

ASPB News



THE NEWSLETTER OF THE AMERICAN SOCIETY OF PLANT BIOLOGISTS

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Perennialism and Stewardship

As I write this letter it is mid-April in central Pennsylvania, meaning that the threat of snow is (almost) behind us and spring flowers are starting to brighten the landscape. While crocuses, daffodils, and tulips are important to the floriculture industry, perennials of another sort have begun to make a name for themselves as field crops. Specifically, C_4 perennial grasses such as switchgrass and *Miscanthus* are the focus of much interest as next-generation biofuel crops. These species exhibit high productivity, and their growth habit confers several advantages (1,2). For example, these species promote soil retention as a result of their permanent root/rhizome systems coupled with reduced tillage requirements, and may exhibit reduced irrigation requirements due both to these deeper root systems and the generally higher water use efficiency of C_4 species. Perennial root systems can also sequester significant amounts of atmospheric carbon, e.g., at estimated annual rates for switchgrass of 1 to 10 tons/ha (3,4). Importantly, these grasses can also thrive on marginal lands not suitable for cultivation of other crops. Thus, even before the focus on energy crops, switchgrass, a native prairie grass, was utilized by farmers participating in the U.S. Conservation Reserve Program (CRP) (5), whereby growers receive a financial incentive to convert highly erodible or environmentally sensitive land to permanent vegetative cover (1,6).

A recent five-year study of switchgrass grown on marginal croplands throughout the midwestern United States calculated that these switchgrass monocultures yielded 540% more (renewable)

energy than (nonrenewable) energy consumed in their cultivation (7). Biomass yields from *Miscanthus* have been calculated to be even higher (8). However, this is not to say that these plants will be a panacea for the world's energy crisis. C_4 perennial grasses are not suitable for all climatic regions, and their rate of establishment is slow, especially compared to annual crops such as corn. Opportunities for improving their genomic makeup have scarcely been touched (9) and will require overcoming barriers to facile transformation as well as natural ploidy and self-incompatibility barriers (2,9). And the overriding challenge that remains to be addressed for any biofuels program is the fact that technologies for energy extraction and conversion from lignocellulosic tissue are far from optimized. Finally, even post-optimization, biofuels can be expected to meet only a fraction of the world's energy needs. It is still difficult to estimate what that fraction might be, but one interesting back-of-the-envelope calculation described by Carroll and Somerville in their recent review (2) is that 1% photosynthetic efficiency on 1% of the land could fuel approximately 27% of global human energy use as of 2001.

The point that biofuels can provide a significant—albeit minority—fraction of the “energy pie” was also made in a 2007 ASPB President's Letter by Rick Amasino (10). In fact, biofuels have been a perennial (!) topic in ASPB President's Letters, with previous columns on this subject from past presidents Mike Thomashow, Rick Amasino, and Rob McClung (11,12,13). It is interesting to look back at

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ASPB Executive Committee & Staff

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Miscanthus at maximum biomass topping 11 feet, shown with Emily Doherty for contrast. PHOTO COURTESY OF STEPHEN LONG LAB, UNIVERSITY OF ILLINOIS, 2006.

President's Letter
continued from page 1

these articles and see how concepts and approaches toward biofuels have evolved. However, it is also interesting to note that the topic of C_4 perennial grasses as crops has a literary history that predates our President's Letters by at least several decades. My first encounter with this concept was in essays by the American man of letters, Wendell Berry. In a 1981 essay entitled "New Roots for Agriculture" (14), Berry extols many of the virtues of perennial grass species—although his focus in that essay is on the idea of perennials as seed crops rather than as biofuel crops. He writes "Perennial grain crops will greatly reduce expenditures for machinery, energy, labor, chemicals, irrigation, and seed....[Perennials] will permit the safe use of lands now considered marginal because of vulnerability to erosion under present cropping systems." In other words, Berry enumerates many of the same advantages recognized by present-day plant biologists. In an even earlier essay, "The Native Grasses and What They Mean" (15), Berry describes switchgrass plots analyzed by Tim Taylor, then an agronomist at the University of Kentucky. "The prairie grasses," Berry writes, "are extremely efficient users of light.... This means that their productivity—of pasture,

hay, or humus—is spectacularly greater than that of the cool season grasses." Berry's essay was written in 1979, but it took until the 21st century, with the confluence of climate, food, and energy concerns—including the imperative that we do not exchange food for fuel—to better appreciate the agronomic potential of these perennial grasses.

Berry is himself a farmer, and his writings are imbued with a sense of the farmer as a caretaker of the land. Perhaps the farming of perennial biofuels may help in the fight against global climate change and for renewable energy by promoting this same sense of stewardship in the non-farmer. An intelligent citizen activist does not need a scientific degree to recognize the losses that come with the clear-cutting of forests in areas where this silvicultural practice is environmentally contraindicated or improperly executed, nor does a gardener have to be a scientist to appreciate the reappearance of spring perennials, whether they be the aforementioned cultivated plants or species such as the lady slipper orchids that bloom in May in the woodlands of Pennsylvania (see cover photo). It will be a valuable if unanticipated benefit if the cultivation of perennial biofuels results in inculcating in the general public a similar sense of stewardship toward agrarian

land. Perhaps this hope is not misplaced—after all, as the photo to the left shows, a stand of 11-foot-high *Miscanthus x giganteus* is a pretty impressive sight!

The concept of stewardship is also of direct relevance to professional societies such as ASPB, because, I believe, the major role of any professional society is to serve as a steward for its members and their interests. It is for this reason that ASPB not only publishes journals and organizes meetings but also provides significant logistical and financial support toward the member-driven activities of 13 ASPB leadership committees (see <http://www.aspb.org/committees/>). The activities of some of these committees (Minority Affairs, Women in Plant Biology, Education) were described in my March/April newsletter article (16); this month, I'd particularly like to draw your attention to the recent activities of ASPB's Committee on Public Affairs, which are described in detail on pages 11 and 12 of this newsletter.

I was lately reading over a list of anonymous comments from individuals describing why they had elected to renew their membership in ASPB. Some respondents focused on the tangible benefits of membership, such as discounted meeting registrations, print versions of the journals, teaching resources and the like, which is reasonable. However, the types of responses that most resonated with me are exemplified by the response of one individual who wrote, "Because it's the right thing to do." This person, it seems to me, recognized the role that ASPB strives to fulfill as a steward of plant biology and plant biologists. S/he was voicing trust in ASPB to do the best job the Society could "to promote the growth and development of plant biology, to encourage and publish research in plant biology, and to promote the interests and growth of plant scientists in general," as described in the mission statement of ASPB. Whether or not that stewardship resulted in direct benefits to this individual was not as important to him/her as the fact that ASPB was serving the community. And that, in a nutshell, is what stewardship is all about. 🌱

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ASPB Award Winners for 2009

It is my great pleasure to announce this year's winners of ASPB's awards. These awards will be presented during the Plant Biology 2009 Awards Ceremony, which will be held on Saturday, July 18, at 1 p.m. in Honolulu, Hawaii.

