ASPB News

THE NEWSLETTER OF THE AMERICAN SOCIETY OF PLANT BIOLOGISTS

Volume 35, Number 1
January/February 2008

Inside This Issue

President's Letter

Leave Nothing but Footprints

Rob McClung

One of the typical activities of any scientific society is the sponsorship and organization of scientific meetings. Meetings, congresses, and workshops are wonderful venues for the dissemination of scientific knowledge both within the scientific community and to the public. Our students need to learn to effectively communicate their results through talks and posters, and these same talks and posters contribute to our ongoing education. One has to keep abreast of the field both in one's area of immediate research interest and in a broader context.

At meetings, we renew our relationships with old friends and make new ones. Meetings afford opportunities to meet with collaborators, work on manuscripts, and plan new projects. In my experience, face-to-face discussion is simply more effective than conference calls and can be much more fun as well. Of course, one or two meetings or seminar trips per month is overkill (on the body as well as the planet), as those of us living on a plane can attest. Thus, we need to balance the strengths of all communication forms: phone, e-mail, wiki, webcast, and RSS feed, as well as scientific meetings.

In my inaugural letter in the last issue of the newsletter (1), I reminded you of our upcoming meetings: The Pan American Congress Plant and BioEnergy Symposium and Plant Biology 2008, both to be held in Mérida, Mexico, from June 22 to 25 and June 26 to July 1, 2008, respectively. Registration opened for both meetings in early December (http://www.aspb.org/2008), and no doubt you will receive a number of e-mail reminders of this. As I said in my last letter, I hope to see many of you in Mérida. Let me assure you that both meetings will be excellent, and Mérida (2) is a fantastic venue! I intend to spend some time in the region after the meetings.

But is anything in life that simple? As I sat down to consider this letter, I could not help but remember a question that Larry Smart, the representative for the Northeast Section, raised at the Society's Executive Committee meeting during a discussion of the sites for future Plant Biology meetings, including Hawaii in 2009. Larry asked if we had considered the carbon footprint associated with travel to distant locations. The answer was yes, sort of, but not rigorously.

I thought I should take a closer look. There is a profusion of sites on the web offering to calculate the carbon footprint of your planned trip to Mérida or anywhere else, for that matter. One such site (3) told me that my flight from Boston to Mérida (one-way) will be 3,084 km. Assuming I fly economy class (that is a safe assumption—I am not very tall, so it is not especially uncomfortable, and I am frugal, as befits a New Englander), my journey will consume 246 kg (326 liters) of fuel. The energy content of this amount of fuel is equivalent to that of 3,254 kW-

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

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Deadline for May/June 2008 *ASPB News:* April 5, 2007

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ASPB News

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	LUCK or LUCNA-1G-ASPB	1 g	$429.00
X-gal	X4281C-ASPB	1 g	$34.00
	X4281C10-ASPB	10 g	$140.00
X-gluc (CHA-Salt)	G1281C-ASPB	100 mg	$30.00
	G1281C1-ASPB	1 g	$159.00
	G1281C2-ASPB	2 g	$310.00
	G1281C3-ASPB	3 g	$428.00
	G1281C4-ASPB	4 g	$557.00
	G1281C5-ASPB	5 g	$679.00
Ampicillin	A0104-5-ASPB	5 g	$31.00
	A0104-10-ASPB	10 g	$51.00
	A0104-25-ASPB	25 g	$96.00
Bialaphos	B0178-100-ASPB	100 mg	$199.00
	B0178-250-ASPB	250 mg	$472.00
	B0178-500-ASPB	500 mg	$897.00
Carbenicillin	C0109-5-ASPB	5 g	$74.00
	C0109-25-ASPB	25 g	$254.00
Chloramphenicol	C0113-25-ASPB	25 g	$41.00
	C0113-100-ASPB	100 g	$91.00
Kanamycin	K0126-1-ASPB	1 g	$24.00
	K0126-5-ASPB	5 g	$52.00
	K0126-10-ASPB	10 g	$85.00
	K0126-25-ASPB	25 g	$138.00
Phosphinothricin	P0159-250-ASPB	250 mg	$120.00
	P0159-1-ASPB	1 g	$369.00
Rifampicin	R0146-1-ASPB	1 g	$43.00
	R0146-5-ASPB	5 g	$97.00
	R0146-25-ASPB	25 g	$319.00
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	S0188-25-ASPB	25 g	$109.00
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ASPB Members Elected 2007 Fellows of AAAS

Sixteen members of ASPB have been elected to the 2007 class of Fellows of the American Association for the Advancement of Science (AAAS). This distinction for significant contributions to science and technology is determined by peer nomination. The Fellows Forum held during AAAS's annual meeting in Boston on February 16, 2008, will recognize all 471 new Fellows elected for 2007. The Fellows each will receive a certificate and a blue and gold rosette symbolic of their notable achievements. Congratulations to the 2007 AAAS Fellows from ASPB!

Agriculture, Food, and Renewable Resources

Henry Daniell, Sr.
Pegasus Professor Trustee Chair
University of Central Florida

Chloroplast genetic engineering, transgenic plants with agronomic traits, and field production of vaccine antigens and biopharmaceuticals

Robert E. Sharp
Professor
University of Missouri
Division of Plant Sciences

Regulation of root and shoot growth responses to water deficits

Biological Sciences

Bonnie Bartel
Professor
Rice University
Department of Biochemistry and Cell Biology

Auxin metabolism, peroxisome biogenesis, and microRNA functions in plants

R. Kelly Dawe
Professor
University of Georgia
Plant Biology Department

Centromeres, kinetochores, and chromosome movement

Philip W. Becraft
Associate Professor
Iowa State University
Department of Genetics, Development, and Cell Biology/Agronomy Department

Developmental biology of cereal endosperm

Machi F. Dilworth
Director
NSF Tokyo Regional Office
National Science Foundation
U.S. Embassy, Tokyo

Initiation, management, and competitive review of government-supported science programs, especially in plant biology

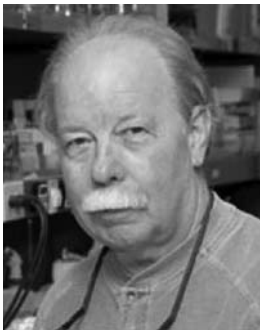
Biological Sciences (continued)

Steven P. Briggs, Sr.
Professor
University of California, San Diego

Plant–microbe signaling revealed by peptide mass spectrometry

Mary Lou Guerinot
Professor
Dartmouth College
Biological Science Department

Metal acquisition, distribution, and regulation in plants

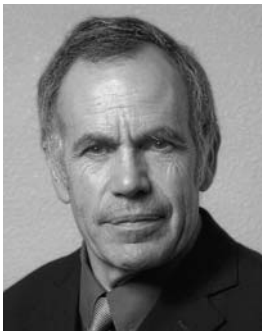


Thomas J. Guilfoyle
Professor
University of Missouri
Department of Biochemistry

Structure and function of RNA polymerases in plants and modes of action of plant hormones

Steven C. Huber
USDA Plant Physiologist and Professor
University of Illinois

Plant carbon and nitrogen metabolism and regulation of carbon–nitrogen interactions by protein phosphorylation



Stephen Patrick Long
Robert Emerson Professor
University of Illinois
Plant Biology Crop Science

Physiological and ecological responses of native and agronomic ecosystems to global change

Robert L. Fischer
Professor
University of California at Berkeley
Plant and Microbial Biology

Regulation of plant gene imprinting by DNA demethylation and Polycomb group proteins

Jan A. Miernyk
Research Molecular Biologist
USDA–ARS Plant Genetics Research Unit

Analysis of metabolic compartmentation, organelle biogenesis, and protein folding

Jack Preiss
Professor
Michigan State University
Department of Biochemistry

Molecular biology genetic and allosteric regulation of bacterial glycogen and plant starch biosynthesis

John Shanklin
Senior Biochemist
Brookhaven National Laboratory
Department of Biology

Biochemistry of lipid modification enzymes

Barbara A. Zilinskas
Professor
Rutgers University
Plant Biology and Plant Pathology Department

Photosynthesis and outstanding teaching and program development in biotechnology

ASPB Dramatically Expands Online Access in China

ASPB, working together with its local agent Charlesworth China, recently signed an agreement with the National Science and Technology Library (NSTL) in the People's Republic of China to provide access to the full-text online versions of *Plant Physiology* and *The Plant Cell* for a three-year period. NSTL's end users are individuals in universities, research institutes, and government departments that participate in NSTL—a total at this time of more than 450 Chinese institutions. With this agreement, ASPB's reach in China now expands from several dozen print + online subscriptions to online access for thousands of users nationwide. We will continue to provide individual libraries with print subscriptions as requested.

ASPB signed with the Charlesworth Group as its exclusive agent for online and print marketing in mainland China in fall 2007. The three-year, renewable relationship combines a comprehensive marketing plan; sales support for online and print agreements with consortia, national buying agencies, and individual academic institutions; and local expertise with U.S.-based management and support, all aimed at expanding the exposure and sale of ASPB's two premier plant science journals in China. Charlesworth will also provide targeted subscription marketing, translated promotional materials, and a Chinese-language website, as well as local support for libraries, as part of its partnership with the Society.

(From left) Jean Rosenberg, director of meetings, marketing, and membership, and Nancy Winchester, director of publications, celebrate the new partnership with Charlesworth China's SiNae Pitts and Neil Charlesworth at the 2007 Frankfurt Book Fair.

Charlesworth, ASPB, and NSTL worked throughout spring 2007 on a three-month trial that helped gauge interest in the journals among Chinese scientists. Usage during the April–June trial period exceeded all expectations, and the contract negotiations with NSTL were concluded in the winter.

"We are very excited about this development," says ASPB Executive Director Crispin Taylor. "Not only is our new arrangement with Charlesworth and NSTL bound to increase usage of *Plant Physiology* and *The Plant Cell* in China, but it is our expectation that it will also increase Chinese authorship and submissions to the journals."

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hours of electricity, enough to light six 60W light bulbs continuously for one year.

That much fuel contains as much carbon as a typical tree about 13 meters tall. In terms of global warming, though, it is even worse than that sounds, because the total warming effect of the airplane emissions (CO_2, NO_x, which catalyzes the formation of ozone, a greenhouse gas, and water vapor) is about three times greater than the effect of CO_2 alone. This analysis is quite complex, and the factor actually can range from two- to five-fold, according to the Intergovernmental Panel on Climate Change report (4). As an aside, I should note that the IPCC shared the 2007 Nobel Peace Prize with Al Gore (5).

To return to air travel, business class apparently costs about 1.5 times as much in terms of fuel consumption, because one occupies a larger portion of the airplane (still quite a bargain, compared with the fare differential). Obviously, the calculations are imperfect, and many of the assumptions (for example, the site's calculations are for travel in a Boeing 747, which is not used for this particular route, occupied at 80% capacity) are unlikely to be met. For instance, that site assumes a direct routing, and I am likely to fly via Houston (3,700 km one way).

However, a detailed and accurate calculation is not the point. The point is that each of our activities comes at a cost of energy consumption, and there are climate change consequences to the use of that energy. Whoever first said "take nothing but memories, leave nothing but footprints" did not anticipate carbon footprints. Perhaps the camping mantra of "tread lightly, and leave nothing behind" is more appropriate.

There is no small irony in our Society hosting a meeting on biofuels, with the laudable goal of addressing the need for a sustainable and renewable supply of energy, that requires almost all of the 500 anticipated registrants to fly great distances to participate. This inescapable irony has yielded considerable recent criticism of the UN-sponsored conference on climate change held in Bali December 3–14, 2007 (6), in both the traditional media (7) and the blogosphere (8). One possible route to bringing the scientific portion of the meeting to a broad audience with almost no carbon footprint is to broadcast live and/or archive the talks along with the posters and abstracts. Even questions could be contributed by webcam or e-mail. After all, our primary goal is to get the knowledge out and to expand participation. Other societies, including the Ecological Society of America (9) and the Society for Conservation Biology (10), have taken significant steps to try to offset the impacts of their members' travel to conferences. The ASPB Executive Committee will further discuss how the Soci-

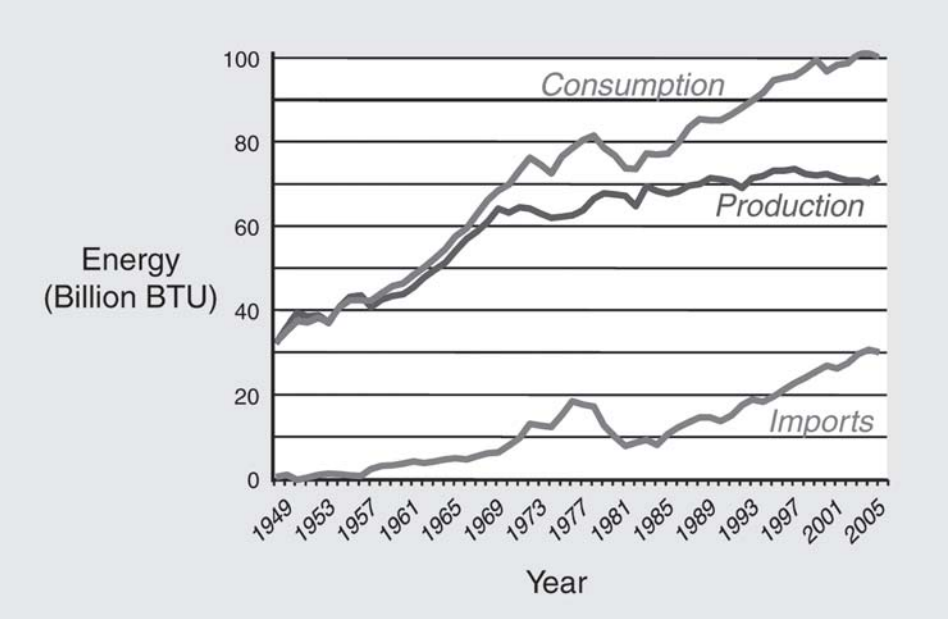

Figure 1. Summary of U.S. energy production and consumption from 1949 through 2006. Source: Department of Energy Annual Energy Review, 2006 (http://www.eia.doe.gov/emeu/aer/contents.html).

