through the ASPB web portal (<http://ebc.aspb.org>) between January 2 and March 7. Committee reviews

and announcement of winning proposals will be provided via e-mail to all entrants in April.

9. Descriptions of last year's winning projects are in *ASPB News*, September/October 2013 (page 25). E-mail Katie Engen (Katie@aspb.org) for more details on these and other past winners.

This is an ideal opportunity to showcase innovative instructional materials to your plant science colleagues. We look forward to seeing your inspiring work at Plant Biology 2014. ■

PLANT BLOOME

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- **Methods and approaches:** How will the project be implemented? Who will be involved? What is the target audience(s)? What activities will take place? What is the anticipated timeline for the project? How are the proposed activities aligned with the project's goals and objectives?
 - **Anticipated outcomes:** What is expected to happen as a result of the project? How many participants will be involved? What should they know, appreciate, or be able to do as a result of participating in the project? What are the measureable learning objectives?
 - **Evaluation plan:** *Include a robust assessment plan for evaluating proposed goals and outcomes. The assessment could inform further refinement of the project.* What evidence will be collected that will be useful for determining whether goals or objectives are achieved? How will project outcomes be documented (e.g., number of target audience reached; knowledge or skill gains; changes in interests, attitudes, or intentions)? Who will be responsible for executing the evaluation plan?
 - **Dissemination plan:** How will project products and outcomes (instructional materials, professional development materials, exhibits, evaluation results, etc.) be shared with others who may be interested in using them (conference posters or presentations, peer-reviewed publications, newsletter articles, website, etc.)?
 - **Sustainability:** *There is the expectation that funded programs and relationships formed via the programs are sustainable.* How will the program be maintained, continued, or enhanced after the grant budget is fully allocated?
 - **References:** Include citations for any journal articles, books, websites, or other resources cited in the project description.
4. **Statement of education/outreach experience and expertise (limited to one page)**
 - The investigator(s) should describe previous education and outreach experiences and expertise of those involved in the project.
 - Statements should include, if appropriate, brief descriptions of previous education and outreach projects, including project outcomes and impacts.

- If appropriate, relevant references that provide evidence for the qualifications of the investigator(s) should be included (URLs for the investigators' education/outreach websites, publications, etc.). (Background on the proposal itself should be contained within the project description.)

5. Itemized budget (limited to one page)

- Budget limit is \$50,000, including salary, benefits, materials, equipment, travel, and other costs.
- Each cost should be justified.

Other guidelines and requirements

1. The project manager must be a current member of ASPB.
2. No indirect costs (overhead) will be covered by the grant awards.
3. No funds may be requested for endowments or granting programs.
4. Although projects may be implemented with a small audience for initial development and pilot testing, ASPB expects that project products and results will impact a broader audience and generally reach beyond a single institution.
5. ASPB expects to have the right to the use of projects, materials, and results developed with grant funding.
6. All recipients agree to advise future applicants who seek their consultation on developing winning proposals.
7. Beyond the sustainability inherent in each proposed program, all recipients are expected to help promote their resource(s) during future ASPB events, most especially in the education booth at annual Plant Biology meetings. Separate logistics for such promotion will be determined in conjunction with the ASPB Education Committee.

Sources that may be helpful in preparing successful proposals

- Project summaries from previously funded projects are available at http://my.aspb.org/?page=EF_ProgramsResources.
- Project managers from past winning grants can advise future applicants who seek their consultation on developing winning proposals. ■

Ko Shimamoto

(1949–2013)

Ko Shimamoto, the world-renowned plant scientist and pioneer of rice molecular genetics, passed away September 28 at the age of 63 following a recent illness. Ko was born October 19, 1949, in Japan. He grew up in Toyohashi, a city near Nagoya.

After he graduated with a bachelor's degree from Kyoto University, he went to the United States and became a grad student in Oliver Nelson's lab at the University of Wisconsin–Madison in 1974. He was given two projects in research areas that no one else in the lab was investigating—maize tissue and organ culture—so Ko had to use his extensive initiative and work largely independently. In the first project, Ko set up a caryopsis culture system to answer questions on translocation of organic compounds from the mother plant to the developing seed. In his second project, Ko isolated several maize cell lines that were resistant to the drug aminopterin, a growth inhibitor. Even with the very primitive tissue culture facilities available, these projects were successful in Ko's hands. "Ko was rinsing his hands and arms with alcohol until they were raw in order to reduce microbial contamination of his plates. He and I worked many evenings in the lab. Soon we became friends and, eventually, neighbors, after his first son was born and he moved to university housing," recalls Hugo Dooner, now at the Waksman Institute of

Microbiology, Rutgers University. The seeds of his future brilliant career and success had been sown during those hard working days in the Department of Genetics in Wisconsin.

In 1980, Ko went to the Friedrich Miescher Institute, Basel, Switzerland, to work as a postdoc. He spent three years in the lab of Patrick King and worked on the isolation of selectable markers for plant cells in vitro. Those were happy days for Ko. "As young postdocs, we had a lot of fun with science and over a glass of beer," recalls Jurek Paszkowski, a plant geneticist now in the Sainsbury Laboratory, University of Cambridge.

Ko returned to Japan in 1984 to work at the Plantech Research Institute, a newly founded institute owned by the Mitsubishi Chemical Corporation. He directed two groups working on Brassica F1 hybrid and rice molecular breeding. In 1989, he became the first person to successfully generate transgenic rice plants. Using the rice transformation system he established, he introduced maize transposons, Ac/Ds, into rice and set up a transposon tagging system. This had been his dream ever since he was a PhD student in Oliver Nelson's lab. This landmark achievement resulted in the publishing of his first paper in *Nature*. Although working in a company lab, he never lost his strong attachment to basic science. He always said to young-



Ko Shimamoto

er researchers: "No need to distinguish between basic and applied research, just do good science." During the 11 years he worked for Plantech, he published a number of papers in top journals, as well as generated new rice cultivars.

In 1994, he moved to the newly established Nara Institute of Science and Technology, where he launched his new lab. In 2007, he elucidated the nature of the flowering hormone "florigen," which had been a mystery for more than 70 years. Further, in 2011 he discovered the florigen receptor, and this led to the uncovering of the novel mechanisms in which florigen induces flowering. Besides contributions to the field of flowering, Ko made great contributions in the field of disease resistance in rice. In 1999, he identified OsRac1, one of the most important factors in this field. Subsequently, he discovered a variety of other genes also involved in disease resistance in rice. In 2010, these results led to his pioneering proposal of the defensible complex model of the control of disease resistance in rice. Ko's approach to research

was unique. He was a leader, not a follower, always preferring to approach a problem in a way not attempted before. He was always very open to new technologies and discussions with scientists from many different fields of research.

Ko constantly produced novel findings of high quality and originality and made many groundbreaking contributions to the field of plant science research. His originality and creativity led to his being awarded several prestigious awards: the Japanese Society of Breeding Award (1993); the Kihara Memorial Foundation Award (2000); The Prize for Science and Technology from Japan's Ministry of Education, Culture, Sports, Science, and Technology (2011); and the coveted Purple Ribbon Medal of Honor, in the name of the Emperor (2012).

Ko not only actively devoted himself to research and education, but also loved karaoke and playing the violin. He is survived by his wife, two children, and grandchildren. His illness was kept a secret even to his close colleagues. The death of Ko shocked and saddened his many colleagues, former students, and friends worldwide. We will miss his emotionally charged seminars and inspirational discussions. Ko's legacy to science will long be remembered, and he remains an inspiration to plant scientists everywhere. ■

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