ASPB–Pioneer Hi-Bred International Graduate Student Prize

- Elliott Heffner, Cornell University
- Justin McGrath, University of Illinois
- Justin Walley, University of California

Early Career Award

- Siobhan Brady, University of California

Charles Albert Shull Award

- Steven E. Jacobsen, University of California

Charles Reid Barnes Life Membership Award

- Thomas J. Guilfoyle and Gretchen Hagen, University of Missouri

Dennis R. Hoagland Award

- Jorge Dubcovsky, University of California

Martin Gibbs Medal

- John B. Ohlrogge, Michigan State University

Stephen Hales Prize

- Jeffrey Dangel, University of North Carolina

Fellow of ASPB Award

- Peter Albersheim, University of Georgia
- Rick Amasino, University of Wisconsin
- Clanton Black, University of Georgia
- Hans Bohnert, University of Illinois
- Rebecca Boston, North Carolina State University
- Robert H. Burris, Professor Emeritus, University of Wisconsin
- Nicholas Carpita, Purdue University
- Vicki Chandler, University of Arizona
- Eric Conn, University of California
- Roland Douce, DBMS/PCV
- Pamela Green, University of Delaware
- Mary Lou Guerinot, Dartmouth College
- Alan Jones, University of North Carolina
- Robert Last, Michigan State University
- Peggy Lemaux, University of California
- Carl Leopold, Cornell University
- Stephen Long, University of Illinois
- C. Robertson McClung, Dartmouth College
- John Ohlrogge, Michigan State University
- Mel Oliver, USDA–ARS, Plant Genetics Research Unit, University of Missouri
- Federico Sánchez, Instituto de Biotecnología, UNAM
- Lawrence Schrader, Washington State University

- Edgar Spalding, University of Wisconsin
- Michael Thomashow, Michigan State University
- Mary Tierney, University of Vermont
- Carroll Vance, USDA–ARS Agronomy Plant Genetics, University of Minnesota
- Kathryn VandenBosch, University of Minnesota
- Larry Vanderhoef, University of California

Congratulations to all of the 2009 award winners!

My sincere thanks goes out to the chairs and members of each of the ASPB award committees for their insights and efforts in making this year's selections. I also thank those individuals who took the time to make nominations. Your thoughtfulness and hard work are greatly appreciated.

I invite all ASPB members to send congratulations to these well-deserving friends and colleagues, and hope that all participants in Plant Biology 2009 will join us in Honolulu on July 18th for the awards ceremony. For more information on Plant Biology 2009, please see the meeting website at <http://www.aspb.org/meetings/pb-2009/>.

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ASPB/AAAS Mass Media Fellow

Mandy Kendrick, a graduate student at the University of Maryland, has been selected to represent ASPB as the 2009 AAAS Mass Media Science & Engineering Fellow. She will spend 10 weeks this summer at *Scientific American* developing an understanding of how media personnel translate scientific discoveries into news articles.

In May, Mandy will earn her PhD from the Department of Cell Biology & Molecular Genetics, where she focused under the guidance of Dr. Caren Chang on utilizing reverse genetic approaches to characterize *AWE1*, a potential novel component of the

ethylene signal transduction pathway. While at the University of Maryland, Mandy helped establish the departmental graduate student association, served as an ASPB ambassador, and was the recipient of a USDA Graduate Student National Needs Fellowship. Prior to graduate school, she studied plant sciences at the University of Missouri and interned at Monsanto Company within the herbicide development group.



Mandy Kendrick

Mandy's interest in science communication stems from growing up in rural America, where scientific resources and information are not always readily available or accessible for the general public or for public high school teachers. Working at *Scientific American* over the summer will allow her

to gain firsthand experience at a magazine that has been publishing articles for more than a century, with the intent to educate the general public on recent scientific findings.

Mid-Atlantic Section Spring Meeting

The Mid-Atlantic section of the American Society of Plant Biologists held its annual spring meeting jointly with the 10th Plant Biology Minisymposium on the College Park campus of the University of Maryland April 3–4, 2009. The meeting attracted over 60 participants from the Mid-Atlantic region, including Stefan Gleissberg’s laboratory from Ohio University. Several members brought vans and cars filled with undergraduate students about to experience their first scientific meeting and in some cases their first oral or poster presentation. The section was thrilled to see Leeann Thornton return to the spring meeting as an assistant professor at The College of New Jersey. She had received the Marsho award for the best undergraduate presentation at the same meeting over 10 years ago.



Leeann Thornton brought her students from The College of New Jersey to the MAS-ASPB spring meeting. Left to right, Jon Monroe (James Madison University), Leeann Thornton, Katie Parisio, Janine Bernardo, Kelly Salmon, Mark Massak, and Kristine Badin. Jon Monroe was Leeann’s former undergraduate mentor.

The keynote speaker, Ursula Goodenough from Washington University, talked about “Basal Sexual Strategies: Sexual Differentiation, Haploid–Diploid Transition, and Uniparental Inheritance of Organelle Genomes.” John Marafino from James Madison University received the Marsho award for the best oral presentation by an undergraduate student. He talked about “Nuclear Beta-amylases in Arabidopsis-Protein Localization, Knockout Mutants and Sequence Analysis.” The best talk by a graduate student was awarded to Yongxian Lu from the University of Maryland at College Park. His paper was titled “Cation/Proton Exchangers Are Key Players in Pollen Tube Guidance.” Crispin Taylor, ASPB’s executive director, gave a brief overview of the Society and presented travel awards to six undergraduate students.



John Marafino received the Marsho award for the best paper presented by an undergraduate student. John works in the laboratory of Jon Monroe of James Madison University.



Dinner with the keynote speaker. Left to right (sitting): Chuck Delwiche, Ursula Goodenough, Ruth Timme. Left to right (standing): Todd Cooke and Zhongchi Liu (past chair of MAS-ASPB).

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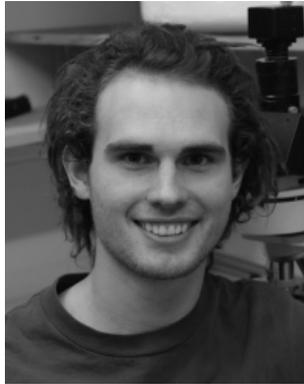
Yongxian Lu received the Marsho award for best graduate student presentation from Stephen Mount, chair of the MAS-ASPB. Yongxian is working on his PhD in the laboratory of Heven Sze.



SURF Happens!

Changbin Chen, mentor of 2008 Summer Undergraduate Research Fellowship (SURF) winner Ross Peterson, recently contacted ASPB to let us know about an exciting impact of Ross's SURF award. Ross was awarded his SURF in the spring of 2008 for a project titled "Characterization of Homologous Chromosome Pairing, Synapse, and Recombination during Arabidopsis Autotetraploid Meiosis."

Changbin reports that this work has generated two first-author manuscripts for Ross and the Changbin lab—great news in itself. Additionally, Ross has received recog-



Ross Peterson

inition from his institution. He recently was selected as the 2009 Philip C. Hamm Memorial Scholar at the University of Minnesota. To learn more about the award, see http://blog.lib.umn.edu/bioblog/bionews/2009/01/philip_c_hamm_memorial_scholar.html.

Ross's studies of plant biology are continuing. Now a junior, he is working in Costa Rica on a project that focuses on plant diversity, culture, and human diet.

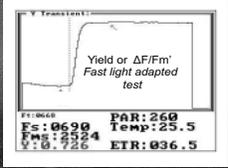
ASPB is pleased that Ross and Changbin are receiving such success and recognition. These developments also serve as evidence

that the primary goal of inspiring students to pursue careers in plant biology is being met through ASPB's SURF program.

The 2009 SURF award winners are featured on pages 16–20 of this issue. Applications for the 2010 SURF program will be accepted starting in December 2009. Each 2010 SURF award includes a \$4,000 undergraduate student summer research fund, a one-year student membership to ASPB, and \$575 for student travel to Plant Biology 2011 in Minneapolis. A \$700 mentor stipend (which can include supplies from the mentor) is also awarded. All SURF mentors must be members of ASPB. More details can be found at <http://www.aspb.org/education/undergrad.cfm>.