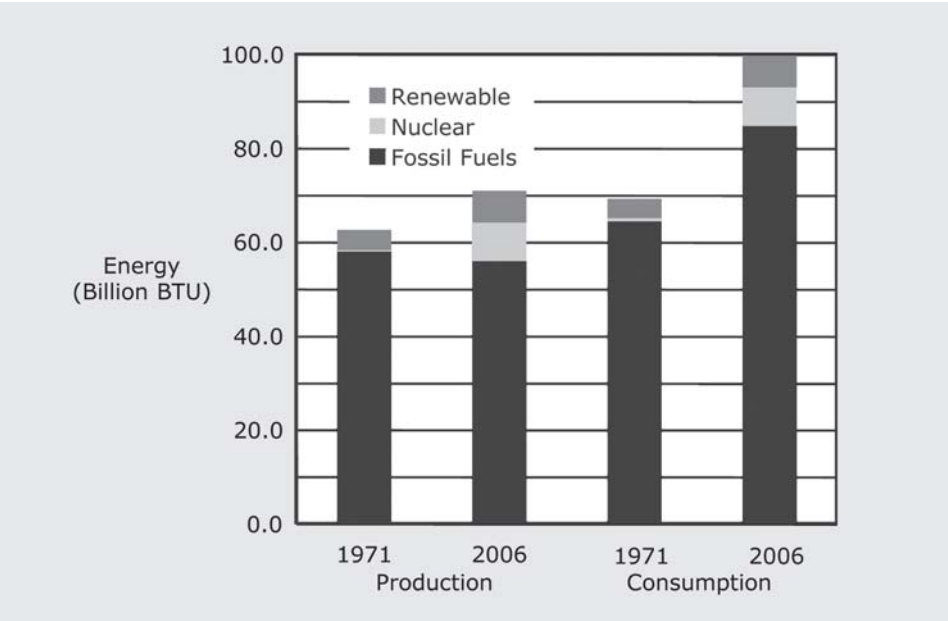

Figure 2. Summary of U.S. energy production and consumption by energy category in 1971 and 2006. Source: Department of Energy Annual Energy Review, 2006 (http://www.eia.doe.gov/emeu/aer/contents/html).

ety can reduce its carbon footprint at its February meeting.

In spite of this, I still plan to attend ASPB's meetings in Mérida. Plant biology's past and potential future contributions to global well-being cannot be denied. Norman Borlaug was awarded the 1970 Nobel Peace Prize for his incredible scientific contributions to human food supplies, which we now refer to as "the green revolution" (11). In the context of energy and global warming, it is important to remember that plant biology has the potential to make a significant positive impact on our energy supply.

I encourage you to take a second look at Rick Amasino's final president's letter in the September/October newsletter in which he discussed energy, biofuels, and carbon offsets (12). Rick cited Department of Energy estimates (13) that cellulosic biomass could provide a carbon-neutral source equivalent to about 10% of current U.S. fossil fuel use. To quote Rick, "At first glance, the cellulosic biofuels' slice of the overall energy pie might appear small. But given that addressing a problem of this magnitude will require a portfolio of approaches, a slice that comprises 10% of the pie is a major contribution." Is there a future peace prize in the biofuels field? That remains to be seen. But certainly there is the opportunity for plant biology to make a significant impact in the effort to develop a sustainable energy supply while minimizing adverse environmental consequences.

The other side of the coin—sequestering carbon, recharging underground aquifers, buffering soil erosion and fertilizer runoff, providing pollination, and maintaining biodiversity—is collectively known as ecosystem services. Restoring forests has already won the Nobel Peace Prize, awarded in 2004 to Wangari Maathai for her Green Belt movement (14). So our next challenge is to restore nature's biocapacity to produce food, fiber, and now fuel by moving the green revolution toward sustainability. We must focus on solutions that can deliver returns in both the direct and indirect ecological products of nature, even if that means we give up a slight advantage to maximize a particular output. Prairie hay biofuel (15) may offer one such example and perennial wheat another (16). It is easy to adopt a posture of despair and cynicism in the face of problems of enormous scale and consequence. After all, what can one person do? Perhaps individuals cannot do much, even if they modify their energy consumption patterns. Collectively, though, many people can accomplish a great deal. In response to the energy crisis of the 1970s, the United States reduced total petroleum consumption by about 20% (Figure 1). One aspect of this response was the adoption of cars with improved fuel efficiency, which increased by about 70% from adjusted miles per gallon (mpg) of 13.1 in 1975 to 22.0 in 1987 (17).

The subsequent 20 years have seen complacency and a slight reduction in fuel effi-

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ciency to 20.2 mpg in 2007. Over that interval, engineering improvements were simply misplaced. For example, from 1987 to 2007, vehicle weight increased about 25% (oh, those SUVs!), but average engine power rose 90%, from 118 to 223 horsepower, powering a 27% reduction in the number of seconds required to accelerate from 0 to 60 mph from 13.1 to 9.6! This is simply mad. But we all have choices: Compare your neighbor's 2008 Jeep Grand Cherokee four-wheel drive at 11/14 city/highway mpg with your 2008 Toyota Prius (hybrid electric) at 48/45 city/highway mpg (18). Crude oil prices hovering around $90 per barrel should provide some urgency to consumer demand for improved fuel efficiency. Collectively, we can have considerable effect. So drive your hybrid (or better, take the bus) to the airport on your way to Mérida.

As scientists, we have the opportunity and *arguably the imperative* to accomplish much more than simply acting as responsible citizens contributing through the collective power of changing consumer demands. We can set examples in the use of renewable energy and of energy-efficient behavior for society. We can also urge our academic, government, and industry employers to strive for maximum energy efficiency and use of renewable sources of energy. Of course, we can influence government directions and priorities through the ballot box, which is front and center at this time in the U.S. election cycle when living in New Hampshire!

We are scientists, and we can and should use our talents to provide the innovations that will be necessary to yield a greener economy. The ideas, vision, and energy of Norman Borlaug effected a revolution in cereal productivity. Biofuels, if we define them narrowly, may not provide the equivalent of a second green revolution, but the discussion can broaden to include other natural services and contribute in a major way to sustainable land use. Ten percent of our current energy need is not that different in absolute value than the 20% reduction in petroleum consumption that occurred in response to the oil crisis of the 1970s (Figures 1 and 2). Plant scientists must not lose sight, either as individuals or as a society, of our potential to improve the human condition. I view the meetings in Mérida as one of many investments we need to make toward increased energy production from biofuels. The goal is worthy. Our responsibility is to nurture that investment.

See you in Mérida, and if not, see us online!

Rob McClung
c.robertson.mcclung@dartmouth.edu

I thank Andy Friedland (Dartmouth College), Larry Smart (SUNY College of Environmental Science and Forestry), and Justin Borevitz (University of Chicago) for helpful conversations and comments.

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THE ROAD TO MÉRIDA

The Pan American Congress on Plants and BioEnergy: June 22–25, 2008

Plant Biology 2008: June 26–July 1, 2008

In 2008 ASPB will hold a new conference on plants and bioenergy immediately preceding its annual meeting in Mérida, Mexico. To help you prepare for these meetings, each issue of the *ASPB News* will provide important information.

Airline Discount to Attend ASPB's Meetings in Mérida, Mexico

If you are planning to attend either Plant Biology 2008 or the Plant and BioEnergy Symposium this summer, then check out the airline discounts ASPB has arranged through Continental Airlines.

Continental Airlines is providing attendees with discounts off published fares of 2% to 15% on Zone fares. Call your travel professional or Continental MeetingWorks at 800-468-7022 for reservations. Refer to **Z Code ZCK5** and **Agreement Code C75X1C.** Or save an additional 3% by booking your own reservations at www.continental.com. Choose your flight times and obtain your meeting discounts by inserting **ZCK5C75X1C** in the Offer Code box.

Another way to travel to Mérida is via Cancún. There are several flights daily from most cities to Cancún, and from Cancún you can take a regional airline into Mérida or hop a bus (be prepared for a three- to four-hour trip). Information on taking a bus from Cancún to Mérida is available right at the Cancún airport.

Summer is a popular time in the Yucatán, so book your flights early!

Hotel Information

This year's hotels are all located within a short walking distance from each other in a commercial district with restaurants, stores, supermarkets, banks, and other businesses. The historical center of Mérida and the beaches are close by as well. All hotels are a 20-minute drive from the airport and include private bath, Internet access (policies vary by hotel), cable or satellite TV, telephone, air conditioning, hair dryer, and other amenities. We suggest visiting the hotel websites for additional information and to see pictures of each facility.

The Plant Biology 2008 Conference is being held at the Siglo XXI Convention Center. The convention center is a 20-minute bus ride from the hotels. Frequent shuttle service from each hotel to the convention center will be provided to attendees at no charge. The headquarters hotels for Plant Biology 2008 are the Fiesta Americana Mérida and the Hyatt Regency Mérida.

Hotel rates range from US$102 to $130 a night for a single or double room. Rooms are available to us at these great rates until 30 days before the meeting. The cutoff to reserve discounted rooms is April 20, 2008, and after that it is on a space-available basis, so make your room reservations soon!

© PANORAMIC VIEW OF CHICHEN ITZA, by Guillermo Aldana for the Mexico Tourism Board

Welcome, Newest Members!

ASPB is pleased to honor the following individuals, who joined ASPB in 2007. We hope that you continue to benefit from your membership for many years. Contact us at info@aspb.org if you have any questions.

Christopher Aakre
Emily Abrash
Bolaji Adekola Adeniji
Abolanle S. Adisa
Vikram Agarwal
Adil Ahmad
Collin Ahrens
Karen Ahrens
Jose A. Alcalde
Debbie L. Alexander
Shawkat Ali
Adriana M. Almeida-Rodriguez
Maria Lucrecia Alvarez
Barbara Ambrose
Claire L. Anderson
O. Roger Anderson
Meike S. Andersson
Devi Annamalai
Amy R. Annino
Aldwin M. Anterola
Klaus J. Appenroth
Lirio M. Arevalo
Nicole L. Arnold
Chuthamat Atnaseo
Patrick J. Audet
Robert Augustine
Kyaw Aung
MD A. Babar
Chang Hyu Bae
Basavaraj Bagewadi
Margarete Baier
Tameka Bailey
Pierre Baldet
Ian Baldwin
Patrick R. Baldwin
Janneke Balk
Abdelali Barakat
Rosario Barbieri
Guy C. Barker
Cristina Barrero
Csengele Barta
Manojit M. Basu
Philip D. Bates
Hermann Bauwe
Elias A. H. Baydonn
Jorg D. Becker
Steven V. Beer
Juan Bejar
Eileen Belanger
Halima T. Bello
Labeed Ben-Ghaly
Matheus R. Benatti
Nazmul H. Bhuiyan
Christopher P. Bickford
Robert Billmyre
Stefan Binder
Philip Bocock
Natacha Bodenhausen
Maria Bolarin
Yung-tsi Bolon
Ulla Bonas
Dario Bonetta
Esteban Bortiri
Kamal Bouarab
Alain Bouchereau
Peter Bowerman
Andrew J. Bowling
Laurie E. Boyden
Allyson Bradley
Jessica N. Brazelton
Eric D. Brenner
Timothy J. Brodribb
Bobby Brown
Stevens Brumbley
Harry Brumer
Mike Brunner
Katharina Buerstenbinder
Mindy Bumgarner
Victor B. Busov
Timothy S. Butterfield
Charles Q. Cai
Joseph L. Caldwell
Martin Calvino
Nathaniel S. Cannon
Steven B. Cannon
Maria A. Cantero-Garcia
Aiqin Cao
Christopher Cardona-Correa
Jamie P. Carter
Claudine M. Carvalho
Keun Chae
Vijaya Vardhana R. Chaikam
Catherine Chan
Yuan-Li Chan
Yu-Yun Chang
Carolina M. Chanis
Mithu Chatterjee
Mohor Chatterjee
Fani Chatzopoulou
Chin-Fun Chen
Hong-Hwa Chen
Jianghua Chen
Qiang Chen
Xinlu Chen
Yu Chen
Yu-Chan Chen
Zhonghua Chen
Daolin Cheng
Davis W. Cheng
Shijun Cheng
Zigang Cheng
Anthony Chettoor
David J. Chevalier
Eric Chevalier
Tsan YU Chiu
Hwa-Young Cho
Sang-Kyun Cho
Sung Ki Cho
Chang Jae Choi
Suh-Yeon Choi
Nanyen Chou
Po-Hsuan Chou
Shao-Pei Chou
Mahboob A. Chowdhury
Katy M. Christiansen
Chengcai Chu
Wen-Po Chuang
Vesna Cilic
Stephen A. Coates
Paul R. Cohill
Marisha Collins
Francisco J. Corpas
Ana Maria M. Correa Morales, Sr.
Olivier Cotsaftis
Peter Cousins
Catherine P. Coutand
Michael F. Covington
David J. Craik
Michael Denis Cramer
Scott R. Crawford
Nicky M. Creux
Kevin C. Crosby
Felipe Cruz-Garcia
Marsha A. Cummings
Puneet Daigan
Valeriano Dal Cin
Sachie Dale
Catherine Damerval
Janet C. Daniel
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Golden Opportunities for Success

The great Roman philosopher Seneca once said, "Luck is what happens when preparation meets opportunity." Through my years as a student, I have often seen how hard work unlocks the door to success. But it has been those rare, unforeseen opportunities that have thrown the unlocked door open wide.


Kristy Brumfield

ASPB has opened its arms to welcome new students from various backgrounds. The Society has embraced a mission to increase the diversity of the organization by recruiting highly qualified individuals to participate as Minority Affairs Committee (MAC) Recognition Travel awardees. It has reached out to minority students and professors specializing in the plant sciences. This diligent effort to welcome us to Chicago for Plant Biology & Botany 2007 made a lasting impression on me. It was truly an honor to represent my university at the ASPB annual meeting, and after attending the conference as a MAC awardee, I feel that I walked away with several valuable experiences.