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



Name: David Puthoff
Title: Assistant Professor
Place of Work or School: Frostburg State University
Research Area: Plant-pathogen interactions
Member since: 1998

- 1. Why has being a member of ASPB been important to you?**
It has been great to be a part of an organization devoted to plants. I have found so much information, including job ads, funding resources, teaching resources, and more on the website. The best thing is that all the people at meetings and in the publications think plants are as cool as I do.
- 2. Was someone instrumental in getting you to join ASPB?**
My graduate adviser, Dr. Linda Walling, gave me a one-year membership and I never looked back.
- 3. What would you tell colleagues to encourage them to join?**
I would tell them that ASPB is a great networking place. The annual meetings are a great place to get new ideas and learn new techniques. Plus, you get free electronic access to the publications.
- 4. Have you enhanced your career using ASPB job postings or through networking at an ASPB function?**
I have found many job ads (postdoc and tenure-track) that have been useful. I have even been hired from at least one of those job ads. It is a great resource.
- 5. Have you had any success at finding candidates as a result of a job posting at the meeting or via our online Job Bank?**
Have not used that, YET!
- 6. Do you read print journals? If so, where do you usually read them?**
I read only the online versions and most of the time it is in my office. Sorry, I am rather boring that way.
- 7. What do you think is the next "big thing" in plant biology?**
I think the next "big thing" in plant biology will be the exploitation of the power of transgenic plants. There are lots of hurdles to cross and still many more things to learn, but in the future I think they will bring us great returns.
- 8. What person, living or deceased, do you most admire?**
I cannot narrow it down to one or even a few. Each has traits I admire and they all have some that I think they could improve upon. I know, typical scientist answer—there are always exceptions and many shades of gray.
- 9. What are you reading these days?**
Besides *The Plant Cell* and *Plant Physiology*, many kids books to my three children. Not much time for adult books, but I do like Robin Cook.
- 10. What are your hobbies?**
My hobbies include gardening, just being outside, and drag racing.
- 11. What is your most treasured possession?**
My most treasured possession is my family. I have a wonderful wife and three beautiful children.
- 12. What do you still have left to learn?**
So many things. The most important things are how to squeeze a couple more hours into a day and to not worry about things that I cannot change. 🌱

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NOTICE

Our dear friend and esteemed colleague, Dr. Bernard Phinney, passed away Wednesday, April 22. A tribute to Bernie will appear in the July/August 2009 issue of the *ASPB News*. 🌱

Plant Biology 2009

*Til we meet (Ahi hou) in Hawaii
Aloha and Mahalo nui loa*



**July 18-22, 2009
Honolulu, Hawaii**

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A Busy and Productive March for ASPB in D.C.

On March 17, 2009, members of the ASPB Committee on Public Affairs traveled to Washington, D.C., for a series of meetings on Capitol Hill and at various federal agencies (see box on page 12). The Hill visits followed the committee's annual winter meeting, which was held a day earlier at ASPB headquarters. Committee members and their guests met with the staffs of senators and representatives from their home states; staff from the Senate Appropriations Subcommittee on Agriculture, Rural Development, Food and Drug Administration, and Related Agencies and from the House Science and Technology Subcommittee on Energy and Environment; and representatives from the Obama administration's Office of Science and Technology Policy, the National Science Foundation (NSF), the U.S. Department of Agriculture (USDA), the Department of Energy (DOE), and the National Institutes of Health (NIH).

The primary purpose of the day's visits was for ASPB members to convey to government officials the important contributions that basic research in plant biology is making to help address some of the country's most pressing scientific, social, and economic problems. Committee members specifically cited plant biology research that is pertinent to the food supply, next-generation biofuels, human health, and climate change. Additionally, committee members used the day to stress the importance of robust funding for competitive research in plant biology and urged Congress to support sustained competitive funding increases at the NSF, USDA, DOE, and NIH. Many offices readily acknowledged the importance of competitive research to the country's long-term competitiveness and promised to be mindful of ASPB priorities during future appropriations processes.

Committee on Public Affairs members taking part in the visits included committee chair Gary Stacey of the University of Missouri–Columbia, Pat Schnable of Iowa State University, Richard Sayre of the Donald Danforth Plant Science Center, Martha

Hawes of the University of Arizona, and ASPB executive director Crispin Taylor. ASPB President Sally Assmann of the Pennsylvania State University, Publications Committee chair Sally Mackenzie of the University of Nebraska–Lincoln, and Pennsylvania State University graduate student Sarah Nilson were guests of the committee and participated in the meetings. The committee (and the Society) are grateful for their investments of time and energy.

A week later, Sally Assmann returned to Washington to participate in the Coalition for National Science Funding exhibition, where she showcased to congressional staff and Congressmen Rush Holt (D-NJ) and Vernon Ehlers (R-MI) how her research on ABA signaling in guard cells informs our understanding of plant responses to drought. Speaker Nancy Pelosi (D-CA) also attended the event and spoke about the importance of scientific discovery to America. Prior to the exhibition, both Sally and Crispin met with NSF Director Arden Bement, NSF Acting Deputy Director Cora Marrett, and NSF's Assistant Director for Biological Sciences Jim Collins to discuss the importance of plant biology to the NSF's mission.

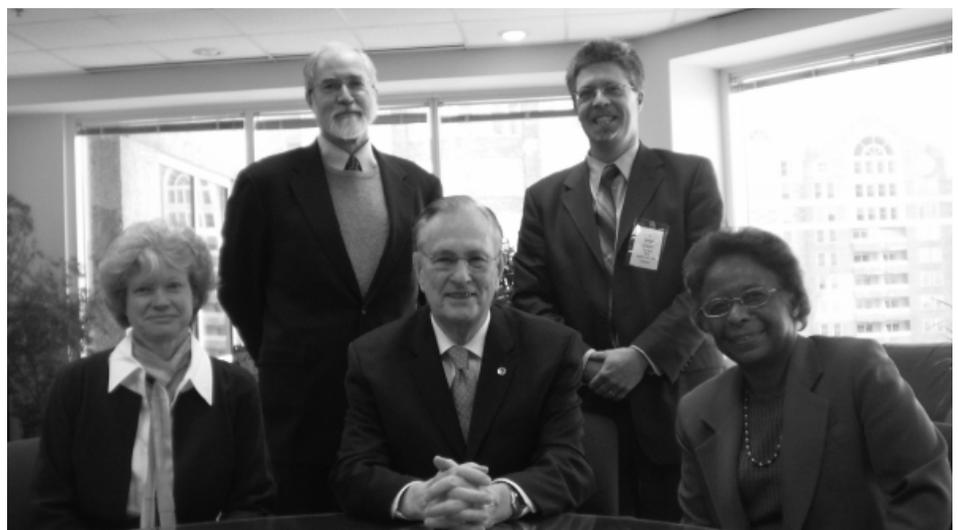
Meanwhile—behind the scenes but no less effectively—the committee submitted

written testimony to the House Appropriations Subcommittee on Commerce, Justice, Science and Related Agencies regarding ASPB's priorities for NSF funding in the FY 2010 budget (see <http://appropriations>).

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ASPB President Sally Assmann explains the connections between guard cell signaling and plant responses to drought to Congressman Rush Holt (D-NJ).



Sally Assmann, Jim Collins, Arden Bement, Crispin Taylor, and Cora Marrett pose in Dr. Bement's office following their March 24 meeting.

ASPB in D.C.
continued from page 11



Caren Chang delivers ASPB's oral testimony to the House Appropriations Subcommittee on Commerce, Justice, Science and Related Agencies.

house.gov/witness_testimony/CJS/Witness_04_02_09/American_Society_Plant_Biologists.pdf). This written testimony was reinforced in person on April 2, 2009, when Caren Chang of the University of Maryland testified before the subcommittee. In her oral testimony, Caren highlighted the value and importance of research funded through the NSF's Plant Genome Research Program, the 2010 project, and the iPlant Collaborative, as well as the NSF's education and professional development programs.

Although March (and early April) were very productive, the Committee on Public Affairs will continue to advocate for expanded federal support for plant biology research. In the near term, the committee's emphasis will be on submitting additional written testimony to House and Senate appropriations subcommittees working on components of the FY2010 budget that fund plant biology research and related programs at the NSF, DOE, USDA, and NIH. Beyond that, the committee's focus will shift toward ASPB's policy and funding priorities for the FY2011 budget request.

Having a hard time keeping up with potential funding opportunities made available through the American Recovery and Reinvestment Act (a.k.a the stimulus package) as they emerge from the NSF, DOE, and NIH? Check out ASPB's frequently updated stimulus funding page at <http://www.aspb.org/publicaffairs/stimulus.cfm>.