Attending Plant Biology & Botany 2007 has added a new dimension to my future career pursuits. I gained valuable information about innovative laboratory techniques and protocols, as well as the myriad ways in which basic research in plant biology is being applied. I also received ample feedback on specific experiments that might enhance my dissertation research and create a strong résumé for the postdoctoral application process. The meeting was a fantastic way to meet potential future collaborators and gain their insight on pertinent research questions.

Engaging intellectually with scientists from all over the world was the greatest highlight of my experience as a MAC awardee. One conversation with a world-renowned professor stands out, because it really inspired me. This professor offered encouraging words about working hard toward the goals we hold close to our hearts and never settling for anything less than that. He even gave me information about future postdoctoral opportunities! Having such a personal one-on-one conversation about my goals and future as a plant scientist was truly motivating. I left the meeting feeling exuberant about my chosen career path.

The opportunity to attend the ASPB meeting as a MAC awardee also allowed me to learn more about the outreach efforts of the organization. The Society increases diversity by recruiting minority students and faculty. The ASPB Diversity Bank (http://www.aspb.org/diversitybank) is an excellent means to provide students at minority-serving institutions an opportunity to gain valued research experience and funding that they might otherwise have been unable to realize. As a student who has seen the vast benefits of mentorship, I encourage everyone to participate in the Diversity Bank and to unlock the door for other students who may not have the chance to do research at their home institutions.

In addition to the Society's focus on reaching out to diverse populations, it also has an active mission to promote the plant sciences at every level of the education process. Indeed, educating the world about the importance of plant research has been a long-standing premise of the organization. ASPB continues to provide support to its member scientists and to publish two world-class journals that highlight the research of plant scientists all over the world. As a MAC awardee, I gained a true appreciation for these aspects of ASPB's operations.

Finally, golden opportunities for success are right around the corner for those who are willing to receive, as well as for those who give. ASPB has been so successful in its pursuits because of its ongoing mission to give back to the community of scientists it serves. As a new member of the organization, I feel fortunate to be embarking on my future career as a plant scientist.

Thank you, ASPB, for providing me with my golden opportunity!

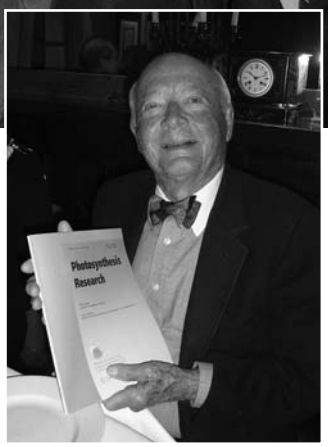
Kristy Brumfield
Graduate Student
Department of Biological Sciences
Louisiana State University

Tribute to Andrew Benson

Bob Buchanan (University of California at Berkeley), Roland Douce (Université Joseph Fourier Grenoble), and Hartmut Lichtenthaler (Universität Karlsruhe) have edited a special issue of *Photosynthesis Research* to honor Professor Andrew A. Benson on his 90th birthday *(Photosynthesis Research* 2007: A Tribute to Andrew A. Benson, special issue, Vol. 92, No. 2, pp. 143–271). On October 20, 2007, Roland Douce organized a dinner in Paris to celebrate the occasion. The dinner was held in the Salon Voltaire at Le Procope, the oldest restaurant in Paris (in business since 1686). The editors presented a bound volume of the journal to Andy at the dinner, which was also attended by Gérard Milhaud, Dee Benson, Vera Milhaud, Regine Lichtenthaler, and Melinda Buchanan. Andy and Gérard worked together in Melvin Calvin's photosynthesis laboratory in 1952–1953 and have since maintained their friendship.

Many leading French intellectuals have dined at Le Procope since its founding—for example, Voltaire, Rousseau, and Diderot—as have historical figures such as Benjamin Franklin and Thomas Jefferson, early American ministers to France. In the latter part of the 18th century, the restaurant served as a place for Robespierre and other French revolutionaries to meet and plot strategy. Le Procope retains the original décor and displays numerous items of historical significance, including the hat of Napoleon Bonaparte. According to the restaurant, Bonaparte left his hat in lieu of money for a bill he was unable to pay.

Attending the dinner at Le Procope (left to right): Hartmut Lichtenthaler, Andy Benson, Roland Douce, Gérard Milhaud, and Bob Buchanan. PHOTOS BY HARTMUT LICHTENTHALER.



(Right) Andy Benson with the special issue of *Photosynthesis Research* published to commemorate his 90th birthday.

The evening with Andy Benson in the St. Germain district of Paris was memorable and a fitting way to mark a milestone in the life of one of the pioneers of photosynthesis research.

Issues of *Plant Physiology* Needed!

The American Society of Plant Biologists is collaborating with JSTOR, the not-for-profit online digital archive, to include ASPB's journals in the JSTOR Biological Sciences Collection. In May 2007, the complete back files of *The Plant Cell* were made available for searching, browsing, and printing as part of the collection. We are now preparing to do the same for the back issues of *Plant Physiology.* Currently, JSTOR is seeking volumes 1–12 of *Plant Physiology* for digitization. In order to help facilitate the production process, **we are asking members to help us locate back issues from the first 12 volumes of *Plant Physiology.*** To learn more about donating back issues, please contact

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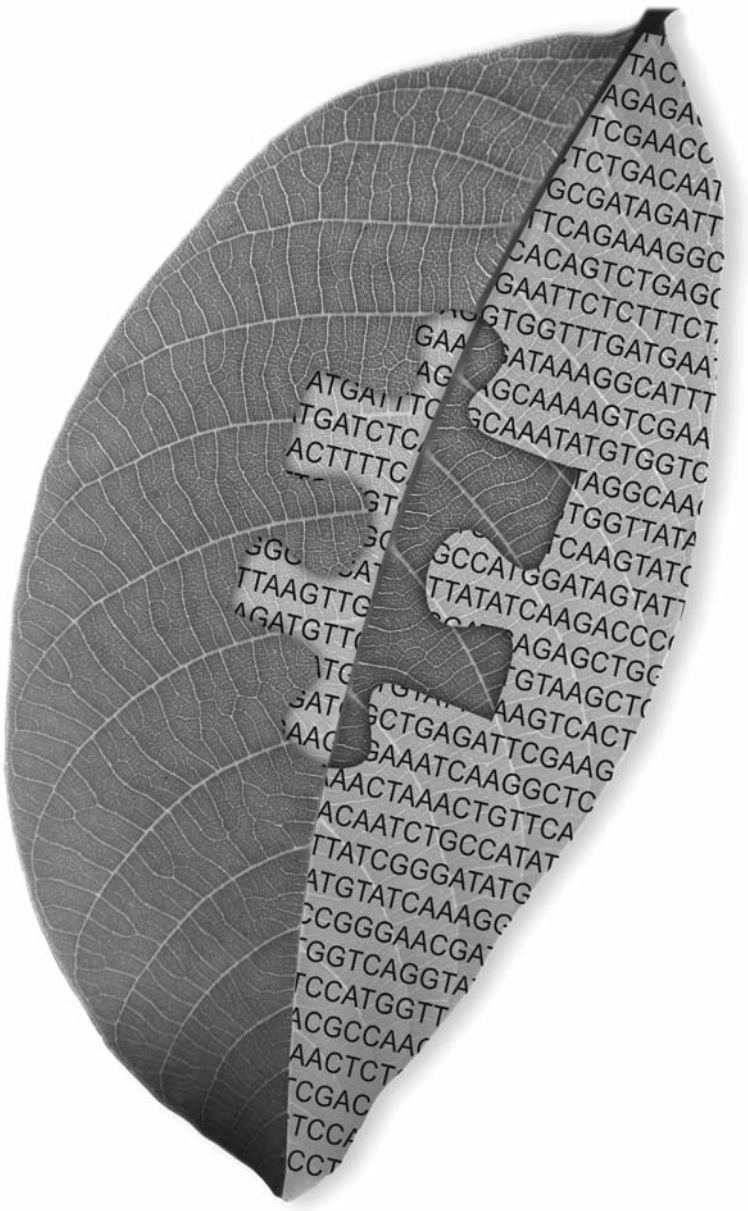

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ASPB's 2005 AAAS Mass Media Fellow Sarah Nell Davidson sent a series of "postcards" to the ASPB News *during the academic year she spent abroad doing research for her PhD thesis. This is her last Postcard.*

Greetings from Cuernavaca, Morelos, Mexico

Home of Plant Biology 2008 Organizer Federico Sánchez

It is appropriate that the National Autonomous University of Mexico (UNAM) chose Cuernavaca as the site for its Institute of Biotechnology. The native people of the state of Morelos, who dwelled here for centuries, developed as a productive agrarian society. The Mexica Aztecs who dominated the valley referred to the inhabitants of what is now the state of Morelos as "*Tlahuica,*" or "those who work the land." Likely they produced maize, tomatoes, and squash. After the conquest, Hernán Cortés claimed the region for the Spanish crown, and he constructed his goliath estate in the climatically pleasing city of Cuernavaca. Under Cortés, new agricultural practices were implemented, and sugarcane production took off. Today, the area is best known in Mexico for rice and sugarcane production. After a recent slump attributable to competition with Brazil, sugarcane production is on the rise because of the new push for biofuel production.

I caught up with energetic ASPB member Federico Sánchez in his office last August. Up until his appointment in Cuernavaca, Sánchez had worked with organisms from all the kingdoms of life—except plants. As an undergraduate chemist, he worked on *Salmonella.* His master's and PhD in biochemistry brought him to *Neurospora,* and he spent his time as a postdoc at the University of California, San Francisco, working on the cytoskeleton of *Drosophila.* When he and his wife, scientist Carmen Quinto, returned to Mexico, they were recruited to the newly established Nitrogen Fixation Center on the Cuernavaca campus of UNAM. Quinto began working on *Rhizobium,* and Sánchez turned at last to plants; thus, his relationship with *Phaseolus* was born.

Sánchez, now a professor in the Department of Plant Molecular Biology on the Cuernavaca campus, is a self-taught botanist who moonlights with orchids on the weekends. A member of the Mexican Orchid Society, he has more than 100 species of orchids in his two large greenhouses at home and specializes in Mexican species, of which there are many. "Mexico has the third largest biodiversity in orchids," Sánchez tells me later in the afternoon as we tour his lush greenhouses. But this well-rounded scientist is equally fervent about his favorite legume, *Phaseolus vulgaris.* His group is working hard to understand the signal transduction cascade instigated by interacting with *Rhizobium.* In addition, he has carried over his postdoctoral penchant for the cytoskeleton, this time in *Phaseolus* nodules.

As the president of Mexico's Biochemical Society from 1996 to 1998 and an active member of the International Society of Molecular Plant Microbe Interactions, Sánchez has organized his share of scientific meetings in Mexico. Both of us having just attended the ASPB meeting in Chicago, our conversation turns to next year's ASPB meeting in Mérida. "I and others have dreamed for a long time that the annual meeting of ASPB would be in Mexico," Sánchez said.

Although ASPB has a strong partnership with Canada and has held meetings in Vancouver, Sánchez views Plant Biology 2008 as ASPB's first truly international meeting. "From my point of view, it will really be like ASPB is going for the world," Sánchez began. "In a way, this really represents plant molecular biology. If you look at membership, 40% is the rest of the world."

"It is also very exciting news not only for Mexico, but for scientists in Central America and South America," Sánchez pointed out. "There are a lot of fine scientists and students there, and it will be much more feasible for them to attend a meeting in Mexico."

As the lunch hour approaches, Sánchez invites me to a local restaurant specializing in the Yucatán cuisine we can expect to taste in Mérida next summer. "Not only is the city very clean and beautiful, but the food is wonderful," he tells me as we approach our table. As Mayan enchiladas smothered in a rich pumpkin seed sauce take their place on the table next to regionally inspired Mayan tacos and a lime soup, Sanchez gives me a

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rundown of the culinary history. "Until the 1950s, Yucatán was a state that was kind of isolated from the rest of Mexico because it is so far away, and during the rainy season it was too difficult to cross the rivers. So they had a strong influence from other parts of the Caribbean and the world, from a stuffed Dutch cheese to seafood, all blended with a traditional Mayan cuisine."

As I add habanero sauce to my plate, as advised by my host, in "microliter increments," Sánchez moves on to other hot topics. "One of the main attractions at the 2008 meeting will be the precongress symposium on biofuels." Sánchez is trying to arrange an appearance by the minister of energy. "This will be the landmark," he tells me. "All of the key persons in bioenergy are going to be getting together for this." Sánchez is especially excited about tapping into some of Mexico's native plants adapted to marginal areas for biofuels, especially the diverse legumes that make their home here. Attendees can also likely look forward to a session on plants native to Mexico, the origin of such globally important crops as maize, cotton, peppers, squash, and tomatoes, to name a few.

Sánchez is looking forward to hearing from his former mentor Estela Sánchez de Jiménez at the meeting. "Estela was the first person to start working on the biochemistry of plants in Mexico in the 1970s," he said. "She has been a leader and a mentor and source of inspiration for many generations of Mexican scientists working with plants."

Perhaps influenced by his own positive experience under the guidance of Sánchez de Jiménez, Federico Sánchez is a dedicated teacher and mentor. "ASPB 2008 in Mexico will have a terrific impact on undergraduate and graduate students here who have read the papers of established scientists from around the world," Sánchez observed. "Now they can meet them in person in a very casual setting. The meeting in Mérida will bring a lot of benefits not only locally to Mexico, but throughout Central and South America."

Sarah Nell Davidson
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Announcing the 9th Annual ASPB Education Booth Exhibitor Competition in Mérida!

Dear ASPB Member,

Grants are available to ASPB members in the Education Exhibit Competition. Have you developed new ways of carrying out hands-on science in your teaching laboratory or classroom? Have you developed effective outreach tools you'd like to share?

The Education Committee cordially invites you to share your activity with the ASPB membership by hosting an interactive exhibit or demonstration at the Education Booth at the annual ASPB meeting this summer in Mérida. The annual meeting will be held June 26–July 1, 2008.