Agencies and Offices Visited

White House Office of Science and Technology Policy

Dr. Kei Koizumi, Assistant Director for Federal R&D

National Science Foundation

Dr. Arden Bement, Director
Dr. Cora Marrett, Acting Deputy Director
Dr. Jim Collins, Assistant Director, Directorate for Biological Sciences
Dr. Charles Liarakos, Senior Adviser for Strategic Planning Policy, and Analysis for Biological Sciences Advisory Committee

Sciences

Dr. Judith A. Verbeke, Division Director (Acting), Integrative Organismal Systems
Dr. Judy Skog, Division Director, Division of Biological Infrastructure

U.S. Department of Agriculture

Dr. Colien Hefferan, Acting Deputy Under Secretary for Research, Education, and Economics (Administrator, CSREES)

Department of Energy Office of Science

Dr. Anna Palmisano, Associate Director, Office of Biological and Environmental Research (BER)
Dr. Sharlene Weatherwax, Director, Biological Systems Science Division (BER)
Dr. Gail McLean, Program Manager, Photosynthetic Systems, Photo- and Bio-Chemistry Team, Basic Energy Sciences (BES)
Dr. Robert Stack, Program Manager, Physical Biosciences, Photo- and Bio-Chemistry Team (BES)

National Institutes of Health

Dr. Josephine P. Briggs, Director, National Center for Complementary and Alternative Medicine

U.S. Senate

Office of Senator Christopher Bond (R-MO)
Office of Senator Claire McCaskill (D-MO)
Office of Senator Robert Casey (D-PA)
Office of Senator Arlen Specter (R-PA)*
Office of Senator Ben Nelson (D-NE)
Office of Senator Mike Johanns (R-NE)
Office of Senator John McCain (R-AZ)
Office of Senator Jon Kyl (R-AZ)
Office of Senator Charles Grassley (R-IA)
Office of Senator Tom Harkin (D-IA)
Senate Appropriations Subcommittee on Agriculture Staff

U.S. House of Representatives

Office of Representative Bruce Braley (D-IA)
Office of Representative Gabrielle Giffords (D-AZ)
Office of Representative Russ Carnahan (D-MO)
Office of Representative Dave Loebsack (D-IA)
Office of Representative Jeff Fortenberry (R-NE)
Office of Representative Leonard Boswell (D-IA)
Office of Representative Glenn Thompson (R-PA)
Office of Representative Tom Latham (R-IA)
House Science and Technology Committee, Subcommittee on Energy and Environment Staff

* Senator Specter became a Democrat in April 2009.



Teaching Tips for Higher Education

This is the fourth in a series of general teaching tips for university or college instructors submitted by John Cushman (University of Nevada), member of the ASPBE Education Committee. These simple ideas can help create a motivating classroom atmosphere for your students. Not only will this enhance your teaching and improve their learning, but it just may inspire a few of your students to think, *Hey, this plant science class is pretty cool...I could see myself majoring in this!*

Teaching Tip #3: “Teaching Backward—The Best Way to Learn?”

Perhaps one of the most effective teaching methods available is teaching backward, also known as inductive learning or problem-based learning (1). The basic approach of this highly effective learning or teaching method is based on the unique trait of human cognition for extracting generalizable knowledge from a few specific examples, also known as intuition theory (2). The basic approach has also been labeled inquiry-, problem-, or case-based learning and was developed on the premise that learning can be enhanced by the stimulation derived from student initiative rather than passivity (3). The method involves presenting students with a challenge, a problem, or a specific pattern of facts, and then asking the students to learn what they need to know in order to address such a challenge or problem by asking relevant questions. Backward teaching can take various forms, but the underlying principle is the same: to have students become actively engaged in the learning process rather than passive recipients of knowledge. The inductive teaching method, or problem-based learning, has been increasingly adopted in the clinical medical education field (3, 4). It is best suited for small-group learning and appears to work best when guidance or assistance from an instructor or expert tutor is provided to the students (3). Inductive or problem-based learning results in better testing outcomes as well as improved comfort,

interest, attitudes, comprehension, information retention, deeper learning, and inspiration to pursue independent reading (4, 5).

A broad range of inductive teaching methods have been developed. Below is a list of approaches that can be used to engage your students in active problem solving as they master the facts in a classroom or laboratory setting:

Inquiry- or problem-based learning

Have your students conduct a student-driven, inquiry-based learning project. The instructor or tutor acts primarily as a coach, guide, or facilitator to help students arrive at the most informative questions surrounding a topic. By engaging students in the active process of choosing and asking questions, they are motivated to learn and develop a sense of ownership in their learning.

Example for Plant Biology: Provide students with a copy of standard concepts in biology, such as The 12 Principles of Plant Biology (<http://www.aspb.org/education/12Principles.pdf>) developed by ASPBE. Ask them to analyze each principle and then develop three to five testable questions related to each principle. Use your expertise on current research as well as your familiarity with the students' experiences and abilities to help them refine their questions, expand their scope, or zero in on new and well-defined academic pursuits.

Project-based learning

Have your students work in teams to explore real-world problems and then have them present their findings in oral and written presentations to share what they have learned. This approach results in deeper subject matter comprehension and knowledge, better self-direction, and improved research and problem-solving skills.

Example for Plant Biology: Select a particular topic within plant biology. Ask students to present the same key concepts and facts related to this topic to various audi-

ences for various purposes. The topic can be familiar and relatively well understood, like photosynthesis, or it can be controversial, like GMOs and food. Proscribed audiences and goals should cover a wide range. One group of students could prepare an oral presentation summary of current research for professional scientists. Another group could develop methods for teachers to use in a typical high school lab. A third group could create fun and effective lessons with a cross-curricular emphasis to art, history, or math for use with K–6 students. Being able to accommodate all these variations will stretch students to both a deeper and wider understanding of the topic at hand. The groups will also gain insight by comparing their various preparation processes. Finally, have each group critique one another in order to improve each of the presentations.

Case-based learning

Have your students discuss specific real-world situations or examples that serve to illustrate the consequences of a particular concept that is being taught. Examples should be recent or of significant impact to reinforce their relevance. Have the students justify their reasoning and the factual basis for arriving at a particular decision or course of action. This style of learning is most exciting when based on topics where multiple perspectives or approaches are clearly discernible.

Example for Plant Biology: Bioenergy is an example of a timely and engaging topic with many different facets. Ask students to

- review the economic realities of using corn as both a food and potential fuel source and determine which other sources of bioenergy or types of biofuels can be justified in terms of economic efficiency
- interview current biofuels researchers about their next research steps and then evaluate if the students would pursue these plans or move in a different direction

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The Education Outreach Booth *Laissez les Bons Temps Rouler* in New Orleans

For the sixth year running, ASPB hosted an education outreach booth at the annual conference of the National Science Teachers Association (NSTA). This year the NSTA met in New Orleans March 18 to 22 and our “krewe” hosted a parade of ASPB resources, interactive Fast Plants exhibits, and motivating activities from the Purdue Agronomy Department. Eager teachers and administrators flocked to the booth, ready to flash a smile and vie for answers to their intriguing questions about plants, biology, and teaching. Our volunteer experts happily tossed out sparkling teaching ideas strung cleverly together by valuable concepts and relevant research.

Who was in the ASPB krewe? A bevy of plant science education revelers!

Veteran ASPB booth volunteers Suzanne Cunningham and Sherry Fulk-Bringman. Suzanne and Sherry, both of the Department of Agronomy at Purdue University, offered a wealth of hands-on activities geared toward K-12 learners. The full array of downloadable teaching materials and related resources created by these tireless public outreach and school-based educators is available at http://www.agry.purdue.edu/k12_index.asp. Suzanne and Sherry each also presented their own conference workshops where teachers were able to dig deeper into the activities and concepts they presented in the booth, such as starch assays, nutrition, and soil evaluation.