The Education Committee is looking for new ideas and technology being used in the classroom or in outreach efforts and, as an incentive, is offering a cash grant of $500 and registration costs for up to three presenters. Your proposal should be no longer than four double-spaced pages. It should include a title and the address and contact information of the presenter(s). Please address the following questions in your proposal:

1. State clearly the rationale behind the exhibit. Highlight the use of new techniques, pedagogies, or technology. How is this presentation exciting and new?
2. Provide a clear, detailed summary of how the exhibit will function (a diagram or picture would be helpful). In particular, it will be important to illustrate how the visitors can interact with the exhibit.
3. Indicate the equipment that will be required for the exhibit, including computers, Internet connection, DVD player, monitor, and the like. Indicate what you will provide and what you would need ASPB to provide. We will make every effort to meet your needs.

Note that awardees are expected to spend some time hosting their exhibit and interacting with members at the booth each day. You're welcome to choose the times most convenient for you.

We can't think of a better opportunity to showcase your new approaches or new technology for the plant biology classroom. We hope that you will consider submitting a proposal and will join us at the booth for these exciting exhibits!

Your proposal should be addressed to Education Committee member Chad Jordan (chad_jordan@ncsu.edu) and submitted as an e-mail attachment (Microsoft Word or PDF) by no later than March 7, 2008. Winners will be notified by April 2, 2008.

An article in the September/October 2007 issue of the *ASPB News* highlighted educational activities and Education Booth exhibits from last year's meeting in Boston. The article may be found at http://www.aspb.org/newsletter/septoct07/32edforum2.cfm.

Kind Regards,

ASPB Education Committee

Academia, Industry, Government—Which One Will It Be?

by Pat Okubara
Research Geneticist (Plants), Washington State University, pokubara@wsu.edu

While considering what to write for this article, I took the chance to mentally review over 30 years of experience in plant biology. Long ago, I recognized that my career path had not been predictable; rather, it had been defined by circumstance, opportunity, and plain determination. It is what the English refer to as "chequered"—a patchwork of research projects first undertaken as an undergraduate, then as a technician in an academic laboratory and in industry, later as a graduate student, still later as a postdoctoral associate in both academia and government, and finally as a USDA–Agricultural Research Service scientist and adjunct faculty member at a university.

Academia, the private sector, and government—all three research venues have attractions. The academic setting was and still is the most familiar to me, as it likely is for many of you. Immediately upon graduation, I began working full-time as a technician in a plant molecular biology lab at the same university that granted my bachelor's degree, originally planning to work for two years before returning for a medical degree. Research in plant molecular biology proved to be a turning point, as the excitement of discovery at the bench, doing biology at the molecular level, and a growing appreciation for the uniqueness of plants became too compelling to abandon, even after four years.

In an academic setting, intellectual resources and expertise are comprehensive, and facilities generally are not limiting. Information abounds, and so does the knowledge to make sense of it—so long as you think, read, knock on office doors, and send e-mail queries. This setting is relatively informal. Seminars and opportunities to meet with visiting scientists should not be taken for granted, however, as these are not always commonplace in other venues. One-on-one conversations with visiting researchers are an educational experience for which there is no substitute. One of the drawbacks of academia was and still is the impermanent nature of research projects that are dependent on extramural funding. Although my postdoctoral positions had finite terms, they were as "real" as any job, deserving the best I could give.

For personal reasons, I made the jump from a staff position at a major university into the private sector, doing research in maize transformation in a biotechnology division of a national chemical company. The biotech division resembled a small start-up company. The caveat to this experience was that it took place decades ago, when biotechnology sometimes was described as the solution to chemicals and even to field research. It defied reason how manipulating fragments of DNA could replace or even predict how the whole plant would perform and interact with biotic and abiotic factors in the field. Nevertheless, it was immensely exciting to be part of a new wave in plant biology.

Research in industry came with unique opportunities. Project managers and fellow researchers were less concerned about the degree one held than about one's willingness and ability to do the work. The outcome of this philosophy was that I managed or collaborated on several projects and frequently gave talks and tours to shareholders and management personnel not familiar with the technical aspects of the work. (The requisite skills can, of course, be applied in explaining one's research to bewildered family members.) Each of us attended national meetings on behalf of the entire research group. At these meetings, I faced the obvious viewpoint that industry scientists, who generally did not disclose their own research findings, should not be privy to hard-gained information from others. Perversely, this served to increase my determination to go to meetings. I eventually became acquainted with other regular attendees and gained familiarity with new areas in plant biology.

One highlight of these meetings was a two-minute informal conversation with Dr. Barbara McClintock right before one of the sessions. At the time, she would have been about 80 years old. She was intensely honest. She did not ski but came prepared for a hike and told me she could no longer work with the microscope. This was a jolt to a young scientist who had not yet paused to think about how physical changes could cause one to give up what one loved. What did she do, then? Well, she adapted by relying on others for this part of her research, a solution to which I now fully subscribe. The fact that she had given an impressive keynote address and was full of vitality, exuding great mental strength and determination, was vastly uplifting.

Unlike in academia, projects in industry were formulated in part on shareholders' and investors' interests. Projects had definite timelines or benchmarks and could be dropped without much notice. The competition from other laboratories was intense, and one always had the feeling of having fewer resources than the next biotechnology group. However, the overriding benefit was working as part of an enthusiastic team toward a common, agriculturally based objective and working to develop new technologies that would influence the applied sciences.

In contrast, research in a federal agency is more long term. As a USDA–ARS scientist, I have had complete freedom to develop a research program, albeit within the context of a broader objective or "mission." Surprisingly, the research is not entirely applied. My program has applied objectives, but we are doing basic research designed to provide knowledge that will enable applied objec-

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tives. As in industry, there are mentoring, education, and outreach components to the job. A USDA scientist is accountable to taxpayers, who essentially fund the position, and to the executive branch of the U.S. government. In other words, there are more forms, paperwork, and protocols than in the other research venues. A federal laboratory might be situated on or near a campus and contained within a separate facility. In this case, some effort is needed to get to seminars and maintain connections with the rest of the campus. It has been said that working in the USDA–ARS is part research and part business, and in my view it combines the best of academia and industry.

Some of you might have chosen a research focus early in your career and have had or will have the opportunity to stay within this area. At the end of your career, you will be able to point to a body of work and say, "This is my contribution." My one minor regret for having a checkered career is that I am not able to do this . . . yet. However, I do not think it is too late. Given the benefit of hindsight, I see that all of my career decisions brought me in contact with diverse, talented scientists and have led to enhancing, life-building experiences.

This is an outstanding time to be a plant biologist. Projects have moved toward the interdisciplinary and collaborative, so the researcher can address broader questions. Academia, the private sector, or government… it's your choice. The elements of conducting research in all three settings are the same: high-quality science, commitment to immediate objectives, understanding of the bigger picture, and a mind always to the biology underlying the data.

View past columns of Women in Plant Biology at http://www.aspb.org/newsletter/wipb.cfm.

Membership Corner

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

Name: Aruna Kilaru
Title: Postdoctoral Research Associate
Place of work or school: University of North Texas
Research area: Lipid Signaling and Hormone Physiology
E-mail: kilaru@unt.edu
Member since: 2001

1. **Has being a member of ASPB helped you in your career? If so, how?**
   I was a doctoral student when I joined ASPB. I have benefited from the access to online journals, newsletter, and job postings and reduced registration fee to the ASPB meetings (sectional and annual). But most of all, I continue to gain inspiration from the community of plant sciences; specifically, the wide range of symposia, discussions with peers, and up-to-date information on plant sciences at the annual meetings have provided a broader perspective of my own research and a sense of direction. Interactions with researchers at the meetings generated collaborations and also aided me in finding a postdoctoral mentor.

2. **Why has being a member of ASPB been important?**
   A sense of belonging! Most of my friends switched from plant sciences to animal sciences under the presumption that the latter provide better career opportunities. However, my continuing interactions with ASPB members helped me see not only what we all do as plant biologists, but also what we can do together for the progress of the field. I realize that opportunities are limited only by our imagination. The Society inculcated a familial relationship with other plant biologists, without which I would find myself in a labyrinth.

3. **Was someone instrumental in getting you to join ASPB?**
   Professor Karl H. Hasenstein, my PhD adviser at University of Louisiana, Lafayette, encouraged our lab members to join ASPB. He believed in the need for students to interact and communicate with peers and relentlessly supported our travel to ASPB annual meetings. After my first meeting, I referred several colleagues to join ASPB.

4. **What would you tell nonmembers to encourage them to join?**
   Progress in plant biology is a cooperative effort. As Henry Ford said about teamwork, "Coming together is a beginning. Keeping together is progress. Working together is success." ASPB membership is the beginning.

5. **Have you gotten a job using ASPB job postings or through networking at the annual meeting?**
   Yes, I interacted with Professor Kent Chapman at an ASPB meeting, subsequent to which I gladly responded to his advertisement for a postdoctoral position on the ASPB site.

6. **Have you hired anyone as a result of a job posting at the meeting or on our online Job Bank?**
   Not yet, but I certainly hope to in the future.

7. **Do you still read print journals? Where do you usually read them: work, home, library, in the car, on the bus?**
   I enjoy flipping through the print journals and am always delighted to look at the cover page. But most often, I print articles of interest to read at a later time, either waiting for my daughter to finish her after-school activities, on weekends, or during travel.

8. **What do you think is the next "big thing" in plant biology?**
   Interestingly (and unfortunately), politics seems to decide the next "big thing" in science; I wonder what is after global warming and biofuels. Personally, I think we are in an era of exploding *–omics.* The breadth of information we are gaining is overwhelming. With this knowledge, it will soon be time for us to reach the depths of basic physiology and biochemistry of plants, specifically in response to stress (biotic and abiotic); we will see more receptors, signaling molecules, multiple pathways, and lipid–hormone cross-talks . . . back to basics.

9. **What person, living or dead, do you most admire?**
   Several people (family, friends, teachers, at times even a stranger) had an influence in shaping my life. Most of all, my grandparents and my PhD adviser are the ones whom I admire the most; they are the epitome of hard work, dedication, and passion. They not only provided education and discipline but encouraged me to discover myself.

10. **What are you reading these days?**
    You mean if there is time left between doing experiments and answering a 10-year-old, reading science, and nonsense …just kidding! I enjoy reading, mostly narrative authors; some of my favorites are Gabriel García Márquez, José Saramago, Salman Rushdie, etc. Currently, I am reading *Rembrandt's Whore* by Sylvie Matton, *The Hungry Tide* by Amitav Ghosh, and *The Trial of Socrates* by I. F. Stone.

11. **What are your hobbies?**
    Research, reading, Rachana (challenging time with my daughter)! I also enjoy travel, photography, and dance.

12. **What is your most treasured possession?**
    Experiences and memories; good and bad, they are truly (and only) mine. I cherish them.

13. **What do you still have left to learn?**
    There is so much to learn; the day I can answer all the questions of a child, I will feel learned. On my wish list, however, is learning German and Bharatanatyam (an Indian classical dance).

ASPB Coordinates USDA–CSREES Stakeholders' Workshop on Plant and Pest Biology

The USDA Cooperative State Research, Education, and Extension Service (CSREES) sponsored a Stakeholders' Workshop on Plant and Pest Biology on November 20 in Alexandria, Virginia. The workshop provided the opportunity to a diverse array of stakeholders to present their priorities for research on plant and pest biology.

Nearly 30 stakeholder organizations participated, representing primarily science societies and grower organizations. Nearly 20 officials from USDA–CSREES took part in the workshop, together with representatives from USDA Agricultural Research Service (ARS), the National Science Foundation (NSF), and the Department of Energy (DOE).

Colien Hefferan, CSREES administrator, presented the opening remarks for the program. Anna Palmisano, CSREES deputy administrator for Competitive Programs, explained CSREES program opportunities to stakeholders. Michael Fitzner, plant systems section director for Plant & Animal Systems, discussed programs offered in the plant systems section.

A panel was held of CSREES national program leaders and representatives from ARS, NSF, and DOE. Ed Kaleikau, Ann Lichens-Park, Liang-Shiou Lin, Gail McLean, and Mary Purcell participated on behalf of CSREES Competitive Programs. Ann Marie Thro and Tom Bewick represented CSREES Plant & Animal Systems. Michael Mishkind explained research programs supported by the NSF Directorate for Biological Sciences. Sharlene Weatherwax of the DOE Office of Biological and Environmental Research (BER) discussed plant research opportunities within BER. Kay Simmons discussed plant research supported by ARS.

Committee on Public Affairs Chair Gary Stacey of the University of Missouri presented the ASPB research priorities. Stacey noted that USDA–CSREES–funded research conducted by ASPB members addresses all six CSREES strategic goals. For example, member Debra Mohnen (University of Georgia) identified the Arabidopsis GAUT1 gene, providing insight into a gene family that affects plant biomass for biofuel production. Member Jorge Dubcovsky (University of California, Davis) recently received the USDA Discovery Award for research to enhance wheat nutritional value. The USDA website highlights member John Cushman (University of Nevada), whose work on the resurrection plant may provide novel insight on how to protect plants from drought stress. These are a few of the many ongoing projects by ASPB members that directly address CSREES strategic goals.

(From left) Anna Palmisano, CSREES deputy administrator for Competitive Programs; Gary Stacey, ASPB Committee on Public Affairs chair; and Liang-Shiou Lin, CSREES national program leader for Competitive Programs, attend a Stakeholder's Workshop on Plant and Pest Biology.

The majority of ASPB members perform research that addresses fundamental questions in plant biology. It is this basic research that leads to new approaches to improve crop production. For example, basic plant research led to the discovery of RNA interference, which is now influencing both plant and human biology. ASPB has urged CSREES to continue funding basic plant biology research through the National Research Initiative Competitive Grants Program rather than shifting funding to specific agricultural applications.

Good applied research begins with good basic research. The sequencing of the model plant *Arabidopsis thaliana* has been followed by tremendous advances in our understanding of crop genomes. These advances have greatly accelerated our ability to identify genes controlling important agronomic traits while also enhancing the use of molecular tools to breed superior crop varieties. These resources were developed through significant investments by both USDA and NSF and were accomplished by consortiums of multiple laboratories.

Although continued resource development in some crop plants is needed, model plants (e.g., Arabidopsis) remain relevant to agriculture. According to Stacey, it is time to focus again on solving specific biological questions, which is best accomplished by individual laboratories working in the plant

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Plant and Pest Biology Programs Supported by NRI

Gail McLean, national program leader of the National Research Initiative (NRI) Competitive Grants Program, gave a presentation on NRI Plant Science programs on November 20 as part of the USDA–CSREES Stakeholders' Workshop on Plant and Pest Biology. Her colleagues, national program leaders Ann Lichens-Park and Mary Purcell, also gave presentations on NRI Microbial programs and NRI Arthropod and Nematode programs as part of the workshop. Following are portions of the presentations.

Plant Biology

Dr. McLean explained that the NRI Plant Biology program, funded at $16.1 million,

- Provides fundamental knowledge and training for improvement and sustainability of agricultural plant and forestry production
- Allows scientists to make use of the increasing wealth of genomics data and tools
- Aids development of new varieties of agricultural plants through biotechnology and plant breeding approaches.

Program elements include

- Gene Expression and Genetic Diversity (Liang-Shiou Lin)
- Environmental Stress (Gail McLean)
- Biochemistry (Gail McLean)
- Growth and Development (Liang-Shiou Lin)
- Plant Breeding and Education (Liang-Shiou Lin and Gail McLean).

Contacts for the program are Liang-Shiou Lin (llin@csrees.usda.gov) and Gail McLean (gmclean@csrees.usda.gov).

Plant Genome, Genetics, and Breeding

The NRI Plant Genome, Genetics, and Breeding program provides $10.0 million supporting program goals contributing to

- Increased fundamental knowledge of the structure, function, and organization of plant genomes for U.S. crop and forestry improvement
- Effective integration of modern molecular breeding technologies and traditional breeding practice
- Improved varieties for agricultural growers and producers.

Program elements are

- Tools, Resources, and Bioinformatics
- Functional Genomics
- Genome Structure and Organization
- Applied Plant Genomics Coordinated Agricultural Project (CAP).

The contact for the program is Ed Kaleikau (ekaleikau@csrees.usda.gov).

Other Plant Science Programs

Other NRI programs supporting plant science–related projects include the following:

- Biology of Weedy and Invasive Species in Agroecosystems (Michael Bowers, mbowers@csrees.usda.gov)
- Managed Ecosystems (Diana Jerkins, djerkins@csrees.usda.gov)
- Biobased Products and Bioenergy Production Research (Chavonda Jacobs-Young, cjacobs@csrees.usda.gov)
- Bioactive Food Components for Optimal Health (Etta Saltos, esaltos@csrees.usda.gov, and Ram Rao, rrao@ csrees.usda.gov)
- Improving Food Quality and Value (Ram Rao, rrao@csrees.usda.gov, and Hongda Chen, hchen@csrees.usda.gov).

NRI interagency programs include

- Plant Feedstock Genomics for Bioenergy (Department of Energy)
- Maize Genome Program (National Science Foundation, DOE)
- Metabolic Engineering (NSF, National Institutes of Health, DOE, National Aeronautical and Space Administration, and others)
- Climate Change Science (DOE, NASA, NSF, and others)
- Microbial Genome Sequencing Program (NSF)
- Microbial Observatories (NSF).

Microbial Genomics

The NRI Microbial Genomics program is funded at $10.4 million. Its goals are

- To improve biological understanding of gene sequences and gene expression of agriculturally relevant microorganisms
- To improve the quality of agricultural commodities and products and the realization of more efficient and sustainable production practices.

The program elements of Microbial Genome Sequencing are high throughput sequencing of microbial genomes and strategies, tools, and technologies to make genome sequences more valuable. The program element of Microbial Functional Genomics is increased understanding of the biological role of gene sequences. The contact is Ann Lichens-Park (apark@csrees.usda.gov).

Microbial Biology and Plant Biosecurity

NRI Microbial Biology and Plant Biosecurity programs are funded at $11.4 million. Microbial Biology program elements include

- *Microbial Observatories:* Discover and characterize novel microbes and microbial communities
- *Microbial Associations with Plants:* Fundamental research on interactions between microbes and plants.

The contacts are John Sherwood (jsherwood@ csrees.usda.gov) and Ann Lichens-Park (apark@csrees.usda.gov).

The Plant Biosecurity Program Goal is to safeguard U.S. agriculture from critical and emerging high-consequence plant pathogens and arthropods. The contacts are Liang-Shiou Lin (llin@csrees.usda.gov) and John Sherwood (jsherwood@csrees.usda.gov).

Arthropod and Nematode Biology and Management

The NRI Arthropod and Nematode Biology and Management program is supported with

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Plant and Pest Biology
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$12.9 million. The long-term goals are

- To improve understanding of biotic and abiotic factors that affect establishment and distribution of pests and beneficial species
- To develop scientific and technological frameworks for environmentally sound pest management.

Program elements include

- Organismal and Population Biology
- Suborganismal Biology
- Tools, Resources, and Genomics
- Protection of Managed Bees CAP.

The contact is Mary Purcell (mpurcell@csrees.usda.gov).

USDA–CSREES Workshop
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system best suited to address the specific problem.

Stacey recommended an increased priority on basic plant research supported by the National Research Initiative Competitive Grants Program. For example, greater emphasis on and support for basic research in Program 56 Plant Biology will provide an increased understanding of gene function, growth and development, environmental stress, regulation, and biochemistry, providing the knowledge needed to attain significant gains in crops yields.

Knowledge of plant genomics is revolutionizing our understanding of the genetic bases of important crop traits. Hence, it seems prudent to also provide greater support for Program 52.1 Plant Genome, whose funding has fueled this knowledge revolution. Stacey recommended increased support for the Joint USDA–DOE Plant Feedstocks Genomics Program. He recommended that the department work closely with science and grower stakeholders in future implementation of new basic and applied plant research opportunities pending authorization of new specialty crops, biofuels, and bioproducts research initiatives.

The tremendous prospect of displacing 30% of imported transportation fuels with homegrown biofuels in future years will depend on innovations in both basic and applied plant research. For both specialty and all crops, a balanced portfolio of fundamental and applied research will contribute to the best returns for growers and consumers.

ASPB coordinated the workshop with a grant from USDA–CSREES. ASPB also coordinated USDA–CSREES Stakeholders' Workshops on Plant and Pest Biology in 2002 and 2005.

Plant Biology Research Opportunities in the DOE Office of Biological and Environmental Research

Dr. Sharlene Weatherwax outlined several opportunities for plant research within the Department of Energy (DOE) Office of Biological and Environmental Research (BER) at a November 20 Stakeholders' Workshop on Plant and Pest Biology sponsored by USDA–CSREES. Following is information from her Powerpoint presentation.

Climate Change Programs

BER Climate Change Programs of interest to plant scientists include Terrestrial Carbon Processes Research and the Program for Ecosystem Research.

The Terrestrial Carbon Processes Research Program sponsors carbon cycle research that will improve the understanding of terrestrial carbon processes and aid carbon cycle predictions related to climate change. It also includes studies of carbon metabolism and transformations involving plant and soil components of ecosystems that collectively are important for quantifying terrestrial carbon sources and sinks. The program contact is Roger Dahlman (roger.dahlman@science.doe.gov).

The Program for Ecosystem Research sponsors experimental research to develop a better scientific understanding of potential effects of climatic change on U.S. terrestrial ecosystems and their component organisms. Field or laboratory studies are directed at understanding cause-and-effect relationships between temperature change and the abundance or geographic distribution of terrestrial vascular plants or animals in the United States (see http://per.ornl.gov). The program contact is Jeff Amthor (jeff.amthor@science.doe.gov).

Genomics Research

The Genomics:GTL (formerly Genome to Life) Program supports systems biology research to accelerate the scientific discovery needed to support the development of practical applications for DOE missions. It seeks to achieve a predictive understanding of the capabilities of plants and microbes for applications in bioenergy, environmental remediation, and global carbon cycling and sequestration (see http://genomicsgtl.energy.gov). Research topics have included

- New Analytical and Imaging Technologies for Lignocellulosic Material Degradation
- New Genomic Strategies and Technologies for Studying Complex Microbial Communities and Validating Genomic Annotations
- Ethical, Legal, and Societal Implications (ELSI) of Research on Alternative Bioenergy Technologies, Synthetic Genomics, or Nanotechnologies.

The program contact is Sharlene Weatherwax (sharlene.weatherwax@science.doe.gov).

Plant Feedstock Genomics for Bioenergy

The Plant Feedstock Genomics for Bioenergy program, an interagency program with the National Research Initiative, supports genomics-based research that will lead to the improved use of biomass and plant feedstocks for the production of fuels such as ethanol or renewable chemical feedstocks. It supports

- Functional genomics
- Genetic marker and map development
- Biomass trait modification and characterization
- Development of model bioenergy crop systems.

The program has been supporting research on Brachypodium, rice, switchgrass, sorghum, poplar, perennial grasses, alfalfa, sorghum, and wheat. More information on the program can be found at http://genomicsgtl.energy.gov/research/DOEUSDA/index.shtml. Program contacts are Chavonda Jacobs-Young, Ed Kaleikau, and Sharlene Weatherwax (SCbiomass.genomics@science.doe.gov).

Bioenergy Research Centers

Three GTL Bioenergy Research Centers will develop novel biological solutions for the production of such fuels as cellulosic ethanol or hydrogen or for other groundbreaking bioenergy research with the potential to revolutionize biology-based energy production (see http://genomicsgtl.energy.gov/centers):

1. DOE BioEnergy Science Center, Oak Ridge National Laboratory—Martin Keller, director
2. DOE Great Lakes Bioenergy Research Center, University of Wisconsin, in close collaboration with Michigan State University—Tim Donohue, director
3. DOE Joint BioEnergy Institute, Lawrence Berkeley National Laboratory—Jay Keasling, director.

DOE Joint Genome Institute

3.6 billion bases per month

Community Sequencing Program (CSP)

- 60% of the capacity at the JGI
- A small-genome program for shotgun sequencing of genomes less than 200 Mb and other smaller sequencing projects
- DOE user facility for genome sequencing
- A large-genome program for shotgun sequencing of genomes greater than 200 Mb. Large-genome proposals must be supported by experimental evidence of the organism's genome size, polymorphism rate, and repeat content. Otherwise, submit a small-genome proposal to obtain this information.
- Selected by peer review on the basis of scientific merit and mission relevance http://www.jgi.doe.gov/CSP/index.html.

For more information on DOE Office of Biological and Environmental Research programs, go to http://genomicsgtl.energy.gov and www.jgi.doe.gov. For current funding opportunities, see grants.gov (browse by agency). You may also contact sharlene.weatherwax@science.doe.gov. or info@aspb.org.

DOE JGI Community Sequencing Program Delivers First Moss Genome

ASPB Members Contribute to Sequencing of Physcomitrella patens

Messages from nearly a half-billion years ago, conveyed via the inventory of genes sequenced from a present-day moss, provide clues about the earliest colonization of dry land by plants. The U.S. Department of Energy Joint Genome Institute (DOE JGI) was among the leaders of an international effort uniting more than 40 institutions to complete the first genome-sequencing project of a nonvascular land plant, the moss *Physcomitrella patens.* The team's insights into the code that enabled this seminal emergence and dominance of land by plants are published December 13 online in *Science Express:* "The *Physcomitrella Genome* Reveals Evolutionary Insights into the Conquest of Land by Plants" (http://www.sciencemag.org/cgi/content/abstract/1150646).

In the abstract for the *Science* article, the authors reported the draft genome sequence of the model moss *Physcomitrella patens* and compared its features to those of flowering plants, from which it is separated by more than 400 million years, and unicellular aquatic algae. The abstract explained that these findings reveal genomic changes concomitant with the evolutionary movement to land, including a general increase in gene family complexity, loss of genes associated with aquatic environments, acquisition of genes for tolerating terrestrial stresses, and the development of the auxin and abscisic acid signaling pathways for coordinating multicellular growth and dehydration response. The abstract noted that the *Physcomitrella* genome provides a resource for phylogenetic inferences about gene function and for experimental analysis of plant processes through this plant's unique facility for reverse genetics.

The moss genome project, originally proposed by Brent Mishler of the University of California, Berkeley, and Ralph Quatrano of Washington University in St. Louis (WUSTL), was enabled through DOE JGI's Community Sequencing Program (CSP). Other project leaders include DOE JGI's Jeffrey Boore, David Cove, and Andrew Cuming of the University of Leeds (United Kingdom); Mitsuyasu Hasebe and Tomoaki Nishiyama of the National Institute for Basic Biology (Japan); and Ralf Reski of the University of Freiburg (Germany) with his associate Stefan Rensing, the paper's first author.

Moss Genome Consortium members (from left) Stefan Rensing, Andrew Cuming, Tomoaki Nishiyama, Ralf Reski, Mitsuyasu Hasebe, Ralph Quatrano, Brent Mishler, and David Cove.

"*Physcomitrella* is to flowering plants what the fruit fly is to humans; that is, in the same way that the fly and mouse have informed animal biology, the genome of this moss will advance our exploration of plant genes and their functions and utility," said Eddy Rubin, DOE JGI director. "Traits such as those that allow plants to survive and thrive on dry land will be useful in the selection and optimization of crops that may be domesticated for biomass-to-biofuels strategies."

Physcomitrella, with a genome of just under 500 million nucleotides and nearly 36,000 genes (about 50% more than are thought to be in the human genome), is the first bryophyte to be sequenced. Bryophytes are nonvascular land plants that lack specialized tissues (phloem or xylem) for circulating fluids. Rather, they possess specialized tissues for internal transport. They neither flower nor produce seeds but reproduce via spores.