ASPB Education Committee member and Texas A&M biology professor Larry Griffing shared his considerable expertise in genetics and research technology with booth visitors. His conversational manner engaged many would-be passersby in lengthy and mutually



As Larry Griffing and Suzanne Cunningham exchange ideas, and Mary Porntrai guides a booth visitor, Sherry Fulk-Bringman (in the far left corner) is hidden by the mob of eager agronomists-in-the-making she is addressing.



Hedi Baxter and Dan Lauffer show quick tips from Fast Plants.

interesting discussions. Larry also used his insights on effective microscopy methods to demonstrate how to open up the micro world of plant functions such as cytoplasmic streaming to the teachers who came to the booth. To ensure teachers could access quality input after the conference ended, Larry introduced many of them to the benefits of Planting Science (<http://plantingscience.org/>), a program run by the Botanical Society of America with support from ASPB and others that provides mentors and other

support to middle and high school science classrooms.

The Wisconsin Fast Plants program, with all its enticingly affordable tools, lab setups, and teaching ideas, once again drew a crowd to the booth. Dan Lauffer and Hedi Baxter Lauffer led multiple practical and exciting educational activities during the three-day event. They also arranged for a rotation of volunteers to make cameo appearances. Mary Porntrai traveled once again all the way from Mahidol University in Thailand to



Larry Griffing and Katie Engen (left) share resources with visitors attracted by the bold new ASPB banner.



ASPB offers a booth full of hands-on plant biology activities at NSTA.

reconnect with her U.S.-based collaborators, who included colleagues working at NSTA. Teacher and Fast Plants aficionado Whitney Hagins of Lexington, Mass., brought her direct-from-the-trenches classroom insights to share. Former Fast Plants employee John Greenler also assisted in the booth and promoted a new education outreach collaboration that Fast Plants has with his current organization, the Great Lakes Bioenergy Research Center (GLBRC; <http://www.glbrc.org>). John's colleague at GLBRC, Sarah Krauskopf, brought her expertise to the booth as well. Both John and Sarah introduced a set of bioenergy education resources available at <http://www.glbrc.org/education>. The collaboration with GLBRC is part of why the already-impressive Fast Plants curriculum has been recently enhanced with activities that simplify bioenergy concepts for use in the classroom. All Fast Plants materials can be accessed via <http://www.fastplants.org/>.

Katie Engen, ASPB's education foundation assistant, represented ASPB staff and dispensed many free classroom-ready

materials available at <http://www.aspb.org/education/NEWK12.CFM>. These materials have been developed by the ASPB Education Committee and the Education Foundation for teachers to use in their classrooms. Although most of the teaching materials ran low or even needed to be replenished during the event, it was especially gratifying to give away the few extra sets of handouts and visual aids to some of the local teachers whose schools and science labs are still recovering from Hurricane Katrina. Katie also met with representatives of other science events for teachers and will follow up by sending ASPB resources and related information to professional development workshops and regional teacher conferences around the country.

New this year to the booth was a 4' x 8' backdrop banner with full-color photo images. The banner clearly declares that the American Society of Plant Biology is involved in research, biotechnology, and education. Many teachers reported that they were drawn across the crowded exhibit hall to learn more about us because of this ban-

ner. No matter why they arrived, the booth attracted a steady stream of visitors over all three days of the conference. And although it's important to note that we reached several hundred educators each day, it's perhaps more exciting to recognize that most booth visitors stayed and chatted about their needs and our resources for several minutes or longer—even after receiving their packet of freebies.

Thanks to the hardworking krewe of booth volunteers and because the ASPB Executive Committee continues to support the booth exhibit, the ASPB booth was a Big Success in the Big Easy. Next year NSTA meets March 18 to 21 in Philadelphia. Anyone interested in volunteering in the booth is welcome to contact Katie at katie@aspb.org.

Katie Engen
katie@aspb.org

ASPB Summer Undergraduate Research Fellowship (SURF) 2009 Recipients

SURF fellowships (<http://www.aspb.org/education/undergrad.cfm>) assist promising undergraduate students with meaningful research in plant biology early in their college careers. Ideally, students should conduct their SURF-funded research the summer following their second year. Exceptionally well-prepared first-year students and third-

year students who provide evidence of a strong commitment to plant biology also are considered. SURF students must work with a mentor who is an ASPB member.

The ASPB SURF Committee would like to thank all the students and mentors who applied to the 2009 Summer Undergraduate Research Fellowship program. The applica-

tions were outstanding, making it difficult to choose only 15 fellowship awardees. These 15 awardees will complete 10 consecutive weeks of SURF research and present their results at Plant Biology, July 31 to August 4, 2010, in Montreal, Canada.

Congratulations to the following 2009 SURF Recipients and Honorable Mentions:

CATEGORY A Research and Doctoral Universities



Kevin Cooper, Wake Forest University

Project: *Auxin-induced flavonoid gene expression and root architecture*

Mentor: Gloria Muday

I am both honored and excited to receive this fellowship and greatly look forward to commencing my research project this summer. My project primarily involves the quantification of flavonoid gene expression through quantitative Real Time PCR (qRT-PCR). I look forward to presenting my results and discussing the discoveries of fellow researchers at Plant Biology 2010. Finally, I would like to take this opportunity to thank Dr. Gloria Muday, Dr. Daniel Lewis, and all the other members of the Muday lab for their continued support.



Ying Goh, University of Leeds

Project: *Characterization of targeting signals and pathways controlling ER import sites in plants*

Mentor: Jurgen Denecke

I am extremely excited about receiving the ASPB SURF! Having been exposed to plant science early in my degree, I am thrilled that I am getting a chance to conduct research in a field I would like to further explore. I look forward to my summer research experience and would like to thank ASPB very much for this opportunity.



Faye Holifield, University of Arkansas

Project: *The role of glyoxalase I in abiotic stress tolerance of soybean, *Glycine max**

Mentor: Ken Korth

I am more than excited about being able to do this summer research project. This is an excellent opportunity for me to get my hands “dirty” in plant biology lab work. I am also looking forward to seeing the research completed by my peers in Montreal next summer. I would like to give a big thanks to Dr. Korth, Dr. Wolf, and Dr. Miller for their encouragement and support.

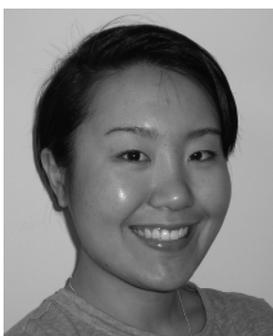
CATEGORY A Research and Doctoral Universities (continued)

Eric Johnson, University of Massachusetts–Amherst

Project: *Probing intracellular hydrogen peroxide condition in wild type and mutants defective in stress-signaling*

Mentor: Alice Cheung

The SURF grant will allow me to finish my current research project by the end of my senior year. This will help to characterize the pathways in plants that utilize or react to reactive oxygen species, specifically hydrogen peroxide. Afterward, I will consider pursuing an MD/PhD, if possible.



Emily Lin, University of Maryland

Project: *Gas chromatography–mass spectrometry derivatization for metabolic flux analysis*

Mentor: Ganesh Sriram

I am really excited to receive the ASPB SURF award. First, I thank ASPB for this fellowship to continue my research in metabolic engineering. My project involves improving the detection of isotopically labeled plant metabolites by mass spectrometry. This will provide important insights toward quantifying metabolic fluxes in plants. I am looking forward to a productive summer and I am sure that I will learn a lot from completing this research project.



Dianne Pater, University of New Mexico

Project: *Isotopic signature of photorespiration*

Mentor: David Hanson

Thank you, ASPB, for supporting undergraduate researchers. It is so exciting to not only become a member of ASPB, but also to have the opportunity to do some really cool research about photorespiration and to present my findings alongside my peers at the conference in Montreal. I would like to thank my colleague, Kathleen Chuchra-Zbytniuk, and the other members of our lab for their support and ideas. My heartfelt gratitude goes to my mentor, Dr. David Hanson, for his encouragement and guidance in my development as a scientist and for being my inspiration for studying plant biology.