"The availability of the *Physcomitrella* genome is expected to create important new opportunities for understanding the molecular mechanisms involved in plant cell wall synthesis and assembly," said Chris Somerville, director of the Energy Biosciences Institute (EBI), the partnership between Lawrence Berkeley National Laboratory, Univeristy of California (UC), Berkeley, the University of Illinois at Urbana–Champaign, and the global energy company BP. "The ease with which genes can be experimentally modified in *Physcomitrella* will facilitate a wide range of

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Sharlene Weatherwax Appointed Acting Division Director for Life and Medical Sciences, DOE–BER

Dr. Jerry Elwood, acting associate director for Biological and Environmental Research (BER), Office of Science, U.S. Department of Energy, announced on October 31 that Dr. Sharlene Weatherwax is detailed until the end of February to the position of acting division director for Life and Medical Sciences. Since joining BER in March 2005, Dr. Weatherwax has served as a program manager in the Life and Medical Sciences Division with responsibilities for managing components of the Genomics:GTL program dealing with plant and microbial biology. She will continue her responsibilities in this position. She was an organizer for the joint research agenda laid out by the Office of Science and the Office of Energy Efficiency and Renewable Energy in *Breaking the Biological Barriers to Cellulosic Ethanol,* and she has participated in a number of interagency initiatives. Before joining BER, she was a program manager for the Energy Biosciences program in the Office of Basic Energy Sciences, Dr. Elwood noted.


Sharlene Weatherwax

Dr. Weatherwax earned her bachelor's degree in biochemistry from the University of California, Los Angeles, and her PhD in biochemistry on microbial genetics and enzymology from the University of California, Berkeley, in 1989. Her work as an NSF postdoctoral fellow in plant biology and subsequently as an independent researcher has included the study of light- and hormone-regulated plant gene expression.

Senate, House Approve 2008 Omnibus Appropriations Bill

The Senate and House approved the fiscal year 2008 omnibus appropriations bill December 18 and 19, respectively. Enactment was predicted that same week (at the time of the *ASPB News* publication deadline). Disagreement between the White House and Congress over a recommended increase of $22 billion in appropriations had raised prospects of a veto. This led to loss of the recommended $22 billion increase (not counting emergency funding). This affected appropriations across a broad swath of domestic programs, including those for research.

NSF

The National Science Foundation received an increase of $147 million, or 2.5 percent, to $6.065 billion. NSF Research and Related Activities is initially up 1.2 percent to $4.821 billion in the omnibus, significantly below both the 10 percent increase the White House had proposed and what the appropriations committees had recommended earlier for NSF. However, with the transfer of the Experimental Program to Stimulate Competitive Research (EPSCoR) from Education and Human Resources to Research and Related Activities, the increase for Research and Related Activities becomes approximately 1 percent. Education and Human Resources is funded at $725,600,000, an increase of 4 percent over the current year.

DOE Office of Science

U.S. Department of Energy Office of Science research increases have also fallen below the president's budget request and below an earlier appropriations bill recommendation in a number of areas. Basic Energy Sciences funding is increased $20 million, or 1.6 percent, in the omnibus to $1.270 billion. DOE Biological and Environmental Research increases 12.6 percent, or $61 million, to $544.4 million. Office of Science funding is increased 5.8 percent overall, or $221 million, to $4.018 billion.

USDA

In the fiscal year 2008 omnibus appropriations bill for the Department of Agriculture, the National Research Initiative (NRI) receives an increase of 1.1 percent, or $2 million, over the current-year appropriation to $192 million. The appropriation is further affected by direction that $3 million within the NRI be of direct benefit to the Food and Drug Administration (FDA) in pursuit of its food safety regulatory responsibilities, and the bill encourages the secretary to provide increases for bioenergy and bio-based fuels research within the funds provided to the NRI.

The Cooperative State Research, Education, and Extension Service (CSREES) overall is funded at $1.184 billion, an increase of 0.1 percent. The Agricultural Research Service (ARS) is funded at $1.121 billion, a decrease of 0.7 percent.

When the president remained firm with a veto-proof margin in Congress on his overall budget request number, Congress agreed, while also lowering funding for some White House priority areas.

Moss Genome
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studies of the cell wall, the principal component of terrestrial biomass. Additionally, the moss has fewer cell types than higher plants and has a much more rapid lifecycle, which also greatly facilitates experimental studies of cell walls. Thus, the completion of the genome is an important step forward in facilitating basic research concerning the development of cellulosic biofuels."

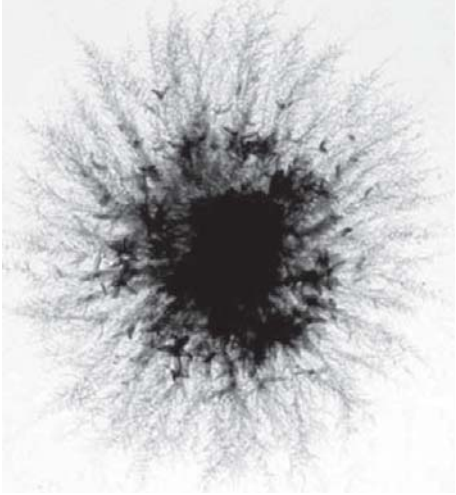
"There is a clear connection with this work and the intensifying interest in the global carbon cycle," said Mishler, a professor in the Department of Integrative Biology and director of the University and Jepson Herbaria at UC Berkeley. "The moss system is proving quite useful for studies of photosynthesis, among many other processes."

One of these, said Quatrano, who is chairman of the Department of Biology at WUSTL, "is the ability of mosses to withstand drought and in some cases complete desiccation, which will provide us with a model experimental system to identify genes and gene networks that might be involved and related to seed desiccation in flowering plants."

Mishler said that *Physcomitrella* is well placed phylogenetically to fill in the large gap between the unicellular green alga Chlamydomonas, also sequenced by DOE JGI, and the flowering plants.

"Having the full *Physcomitrella* genome available to the public greatly advances bioinformatic comparisons and functional genomics in plants," said Mishler. "This is a great example of how phylogenetics can integrate with functional and applied studies."

"Furthermore," Quatrano said, "unlike vascular plant systems, we can target and delete specific moss genes to study their function in important crop processes and replace them with genes from crop plants to allow us to study the evolution of gene function. In addition to the genome, extensive genomic tools are now available in *Physcomitrella* to study comparative gene function and evolution as related to bioenergy and other processes of importance to crops." These tools can be found at www.mossgenome.org.



Twenty-eight-day-old *Physcomitrella gametophyte* showing the leafy gametophores in the center and the protonemal filaments radiating outward. PHOTO BY DAVID COVE.

DOE JGI's Community Sequencing Program provides the scientific community at large with access to high-throughput sequencing by DOE JGI for projects of relevance to DOE missions in bioenergy, carbon cycling, and bioremediation. Sequencing projects are chosen based on scientific merit, judged through independent peer review. Currently, letters of intent for CSP fiscal year 2009 sequencing allocation are being solicited. More information can be found at http://www.jgi.doe.gov/CSP/index.html.

Other DOE JGI authors of the *Physcomitrella* genome article in *Science* include Astrid Terry, Asaf Salamov, Harris Shapiro, Erika Lindquist, Hank Tu, Susan Lucas, and Igor Grigoriev. Authors who are ASPB members include Stefan Rensing, Pierre-François Perroud, Kazuo Yamaguchi, Aldwin Anterola, Setsuyuki Aoki, Jeffrey Bennetzen, Robert Blankenship, Mark Estelle, Alexander Heyl, Karen Hicks, Jon Hughes, Martin Lohr, Takashi Murata, David Nelson, Michael Prigge, Anton Sanderfoot, Gabriele Schween, Shin-Han Shiu, Frederica Theodoulou, Elizabeth Waters, Andrew Wood, Mitsuyasu Hasebe, Brent Mishler, Ralf Reski, and Ralph Quatrano. Correspondence on the article should be addressed to Ralph Quatrano at rsq@wustl.edu.

The DOE JGI, supported by the DOE Office of Science, unites the expertise of five national laboratories—Lawrence Berkeley, Lawrence Livermore, Los Alamos, Oak Ridge, and Pacific Northwest—along with the Stanford Human Genome Center to advance genomics in support of DOE missions related to clean energy generation and environmental characterization and cleanup. DOE JGI's Walnut Creek, California, Production Genomics Facility provides integrated high-throughput sequencing and computational analysis that enable systems-based scientific approaches to these challenges. Additional information about DOE JGI can be found at http://www.jgi.doe.gov.

(Major portions of this article are from a DOE JGI news release issued December 13 that can be found at http://www.jgi.doe.gov/News/news_12_13_07.html.)

CSREES Awards More Than $4.7 Million for Tomato and Potato Specialty Crops Genetic Research

USDA's Cooperative State Research, Education, and Extension Service (CSREES) announced in October more than $4.7 million in grants to 13 universities and research laboratories for tomato and potato specialty crops genetic research that may lead to improved fruit quality, yield, stress tolerance, and disease resistance.

ASPB members receiving grant awards include W. Brad Barbazuk, Robin Buell, Dina St. Clair, and James Giovannoni.

"Specialty crops are a major contributor to U.S. agriculture and are valued at $53 billion in sales annually," said Gale Buchanan, USDA undersecretary for Research, Education, and Economics. "New knowledge is needed to develop plants with enhanced economic value, which will ultimately allow the specialty crop industry to remain competitive in the global environment and contribute to the U.S. economy."

The goal of the research program is to increase fundamental knowledge of the structure, function, and organization of plant genomes to improve agricultural efficiency and sustainability, effectively integrate modern molecular breeding technologies and classical breeding practices for U.S. crop improvement, and improve U.S. varieties for agricultural growers and producers.

The president's 2007 Farm Bill proposal calls for a $100 million investment in specialty crop research to address the critical needs of the industry. These grants support the goal of conducting fundamental work in plant breeding, genetics, and genomics to improve crop characteristics such as product appearance, environmental responses and tolerances, nutrient management, and pest and disease management, as well as safety, quality, yield, taste, and shelf life. The House passed its version of the Farm Bill this year, but passage has been delayed in the Senate.

Total fiscal year 2007 grants of $125,000 to $399,500 were awarded to the following researchers:

- Lukas Mueller, Cornell University, $399,000, Development of a Comprehensive Solanaceae Phenotype and Locus Database (SOL PAL)
- W. Brad Barbazuk, Donald Danforth Plant Science Center, $398,000, Developing an Accurate Computer Program to Identify Potential Genes in the Tomato Genome Sequence
- Robin Buell, Michigan State University, $398,500, Comparative Genomics Resources of the Solanaceae: Tools and Resources for Cross-Species Translational Genomics
- Matthew Robbins, Ohio State University, $125,000, Genomic Resources for the Investigation of Yield and Fruit Quality in Tomato
- Luca Comai, University of California, Davis, $399,500, Tilling Resources for the Tomato Genomics Community
- Dina St. Clair, University of California, Davis, $396,500, Quantitative Resistance to Late Blight *(Phytophthora Infestans):* High-Resolution QTL Mapping to Enhance Marker-Assisted Breeding in Tomato
- Shizhong Xu, University of California, Riverside, $394,500, Mapping QTL for Multiple Traits Using Bayesian Statistics
- John Scott, University of Florida, $399,000, Fine Mapping of a Begomovirus Resistance Gene
- James Bradeen, University of Minnesota, $386,500, Comparative Structural Genomics of the Potato Tertiary Genepool: Improving Access to Agriculturally Significant Genes
- Amit Mitra, University of Nebraska, $301,000, Functional Map of the Tomato Genome Using Direct Repeat Induced Gene Silencing
- Andy Pereira, Virginia Polytechnic Institute, $399,500, Development of a Versatile Mutant Resource in Tomato for Functional Genomics Analysis
- James Giovannoni, USDA–ARS, Vegetable Crops Research Unit, University of Wisconsin, $399,500, Tomato Fruit Epidermis and Carpel Genomics: Tools for Gene Discovery, Functional Analysis, and Enhancement of the Solanaceae Toolkit
- David Spooner, USDA–ARS, Plant, Soil, and Nutrition Laboratory, Cornell University, $399,500, COSII-Based Mapping and Diversity in the Solanaceae.

The awards are funded through the CSREES National Research Initiative Plant Genome Program. Dr. Ed Kaleikau is national program leader for the NRI Plant Genome Program.

ASPB Supports Gender Bias Elimination Act

ASPB joined with more than 70 other organizations on a letter thanking Congresswoman Eddie Bernice Johnson (D-TX) for introducing the Gender Bias Elimination Act of 2007, H.R. 3514.

"In our efforts to improve the status of women in STEM [science, technology, engineering, and mathematics], we strongly endorse the provisions under H.R. 3514 which authorize workshops to eliminate gender bias for women in STEM careers," the letter to Johnson noted.

The letter noted that the legislation also directs research funding agencies, such as the National Institutes of Health, the Department of Energy, the Department of Defense, the National Science Foundation, and the National Aeronautics and Space Administration, to better enforce federal antidiscrimination laws, to assess the workplace climate, and to address accountability by requiring that information on grant recipients' demographics, field, award type, budget request, review score, and funding outcome from these agencies be made public.

Judy Brusslan, chair of the Women in Plant Biology Committee, commended ASPB President Rob McClung and their colleagues in ASPB leadership in supporting H.R. 3514 to address gender bias.

CAST: 35 Years of Communicating Science and Shaping Policy

Returning to its roots, the Council for Agricultural Science and Technology (CAST) celebrated its 35th anniversary of communicating credible, science-based information to U.S. policymakers, the media, the private sector, and the public the week of October 22, 2007, in Ames, Iowa. Founded in Ames in 1972 as an outgrowth of a 1970 meeting of the National Academy of Sciences, CAST initially comprised seven scientific and professional societies. Thirty-eight such societies are now CAST members; ASPB joined in 1997 and now celebrates 10 years of valued partnership in the efforts of CAST. See the CAST website at www.cast-science.org/castHistory.asp for a link to the history publication "Celebrating Our Roots—Reaching Out with Our Harvest."

ASPB and CAST: Similar Missions

The rationale for ASPB membership in and support of CAST turns on key mission statements of ASPB: "to promote the interests and growth of plant scientists in general." Moreover, its Committee on Public Affairs "shall explain the interests of plant science to the U.S. Congress, Executive Branch, and the public" and will "develop a strategy and objectives for support of basic plant science and *coordinate efforts with other plant science societies and related groups*" (emphasis added). Clearly, the missions of ASPB and of its Public Affairs Committee are reciprocally harmonious with that of CAST, which "assembles, interprets, and communicates credible, science-based information . . . to legislators, policymakers, the media, the private sector, and the public."

The strategies of ASPB in "explaining" and CAST in "assembling, interpreting, and communicating" are synergistic and complementary. ASPB generally furthers its mission by personal and group contacts with policy makers, giving testimony, writing letters, and interacting with other science societies. These efforts are often coordinated by the director of public affairs and are focused on plant biology research.

CAST furthers its mission by publishing a range of policy-sensitive documents, the topicality, length, and depth of which are carefully calibrated for maximum impact with their intended audiences.

- A Task Force Report is a comprehensive publication prepared by a group of experts appointed by the CAST Executive Vice President; these reports are 40 to 200 or more printed pages and have a two-year writing, review, and publication calendar.
- An Issue Paper is a thorough treatment of a specific topic by a group of experts; such papers are 12 to 20 printed pages and have up to a one-year publication calendar.
- A Special Publication is a unique, special-purpose document, such as the proceedings of a conference or symposium or a literature review and analysis for a contract sponsor, that has a variable length and publication calendar.
- A Commentary is a quick-turnaround communication by experts on the status of a contemporary "hot" issue; it is four to eight printed pages with up to a four-month calendar. Commentaries are published online on the CAST website, with free access.

After release of its publications, CAST hosts "rollout events" and press briefings in Washington, DC, or at high-profile scientific and professional meetings. To stay current in the policy arena, CAST particularly focuses on Commentaries and Issue Papers.

ASPB's Public Affairs unit focuses primarily on supporting federal agency programs that sponsor basic plant research. Together with the society's leadership and membership, the Public Affairs unit has successfully supported initiation of new plant research programs, as well as continuation of and increases in funding for existing research programs. Indeed, ASPB Public Affairs staff, leadership, and member efforts with Congress and the executive branch have contributed significantly to more than $1 billion in cumulative funding for plant research over the past 12 years that would not likely have been provided otherwise.

Recent CAST Rollouts and Forthcoming Publications

CAST's publications—the organization's most prominent output—serve the broad interests of its 38 member societies (see http://www.cast-science.org/publications.asp for a complete listing). The following paragraphs describe recent and forthcoming publications of specific interest to ASPB members.

Convergence of Agriculture and Energy: Implications for Research Policy (CAST Commentary QTA 2006-8) is available free online at the CAST website. The commentary focuses on the key issues concerning corn-based ethanol production systems of the next five to 10 years. CAST rolled out this publication at the 2006 International Meetings of the American Society of Agronomy (ASA), the Crop Science Society of America (CSSA), and the Soil Science Society of America (SSSA).

Convergence of Agriculture and Energy: II. Producing Cellulosic Biomass for Biofuels (CAST Commentary QTA 2007-2) is available free online. This commentary focuses on key issues in transforming plant species and cropping systems to produce biomass for biofuels and biofeedstocks instead of current uses as sources of food, feed, and seed. This publication was rolled out at the World Food Prize Symposium on Biofuels and Biofoods, the Brookings Institution Opportunity '08 Iowa Forum on Energy and National Security, and at the 2007 International Meetings of the ASA, CSSA, and SSSA. ASPB member Wallace Wilhelm was a coauthor of this publication. Both *Convergence of Agriculture and Energy* commentaries were the subject of coverage by the Associated Press, National Public Radio, and a teleconference for state farm bureaus hosted by the American Farm

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Bureau Federation.

Future commentaries in this series may include *Biodiesel Production, Thermochemical Conversion, Logistics of Biomass Handling and Processing,* and *Carbon Balance of the Soil and Atmosphere.*

Biofuel Feedstocks: The Risk of Future Invasions (CAST Commentary QTA 2007-1) is available free online at the CAST website. The commentary describes the potential risk of dedicated lignocellulose biofuel species becoming weedy or invasive and a process to quantify and minimize this risk. This publication was rolled out at the 2007 International Meetings of the ASA, CSSA, and SSSA. Presentations followed in Washington, DC, for USDA agency personnel, legislative assistants through national CFAR, and members of the American Farm Bureau Federation. ASPB member Kassim Al-Khatib, current CAST president, helped shepherd this Commentary to publication.

Implications of Gene Flow in the Scale-Up and Commercialization of Biotechnology-Derived Crops: Environmental and Policy Considerations (CAST Issue Paper 37) is available for purchase at the CAST website. This comprehensive analysis reviews the concept of gene flow—the transfer of genetic information from one individual or population to another—and discusses the relatively limited situations in which it is likely to cause economic problems in the production of commercial biotechnology-derived (transgenic, recombinant) crops. This publication was rolled out at the 2007 National Meetings of the North Central Weed Science Society. ASPB member Kent Bradford was a coauthor of this publication, and Kassim Al-Khatib helped shepherd it to publication.

Water Quality and Quantity Issues for Turfgrasses in Urban Landscapes (CAST Special Publication 27) is scheduled for publication in the first quarter of 2008 and will be available for purchase at the CAST website. This is a proceedings of a symposium by the same name that focused on the science underpinning best management practices for efficient use of water, including drought-tolerant grass species, grass use in xeriscapes, integrated pest management practices associated with nutrients and pesticides, and optimum management practices. There will be an extensive announcement and marketing campaign. ASPB member Bingru Huang is a chapter author.

CAST Publication Impact

Following the rollout of each of its publications, CAST closely monitors their impact and use. Two months after the rollout event, CAST staff provide a publication impact report to members of the Editorial and Publications Committee, which I currently chair, and to members of the CAST board of directors. The publication impact analysis will soon include proactive solicitation of usage information by hard copy and electronic purchasers of Issue Papers, Task Force Reports, and Special Publications. We are also investigating whether we might track citations of CAST publications via Google Scholar. The objective of these analyses is to ensure that CAST publications have delivered on the council's mission through user penetration and usage.

ASPB Members Can Participate

CAST aggressively seeks new topics for CAST publications, as well as authors and reviewers to bring those publications to fruition. ASPB members are encouraged to propose policy-sensitive topics for CAST publications by submitting a proposal for publication, available at http://www.cast-science.org/proposalInfo.asp. Please copy any proposal that you submit to Crispin Taylor, ASPB executive director, and to me as the ASPB representative to the CAST board of directors. Join in fostering the synergistic and complementary communication and policy missions of ASPB and CAST!

Gary H. Heichel
Professor Emeritus, University of Illinois
garyiris.heichel@hughes.net

CAST Is a Membership Organization, Too

CAST, like all membership-based organizations, can't succeed without funding. If you'd like to leverage ASPB's organizational membership in CAST by becoming an individual member of CAST, please go to www.cast-science.org and make your choice among several levels of individual support. You'll receive CAST Issue Papers, Reports, Special Publications, and the informative Friday Notes online newsletter as benefits of membership. Plus, you'll have the satisfaction of knowing you're a part of an information delivery system that benefits ASPB and other plant science societies at the level of the U.S. Congress and beyond.

ASPB Grant Awards Program Update

David Stern Creates Infectiously Entertaining Education Outreach with MicrobeWorld

In 2006, the ASPB Education Foundation Grant Awards Program (GAP) allocated funds to society member David Stern for his ongoing work with *MicrobeWorld* radio. *MicrobeWorld* is a radio series consisting of 90-second spots illuminating the benefits of plant-related microbes. Stern is the president of the Boyce Thompson Institute for Plant Research (BTI) at Cornell. BTI created the *MicrobeWorld* series in cooperation with the American Society for Microbiology and Finger Lakes Productions International (FLPI). Stern has used his GAP funds to develop stories for *MicrobeWorld* episodes that are aired nationally in daily spots on 80 public radio stations.

The original goal for Stern's GAP grant was to produce nine episodes that would be credited on air to ASPB in 2007. Stern initially also estimated that ASPB would be identified at least 680 times during the year. Stern and his team actually have accomplished much more. The ASPB tag was attached to 17 features on the nationwide network of *MicrobeWorld* affiliates. The following tags were alternated on the 17 features between May 14 and December 21, 2007:

- *Microbeworld* is made possible by the Boyce Thompson Institute for Plant Research, a world leader in plant biology, and the American Society of Plant Biologists.
- *Microbeworld* is made possible by the Boyce Thompson Institute for Plant Research and the American Society of Plant Biologists, the world's foremost plant science society.

Stern's team has determined that *MicrobeWorld* listeners are found primarily on the public and commercial classical radio dial. As written in the National Public Radio (NPR) "Profile 2006," these listeners are

- *Young:* 66% are between ages 25 and 54.
- *Educated:* 58% have received a college degree or some higher level of education.
- *Affluent:* 46% have an annual household income of more than $75,000, 82% above the national average.
- *Active in the community:* 94% participate in community or political activities each year.
- *Politically active:* 59% vote in local, state, or federal elections.

The syndicated radio show has been well received. The following are comments from radio stations (Public Radio Exchange):

- "Everyone who is interested in biology should listen to it!"
- "Authoritative, engaging, informational."
- "Who would have thought microbes could be so perky and interesting? This is great!"
- "Every station should try to find a slot for it. Very good production values, clear writing, and compelling delivery. Good luck to the producers—you deserve it."
- "*MicrobeWorld:* Engaging, informational, clear, and informative. . . .These bite-size doses of science are just the thing for anyone on the go with a thirst for knowledge."

Listeners have said the following in e-mails to the stations:

- "Love the short format and 'cut to the chase' approach."
- "I've continued to be impressed with each of the podcasts that you produce, and I download them regularly to my iPod. Keep up the great work!"

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As of December 21, 2007, the following 17 features will have carried the BTI/ASPB tag on the national NPR network:

Title	Airdate
Ancient herbal secret revealed	5/14/07
Race to save tan oak	5/15/07
Early detection of harmful algal blooms	6/26/07
Cold earth, new life	7/03/07
Biomass breakdown	8/07/07
Virus killer cocktail	8/30/07
Soil microbes and pharmaceuticals	9/03/07
Harmful algal blooms	9/04/07
Proteins and parsley	9/05/07
Human gut bacteria and cruciferous vegetables	9/06/07
Effects of aeration on soil microbes	9/07/07
Hijacking nuclear receptors	10/29/07
Role of microbes on healthy coral reefs	10/30/07
H. pylori survival on spinach	11/01/07
Wine waste	11/02/07
A plant, a fungus, and a virus	12/07/07
Climate change and plant parasites	12/21/07

ASPB Represented at the National Association of Biology Teachers Professional Development Conference

"I've got weeks of plant activities for my classes."

"I love this, and the teachers at my school will, too."

These are just two of the comments made by teachers visiting the ASPB education booth at the National Association of Biology Teachers 2007 Professional Development Conference held in Atlanta, Georgia, November 28–December 1.

Although the conference attendees missed Paul and Coe Williams's presence, some activities from "Paul's Sandbox" were used in the booth, and these were enthusiastically and gratefully appreciated. Besides activities from the Williamses, teachers were able to pick up inquiry-based lab activity handouts with radish seeds for doing bioassays and corn seeds for tropism experiments. Teachers also loved our many handouts, bookmarks, and cards. Introduced for the first time was information on "Ten Classroom-Friendly Uses for Plant Science Radio" developed by our own Katie Engen, ASPB education foundation assistant.

NASA sent material to give to the teachers about their Engineering Design Challenge, in which K–2 students design, build, and evaluate their own lunar plant growth chambers. Participants will receive basil seeds flown on the space shuttle to test their growth chambers. If you are interested, visit http://www.nasa.gov/education/plantchallenge.

Along with Jane Ellis, Janice Haldeman from Erskine College and Margarit Gray from Anderson University helped in the booth. At least 1,200 biology educators from all over the country attended this conference.

Education Committee members Jeffrey Coker and Jane Ellis participated in the Four-Year College and University Symposium, presenting information about successful inquiry laboratories and lab programs for colleges and universities.

Jeffrey Coker, Janice Haldeman, Jane Ellis, and Margarit Gray—a great volunteer foursome at NABT.

(Above and right photos) Janice Haldeman and booth visitors have fun with plant science.

Other highlights of the conference included an all-day Outreach Symposium in which representatives from colleges, universities, government agencies, and informal science centers across the United States gathered to hear panel discussions on design, assessment, funding sources, collaboration, recruitment, and implementation. Researchers looking for broader outreach information have found this symposium very helpful. Also of importance was the all-day Evolution Symposium sponsored by AIBS and the National Evolutionary Synthesis Center (www.nescent.org).

The ASPB Education Committee Welcomes Three New Members

Jane Ellis, chair of the ASPB Education Committee, is pleased to introduce three new committee volunteers: Erin Dolan of Virginia Tech, Chad Jordan of North Carolina State University, and John Cushman of the University of Nevada. According to Jane, "This active committee will benefit from the diverse talents of its newest members."

Erin Dolan

Chad Jordan

John Cushman

Erin Dolan

Erin received her bachelor's degree in biology at Wellesley College and her PhD in neuroscience from the University of California, San Francisco (UCSF), where she studied the molecular genetics of nervous system development. During her time at UCSF, Erin volunteered extensively with UCSF's Science & Health Education Partnership (SEP), which spawned her interest in collaborating with educators and students.

Currently, Erin is an assistant professor in biochemistry at Virginia Tech. There, she oversees the Fralin Biotechnology Center's efforts to enhance public understanding of genetics, genomics, and biotechnology through curriculum and materials development, professional development, and student–educator–scientist partnerships. Information about this work can be found at www.biotech.vt.edu/outreach/outreach.html. The center's well-developed precollege programming, especially the Partnership for Research and Education in Plants (PREP), serves as the venue for her research. The web address for PREP is www.prep.biotech.vt.edu.