Evan Pratt, Michigan State University

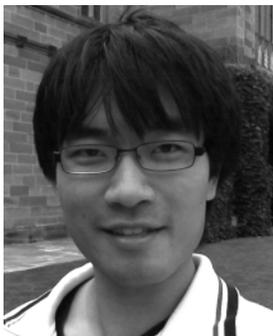
Project: *Characterization of novel chloroplast transporters in the C_4 plant maize*

Mentor: Susanne Hoffmann-Benning

It is very exciting to be able to continue my research over the summer through SURF. I would like to thank Dr. Hoffmann-Benning for getting me started in plant research and guiding me through the SURF application process. I look forward to learning much more from my research, as well as presenting my findings in Montreal at the ASPB annual meeting in 2010.

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CATEGORY A Research and Doctoral Universities (continued from page 17)



David Seung, University of Sydney

Project: *The interaction of abscisic acid and phospholipase D mediated pathways in environmental stress signaling: The role of the cytoskeleton*

Mentor: Jan Marc

It is with great honor and excitement that I accept this award. I would like to thank my supervisor, Dr. Jan Marc, for his encouragement and ASPB for supporting plant biology education, even at the international level. I am sure this is going to be an invaluable experience, and I look forward to embarking on my project!



Shelley Sianta, Colorado State University

Project: *Analysis of an emerging lineage of wild tomato*

Mentor: Patricia Bedinger

I can't express how grateful and excited I am to be a SURF recipient. My project is evaluating a possible diverging lineage of a marginal population of the wild tomato species, *Solanum habrochaites*. I will be evaluating trends of reproductive isolation between the marginal population and a central, outcrossing population, and possible genes involved. I can't wait to get my tomatoes out in the field and start my crosses!



Liza Smith, University of Wollongong

Project: *Does UV radiation induce screening compounds in Antarctic bryophytes?*

Mentor: Sharon Robinson

I am very honored to be a SURF recipient in 2009 and to have the privilege of working under A/P Sharon Robinson. My project will involve culturing moss under different radiation levels, simulating current elevated UV conditions in Antarctica. I'm grateful and excited to have the opportunity to contribute to this growing body of research. Through the fellowship I anticipate that I will gain invaluable research experience, giving me a foundation in plant biology on which to base a future career in conservation.



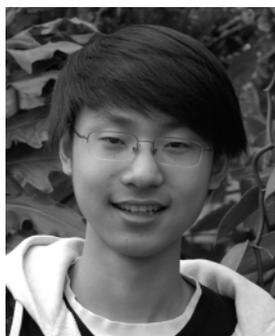
Alaina Willet, University of Tennessee

Project: *Research of Arabidopsis plant to find new components of ERECTA signaling pathway through EMS screen for mutants*

Mentor: Elena Shpak

It is a huge honor to be recognized by ASPB. I am looking forward to continuing my research with plants this summer through this wonderful opportunity, as well as attending the 2010 conference! I would also like to thank Dr. Elena Shpak for her guidance and encouragement.

CATEGORY B Master's Universities, Baccalaureate Colleges, and Associate of Arts Colleges



Hanwen Bai, Ohio Wesleyan University

Project: *The effects of phosphate availability on root architecture and gravity responsiveness in Arabidopsis*

Mentor: Chris Wolverton

I'm eager to carry out the work in my proposal, and I'm very grateful to ASPB for the opportunity to spend the summer in a lab. I look forward to presenting my work in Montreal next summer.



Jacquelyn Harth, The College of New Jersey

Project: *Smut fungus infection of the perennial grass Andropogon virginicus*

Mentor: Janet Morrison

I am thrilled to have been awarded an ASPB SURF for 2009. Already my undergraduate research experience has been extremely rewarding, and I cannot wait to continue my research this summer. I would like to thank ASPB for providing me with the opportunity to continue toward my goal of a career in plant ecology.



Annie Jeong, Barnard College

Project: *Analysis of the spatial orientation of chimeric and male floral organs in Spergularia Marina*

Mentor: Kristen Shepard

I am a junior at Barnard College, majoring in biology with a chemistry minor. The SURF grant will allow me to pursue my research of floral variation in *Spergularia marina*. I plan to get my doctorate in either plant biology or biotechnology, where I can continue to do research and refine my knowledge of the plants that share our environment.



Starr Matsushita, University of Puget Sound

Project: *A role for aneuploidy as a means for hybrid speciation in the genus Arabidopsis*

Mentors: Andreas Madlung and Chris Pires (University of Missouri)

I am incredibly happy to receive such a prestigious fellowship for the summer of 2009. I extend a warm thanks to the ASPB SURF Committee and my research adviser, Dr. Andreas Madlung, for their wonderful contribution to my research. My interest in plant biology began last summer when I started studying the possible effects of aneuploidy on the evolution of an Arabidopsis allopolyploid and was able to find some extremely interesting results. Thanks to the ASPB SURF, this summer I will be able to continue this fascinating exploration into the inner workings of the Arabidopsis genome and its response to aneuploid-induced stress. I am also excited to meet all of the other recipients of this fellowship and to learn about the most recent advances in plant biological research at the ASPB conference in 2010!

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SURF Recipients
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HONORABLE MENTIONS

CATEGORY A Research and Doctoral Universities



Chen Gu, Macalester College

Project: *Characterization of the cellular targets of the SAUR19 protein in Arabidopsis thaliana*

Mentor: William Gray

As a sophomore from Macalester College in St. Paul, Minn., I started my adventure in plant biology in the summer of 2008, when I was first exposed to yeast hybrid systems. The project titled above is going to use a reverse 2-hybrid system to screen for mutated SAUR19 proteins that no longer interact with a known protein interactor. This project can both elucidate the domains of the SAUR19 protein that are critical for its interaction and show whether the aforementioned interaction is responsible for SAUR19's functionality.



David Lee, University of California at Berkeley

Project: *Functional analysis of two Arabidopsis AGC kinases during polarized growth of pollen tubes*

Mentor: Sheila McCormick

Working with professor Sheila McCormick and postdoctoral fellow Yan Zhang on the polarized growth of pollen tubes in Arabidopsis has taught me the dedication necessary to continue in research. This project continues to explore an aspect of the AGC kinase family. By working with such great people, I have gained a solidified interest in plant biology.

HONORABLE MENTIONS

CATEGORY B Master's Universities, Baccalaureate Colleges, and Associate of Arts Colleges



David Valenta, Frostburg State University

Project: *The transformation of micro-tom tomatoes with Hessian fly responsive genes*

Mentor: David Puthoff

Through my application for the SURF grant, I learned a lot about grant writing and the many elements of writing a research proposal. Although I did not receive the award, I plan to finish my research project, which involves transforming tomato plants with genes from wheat, with the expectation that they will confer resistance to whiteflies. I hope to continue my research experience in dental school. I want to thank Dr. David Puthoff for all his hard work on the project, as well as the rest of the excellent faculty from the Frostburg State Biology Department.

2009 National Workshop on the Future of Education in Plant Pathology and Related Disciplines

Recently I was invited to give a presentation on the “Status of Education in Plant Biology” at the 2009 National Workshop on the Future of Education in Plant Pathology and Related Disciplines held in Washington, D.C. This workshop, sponsored by the American Phytopathological Society (APS), NSF, USDA-CREES, and USDA-ARS, brought together representatives from a number of professional societies, government agencies, private-sector employers, early career professionals, and students to discuss the future of education in plant science–related disciplines.

The workshop began with a description of the educational challenges facing many of the plant-related disciplines in an excellent presentation given by Jim McDonald, executive associate dean, College of Agricultural

and Environmental Sciences, University of California, Davis, and past president of APS. His data showed the decline in numbers of faculty, programs, and graduate students in many of the applied and field-oriented plant sciences. He also shared the concerns of plant societies, government agencies, and industries as to the critical need for action to reverse these trends.

During the two-day workshop, breakout sessions focused on questions related to the general organization of improvement efforts, such as

- What are the issues of concern?
- How can the broad training of students be sustained into the future?
- What can different societies learn from each other?

- What are the appropriate roles of government, industry, and professional societies in supporting education?
- What do employers in the private sector, government, and academic institutions anticipate as proficiencies needed for the future?
- Will workforce preparation require fundamental changes in educational content or methods?

In the last breakout session, participants took a close look at topics germane to students and faculty, such as

- What are the “best practices” for attracting undergraduate students into the plant sciences and ultimately into graduate studies?
- How do we bridge the support gap for students interested in a broad education, as opposed to one defined by a research grant?
- What are the proper roles of professional societies and employers in issues of education?

The lists of answers produced by each discussion group were presented to all participants in the workshop in an attempt to achieve a consensus on identifying and prioritizing the key issues and how they should be addressed. Several primary action items were derived from these discussions. Participants determined that it is imperative

- to encourage and support research and internship experiences for undergraduates and to mentor and reward excellent teachers in order to get more graduate students into the plant sciences and related disciplines
- that students be made aware of career opportunities via a centralized database or clearinghouse (website) across disciplines not only to post research and internship opportunities but to advertise available job openings

APS Workshop Presentation Topic Sampler

Opportunities in education in entomology departments

Ernest Delfosse, professor and chair, Department of Entomology, Michigan State University, and vice president–elect of the Entomology Society of America

Strategies for sustaining critical research and educational capacities in Land Grant universities

Randy Woodson, provost, Purdue University

Critical role of ARS plant scientists in feeding and fueling the nation

Antoinette Betschart, associate director, USDA ARS

Funding for research programs and students with interests in field-oriented research

Ann Lichens-Park, national program leader, USDA-CSREES

Graduate education in the plant sciences supported by NSF

Bill Hahn, NSF program director, Division of Graduate Education

The future educational needs of industry employers

Bill Dolezal, research fellow, Pioneer Hi-Bred International

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home ^{WORK} ~ grassroots ideas for cultivating knowledge in your community

Science Process as Content: Inspiring the “Quest” in Question

Since the early mists of time (or at least since the phrase “scientific method” came into vogue), the Holy Grail of science education has been getting students to formulate high-quality, relevant, and testable questions. We all know that finding measurable, reproducible answers to well-thought-out hypotheses is essential to unlocking the many unknown mysteries of the universe. But it is less well known that students are much more effective learners of science—process and content both—when they take a questioning approach to their studies.

Yet the quest for knowledge is not always cleanly objective. In fact, those aspirants who

seek deep understanding often can be found roving toward the boundaries of disciplines, meandering amid mind-tingling inquiries, or traversing expansive fields of open-ended questions. This process is integral to their intellectual satisfaction and research success. Yet all too often, students and members of the public either forget to ask such questions or are unmotivated to go beyond the most expedient answers.

So what can an expert sage such as yourself do to inspire this process, this questing voyage? How can you impel others to ask questions of all sorts and then seek the answers?—especially given the time and energy

you already devote to your current academic adventures. Simply select a few gems from the following lists and sprinkle them into daily conversation or instructional opportunities. You also could use these samples to inspire your own inquiries. Either way, these questions will help you catalyze the kind of thinking that encourages scientific questing in your corner of the realm.

Katie Engen
katie@aspb.org

Questions for Apprentice Aspirants (K–8)

Process as Content	Biology
Can anyone do science research? Why? How?	Are plants important? Why?
How do scientists know which questions to ask?	Is a seed alive? How do you know?
What are some good ways to get scientific answers that make sense?	Do plants have belly buttons? If so, why? If not, why not?
How do we know if or when to stop asking about a topic?	How do leaves “know” to change color each season?
	How and why do plants move?

Questions for Journeymen (high school and undergraduates)

Process as Content	Biology
Must you believe all scientific statements? What action(s) can be taken to support or refute ideas published in a scientific research paper?	If we assume that all of today’s plants are derived from one first plant, what structures and functions should we propose that first plant would have needed to have?
In what ways does current knowledge impact how we could further study Topic A? Support your ideas with details from what is already understood about Topic A.	Can plants defend or heal themselves? How?
How would you effectively communicate Topic A to a scientific audience? To the general public? Support statements with evidence.	Are there any steps in photosynthesis that can be skipped temporarily? Long term? Explain.
	What structures or functions do plant cells and animal cells have in common? What structures or functions are unique to each?

Questions for Craftsmen (general public)

Process as Content	Biology
<p>What is science? Does it affect public policy or popular opinion? Should it?</p> <p>What is your most reliable source for scientific information? How did you choose this source?</p> <p>Which is more important for developing a well-informed public: teaching students to master a set body of knowledge or ensuring that they learn research procedures and critical evaluation skills? Why?</p>	<p>In what ways has the study of science (biology) impacted your daily life?</p> <p>Do you know what roles, if any, plants play in ecosystems?</p> <p>Do genetically modified organisms impact our food supply or our health? In what ways?</p> <p>Do you agree that biofuels are important? Which biofuels and why?</p>

Questions for Grandmaster Science Wizards (plant biologists)

Process as Content	Imparting Biology—Criterion 2
<p>What has science done for you lately? Do you still relish the quest? Why?</p> <p>Is inquiry-based learning the best modality for teaching biology to undergraduates? If so, then why? If not, why not?</p> <p>What is the biggest misconception about science that you would like to clear up? How could you do this?</p> <p>How can specific content mastery be combined with the development of meta-cognitive concept evaluation and scientific processing skills in science classes for today's students?</p>	<p>How should high school or collegiate biology curricula and the resulting learning outcomes be evaluated?</p> <p>Have you signed up for the Education Workshop on July 19 (7:30 p.m.) at PB'09 on "Talking Science in Public: GMOs, Evolution, and Other Challenging Issues"? Or made plans to see the education posters or to visit the education booth? Why not? See page 25 of this newsletter or http://www.aspb.org/meetings/pb-2009/schedule.cfm for details.</p> <p>What do you do to meet your Criterion 2 requirements? Have you considered volunteering at an ASPB education booth? Check out your options at http://www.aspb.org/education/volunteer.cfm.</p> <p>How can professional societies such as ASPB help improve high school or college science instruction?</p>

Please send questions or feedback on this column to katie@aspb.org.

Teaching Tips continued from page 13

- create effective public outreach activities on bioenergy using resources offered by groups such as the Great Lakes Bioenergy Resource Center (GLBRC; <http://www.greatlakesbioenergy.org/education/>). 🌱

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The Arabidopsis Book Posts New Content!

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

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

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

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

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

New Chapters

The Arabidopsis Cell Division Cycle
Crisanto Gutierrez
March 18, 2009

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

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

Web-Based Arabidopsis Functional and Structural Genomics Resources
Yan Lu and Robert Last
October 28, 2008

Sugar Sensing and Signaling
Matthew Ramon, Filip Rolland, and
Jen Sheen
October 22, 2008

The Powdery Mildew Disease of Arabidopsis: A Paradigm for the Interaction Between Plants and Biotrophic Fungi
Cristina Micali, Katharina Göllner,
Matt Humphry, Chiara Consonni,
and Ralph Panstruga
October 2, 2008

The Secretory System of Arabidopsis
(update)
Diane C. Bassham, Federica
Brandizzi, Marisa S. Otegui, and
Anton A. Sanderfoot
September 30, 2008

Gibberellin Metabolism, Perception, and Signaling Pathways in Arabidopsis
Tai-ping Sun
September 24, 2008



PHOTO COURTESY OF THE ARABIDOPSIS BIOLOGICAL RESOURCE CENTER

All chapters are hosted in partnership with BioOne (www.bioone.org) in HTML and PDF formats.

ASPB Education Workshop—Plant Biology 2009

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

Are you unsure of the best practices for teaching controversial issues in science? Do you sometimes avoid talking about these issues? Will you opt to just “stick to the facts” because it’s too hard to gauge and respond to the needs or interests of your conversation partner(s)? Then come to the Education Workshop on Sunday, July 19, 7:30 p.m. to 9:30 p.m., during Plant Biology 2009 in Honolulu and learn how to test the waters and then wade confidently into talking about GMOs, evolution, and other challenging issues of science.

Participants will briefly brainstorm about controversial issues they teach. The

group will generate sample methods for how individuals have tackled these issues. These options will be considered in light of current literature, with particular emphasis on teaching evolution. Teaching methods or “frames” that align with economic, social, cultural, and functional needs of varying audiences will be presented and discussed. Next, small groups will work to select and develop a frame for teaching evolution to a particular audience. Each group will present its techniques and rationales to the larger group for full discussion. Finally, everyone will receive resources vetted by research supporting the insights gained through this

workshop. These resources will be useful in teaching controversial concepts in a variety of school and outreach settings.

Please join the discussion by updating your Plant Biology 2009 registration at <http://www.aspb.org/meetings/pb-2009/registration.cfm> and selecting the Education Workshop on Sunday, July 19. Please submit any questions or requests for information you would like the workshop organizers to consider ahead of time to katie@aspb.org.

Erin Dolan
edolan@vt.edu

PB2009 Education Preview: What’s in the Pipeline for Hawaii?

Surf through this tide of PB2009 program options organized by the ASPB Education Committee

Education Workshop

(Sunday, July 19th, 7:30 p.m.–9:30 p.m.)

Learn how to test the waters and then wade confidently into talking about GMOs, evolution, and other challenging issues of science.

Education Minisymposium

(Monday, July 20th, 2:30 p.m.–4:10 p.m.)

Dive deeper into the Year of Science and Darwin’s many contributions to plant biology and beyond.

Education Booth

Learn how to “hang 10” (or more) interactive activities that can enhance your Criterion 2 and undergraduate education priorities.

Education Posters

Check out how researchers are making a splash with this strong current of education and outreach posters.

Katie Engen
katie@aspb.org

Important Dates in 2009

Aloha!

July 18–22

Plant Biology 2009

Honolulu, Hawaii

<http://www.aspb.org/meetings/pb-2009>

September

(date to be determined)

Mid-Atlantic Section Crab Feast,

ASPB Headquarters

Rockville, Md.

National Workshop
continued from page 21

- for societies to come together to speak in one voice promoting the agricultural sciences as both essential and cutting edge—on par with the STEM disciplines (Science, Technology, Engineering, and Math) as called for in the recently released report of the National Academies titled “Transforming Agricultural Education for a Changing World.” To read this important report, visit <http://www.aspb.org/education/TransformingAgriculturalEducation-DELS-NAS-0309.pdf>.

Although the numbers of graduate students, faculty, and programs in these applied

and field-related plant disciplines reportedly have decreased, my research and inquiries did not show these trends to be true for our ASPB programs. In my presentation, “Budding Plant Biologists—Growing From Clueless to Connected,” I described how our ASPB educational programs covering PreK–12, undergraduate, and beyond are working to increase the excitement, interest, and research in the plant sciences. The workshop participants were interested to see the range of materials, ASPB exhibits, and educational opportunities we have. They were impressed with our SURE, GAP, undergraduate poster sessions, social networking options like Twitter, and Ambassador

programs. Many workshop attendees are hoping to adopt some of ASPB’s strategies for encouraging undergraduates to continue into graduate programs in plant sciences.

Overall it was an eye-opening experience for me. I met many wonderful people with legitimate concerns about the future of their programs and a strong focus on meeting the challenges in shaping the future of the agricultural sciences. I also was proud of what our members are doing to support the development of young plant scientists and the future of plant biology.

Jane Ellis
jellis@mail.presby.edu

Plant Physiology[®] Among 100 Most Influential Journals of Century!

Plant Physiology has been named one of the 100 most influential journals in biology or medicine of the past 100 years! To celebrate the 100th anniversary of the Special Libraries

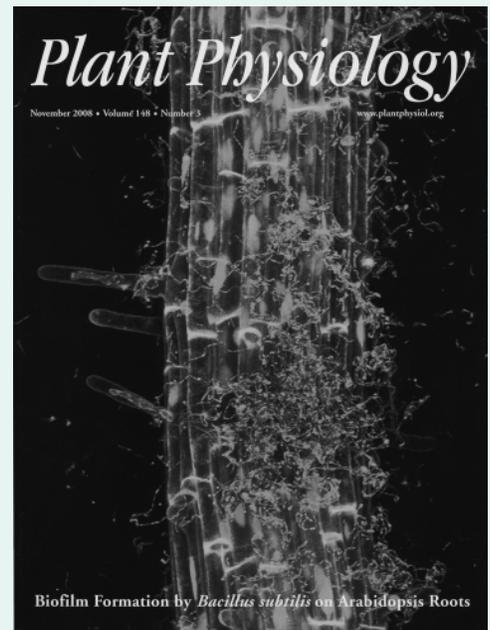
Association, SLA’s BioMedical & Life Sciences Division conducted a poll of its membership to identify which journals



SLA Biomedical & Life Sciences Division

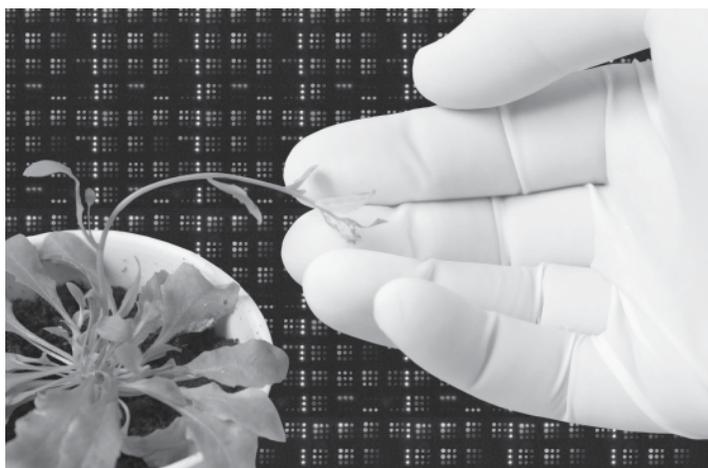
have been the most influential. *Plant Physiology* is one of only three journals from the “Experimental Botany, Plant Physiology & Related Molecular/Cellular Plant Biology” category to make the list. Other journals listed in the top 100 include such prestigious titles as *Science*,

Nature, and the *Proceedings of the National Academy of Sciences*. The American Society of Plant Biologists and *Plant Physiology* are proud to have received this honor. A full list of the top 100 journals can be found at <http://units.sla.org/division/dbio/publications/resources/dbio100.html>.



www.plantphysiol.org

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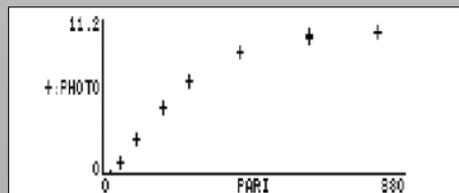
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Light Curve
Desired lamp settings (µmol/m2/s)
600 800 600 400 250 175 100 50 25 15 8 0
Minimum wait time (secs) 120
Maximum wait time (secs) 200
Match if |ΔCO2| less than (ppm) 20 _
DelLn ↑ClrEnd ↓DelChar↑CapLock↓AnyChar
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ASPB Headquarters

Telephone Extensions and E-Mail Directory



For your convenience, keep this listing of extension numbers and e-mail addresses handy when you contact ASPB headquarters so that you can reach the person best able to assist you.

- Our office telephone number is 301-251-0560

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Disposition of a manuscript												●	
All other questions										●			
<i>The Plant Cell</i> (except missing issues)													
Disposition of a manuscript											●		
All other questions										●			
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Membership													●
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Accounts receivable						●							
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