With funding from the National Institutes of Health and the National Science Foundation, Erin is developing her research, teaching, and public engagement efforts with three goals in mind:

1. To compel learners to develop and apply knowledge in genetics, genomics, and biotechnology;
2. To enhance public interest in and understanding of the processes and nature of science; and
3. To reinvent the way scientists and teachers interact, so that they use their shared interest in and passion for science to enhance science learning from kindergarten through graduate school and to develop a scientifically literate citizenry.

Erin also is a 2007 ASPB Grant Awards Program (GAP) winner. She will use her GAP funds to further her outreach goals. Along with project partner David Lally, Erin will develop and disseminate a series of four interactive, video-integrated, web-based flash animation modules that will be available to anyone with web access.

Erin's expertise and goal-oriented focus will do much to sharpen and enhance the Education Committee's efforts. Erin stated, "I am delighted that ASPB has such an active and productive group dedicated to teaching and learning across the grade levels. I am even more excited to be a part of it, as my interests lie in facilitating research collaborations among students, teachers, and scientists."

Adding ASPB committee work to an already busy schedule leaves Erin with very limited free time. She spends any available nonworking hours with her husband chasing around their 2-year-old daughter, Tara.

Chad Jordan

Chad received his undergraduate degree in biology from the University of North Carolina at Asheville and his PhD in botany from North Carolina State. He attended graduate school with current Education Committee member Jeffrey Coker. This connection helped Jeffrey recruit Chad to the committee. Chad came willingly! He said, "I am excited to be on the ASPB Education Committee. I have heard great things about [committee members], and I'm looking forward to working with the committee this year and in the years ahead."

Chad first taught as a visiting faculty member at Sewanee: The University of the South. He returned to NC State as a teaching assistant professor in plant biology and as the program's undergraduate coordinator. Chad teaches NC State's large introductory Plant Life course and a perspectives course on plant biology for majors. He coteaches the graduate course Ethical Issues in Plant Biology. With a background primarily in plant cell and molecular biology, Chad is examining the role of cell cycle genes in whole plant growth and development.

Chad is just starting to conduct educational research at NC State. He reported, "I knew that [plant biology education] was something to which I wanted to commit my career early on. I had two superior professors at UNC–Asheville whose primary teaching and research emphases were in plant biology, and their enthusiasm and expertise stimulated my interest in teaching."

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Grant Awards Program Update
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- "I like the way each topic is summarized for nonscientists. You've presented the main idea clearly without overdramatizing it. I think this kind of outreach is very important, so I'm happy that you are doing this."

Users of stumbleupon.com (a web browser with a recommendation system) provided this feedback about MicrobeWorld.org:

- "Oh, this is just wonderful! Is there anything more exciting than microbials? (No, I'm not kidding.)"
- "Gotta love micro! 'Specially all the environmental bits!"

MicrobeWorld also is distributed as a daily podcast and is available via iTunes and other podcasting aggregators. Each podcast contains the entire program, including beginning and ending tag lines. This outreach outlet has garnered *MicrobeWorld* 2.1 million downloads since August 2005, more than 1,800 subscribers, and 4,000–6,000 daily downloads. Clearly, David Stern's team at *MicrobeWorld* has produced an audience eager to tune in to plant biology.

More information can be found at www.microbeworld.org. All *MicrobeWorld* episodes are archived at this site, including those sponsored nationally by BTI and ASPB. Videos related to MicrobeWorld are posted at http://www.microbeworld.org/look/MicrobeWorldVideo.aspx. A link to the episode archives also is available on the ASPB website at http://www.aspb.org/education/NEWK12.CFM.

This report was compiled with information gathered by Dr. Jane Ellis, committee chair.

New Committee Members
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Chad's outreach interests coordinate with NC State's land grant mission to extend research-based knowledge to the people of North Carolina and beyond. According to Chad, "This mission is one that I feel a particular duty toward in our discipline, as a plant biologist and as a North Carolina native."

Chad is highly interested in providing new plant science information and educational resources to teachers and students. He believes this is essential to the advancement of knowledge in our field and to the development of the next generation of plant biologists. Chad anticipates working in various ASPB Education Committee programs to promote and facilitate these goals.

In his limited free time, Chad is writing a book on Southern-style family recipes and regional cooking traditions. Certainly, Chad's healthy appetite for plant science and related outreach will produce a bounty of results for the Education Committee.

John Cushman

John received his bachelor of science degree from Ursinus College. He earned both his master's degree and his PhD from Rutgers University, New Brunswick. John is now a professor and the graduate program director in the Department of Biochemistry at the University of Nevada, Reno. He teaches the Functional Genomics course and leads the Molecular Genetics colloquium.

John stated, "I became interested in education and outreach through our undergraduate training programs at University of Nevada, Reno, including the Upward Bound and the McNair and TRIO Scholars programs for the recruitment and retention of underprivileged high school and undergraduate students, respectively."

John's primary research interests focus on understanding the mechanisms by which plants perceive and respond to environmental stresses such as high salinity and drought. Major research projects in John's lab include the following:

- *Functional Genomics of Crassulacean Acid Metabolism (CAM)*—to understand how the expression of CAM is controlled by environmental stress and the circadian clock
- *Mechanisms of the Evolutionary Origins of CAM in Tropical Orchids*—to understand the molecular mechanisms responsible for the evolution of the CAM photosynthetic adaptation
- *The Virtual Berry Project*—to develop a model system to apply functional genomics approaches to the study of the developing berry
- *Integrating the Unknowneome with Abiotic Stress Response Networks in Arabidopsis*—to assign a function to every unknown gene in *Arabidopsis thaliana* via focusing on genes and networks that function in abiotic stress
- *Gene Discovery in Resurrection Species*—to create multifaceted use of resurrection plants as models in a long-term integrated research–education–extension project
- *Biofuels from Salt Basin Algae*—to optimize and implement the use of halophytic microalgae as a biofuel crop.

John's research is funded by the National Science Foundation (Integrative Organismal Biology and 2010 Programs), USDA National Research Initiative Competitive Grants Program, Department of Transportation (Sun-Grant Initiative), and the Nevada Agricultural Experiment Station.

When not in the lab or classroom, John likes to go running year round, hiking in summer, and skate skiing in winter in the Sierra Nevada. This high-energy biochemist will do much to amp up the Education Committee's ongoing efforts.

Erin, Chad, and John join Committee Chair Jane Ellis, returning member Jeffrey Coker, adjunct members Larry Griffing and Mary Williams (immediate past chair), and ASPB staff liaison Brian Hyps on the 2007–2008 Education Committee. Contact information for each committee member is available at http://www.aspb.org/committees/education.cfm.

New Staff

Molly Cheatum

Molly Cheatum joined ASPB in November 2007 as a marketing and analytic specialist. She is looking forward to developing our market research capabilities to ensure the continued growth of the Society. Previously she worked as a biologist for environmental consulting firms and recently graduated with a dual master's degree from American University and University for Peace in Costa Rica. Costa Rica provided a unique setting for studying international affairs and sustainable development, both contributing to the focus of her studies. She resides in Takoma Park (Washington DC) and enjoys reading, cooking, and volunteering in her spare time.

Harold J. Evans

Harold J. Evans passed away on October 20, 2007, in Lake Oswego, Oregon, following several years of declining health initiated by a stroke. He is survived by his wife, Mavis, and two daughters, Heather and Pam. During his long academic career, he set the gold standard for scientific rigor and tenacity in uncovering the secrets of plant physiology, particularly regarding mineral nutrition and the process of nitrogen fixation.

Harold was born in 1921 in Franklin, Kentucky, and attended the University of Kentucky to obtain his BS (1946) and MS (1948) degrees. His doctoral work was conducted at Rutgers University (1950), where he became a pioneer in research on the effects of deficiency of trace elements in plants. Following a brief stint as a postdoc at Johns Hopkins, he soon moved into the faculty ranks in the Botany Department at North Carolina State University, working up to full professor before he left for Oregon State University in 1961. He served in several capacities in Oregon, including professor of plant physiology; affiliate professor of biochemistry; and director of the Laboratory for Nitrogen Fixation Research, an independent department that he created and led to international prominence.

His list of awards and honors is too long to cite fully, but highlights include membership in the National Academy of Science, the Oregon Academy of Science Award, the University of Kentucky Distinguished Alumnus Award, The Johns Hopkins University Society of Scholars Award, ASPB's Charles Reid Barnes Award, a stint as president of the

American Society of Plant Physiologists (1970), and appointment as Oregon State University Distinguished Professor (the highest honor at that institution).

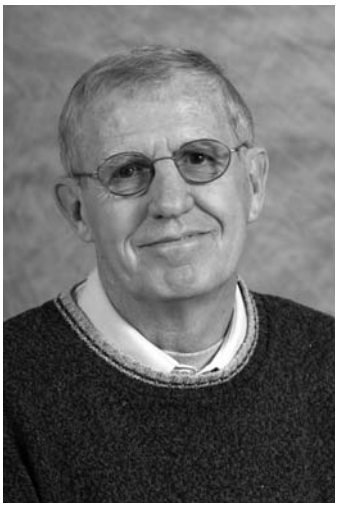
He published about 200 scientific papers concerning the biochemical role of minerals and various aspects of biological nitrogen fixation. His fundamental discoveries include the demonstration of the essential roles of molybdenum and cobalt for nitrogen-fixating legumes, the enzymatic mechanism of nitrate reduction in plants (highly cited work from 1953), the influence of metal activators on enzymes (e.g., pyruvate kinase and malic enzyme), the function of the glyoxylate cycle in legume nodules, the first application of the acetylene reduction technique to nodules, the first purification of active nitrogenase from nodules, the first report of nitrogen fixation by free-living rhizobia, the role of polyhydroxybutyrate (PHB) in nodules, characterization of diverse nitrogen-fixing systems (grasses, rotting wood, marine environments, terrestrial wetlands, maize, and actinorhizal plants), the essential features of the hydrogenase uptake system in rhizobia, the roles of nickel and selenium in nodules, and the importance of antioxidants in nodules. Toward the end of his remarkably productive career, he astounded the world of nitrogen fixation by culturing rhizobia with H_2 and CO_2 as the sole source of energy and carbon, respectively, thus establishing their ability to grow as chemolithotrophs. He also showed that rhizobia's ability to utilize H_2 via an uptake hydrogenase provides substantial benefits to legumes, because nitrogenase invariably releases H_2 as a byproduct of nitrogen fixation, and this H_2 represents a considerable energy drain. The presence of hydrogenase genes in some rhizobia makes them more efficient as symbionts and thus of considerable practical benefit for agricultural productivity.

Harold had an enviable record of 32 years of continuous funding from NSF, a run that ended only on his retirement in 1988. In addition to his scientific contributions, Harold's legacy consists of the dozens of professional plant scientists who continue the quest today, having been graduate students and postdocs under his supervision.

David Dalton
Reed College

Dan Arp
Oregon State University

Bud Ryan



Clarence A. "Bud" Ryan, Charlotte Y. Martin Professor of Biochemistry and a Fellow of the Institute of Biological Chemistry, Washington State University (WSU), died on October 7, 2007, at the age of 76. Bud was widely known for his work on the regulation and function of plant proteinase inhibitors in defense against insect herbivores. In addition to being an excellent scientist, Bud was a cherished mentor to dozens of students and postdocs, and he was dedicated to promoting plant biology at the university, national, and international levels.

Bud was born on September 29, 1931, in Butte, Montana, the second of four children. When Bud was 10 years old, the family moved to Helena, Montana. Bud became interested in chemistry at Cathedral High School and, after graduation, decided to enroll at Carroll College in Helena. He paid his way through college by cleaning a bar and working as a ticket taker at the local movie theater. As a starter for the conference-winning basketball team for two years, Bud would maintain his passion for the game—as both a participant and a spectator—for the rest of his life. Bud received his bachelor's degree in chemistry with a minor in bacteriology from Carroll College in June 1953.

After college, Bud worked for the Montana State Highway Laboratory and as a cabbie at night to pay off his college loans. During this time, he met Patricia Meunier, the love of his life, at a local barn dance. Bud and Pat were married the following May, in 1954.

Bud entered the graduate program at Montana State University in 1954. He conducted his thesis research, entitled "A New Transglucosidase Found in Potatoes," in the laboratory of Dr. Kenneth Goering, and in June 1959 he obtained his PhD in chemistry. After graduation, Bud received several job offers to work in industry. With a young family (Bud and Pat's children, Jamie, Steven, and Janice, were born while Bud was in graduate school), a career in industry seemed to be the best route for the Ryan family.

But by this time Bud had been bitten by the research bug. Relying on intuition, as he did so often during his life, Bud decided to pursue an opportunity to do postdoctoral work. He first studied with Dr. T. E. King at Oregon State University and then at the USDA Western Regional Laboratory in Albany, California, with enzymologist Dr. A. K. Balls. It was in Albany that Bud came across a research article describing how potato peels inhibit cholinesterase activity. Bud wondered what the plant chemical might be and whether it would inhibit the esterase activity of trypsin and chymotrypsin.

Always quick to improvise, Bud ran down to the grocery store and purchased a bag of potatoes and, within six months, had crystallized the first chymotrypsin inhibitor from plants. Based on this discovery, Bud received a Career Development Award from the National Institutes of Health to further study the properties of the inhibitor and to purify other inhibitors. The course for Bud's long and productive career in plant biology was set.

Bud and his family moved in 1964 to Pullman, Washington, where he accepted an assistant professor position in the Department of Agricultural Chemistry at WSU. In 1966 a fourth child, Joseph Patrick (Joe Pat) Ryan, was born. Bud would spend the rest of his career at WSU. His decision to remain at WSU was influenced by the stimulating research environment in the Department of Agricultural Chemistry, which, in 1980, became the Institute of Biological Chemistry (IBC). Throughout his career, Bud played a prominent role in shaping the Institute into a world-renowned research facility.

Bud's early success in characterizing the biochemical properties of proteinase inhibitors (PIs) led him to investigate factors that control their accumulation in plants. He discovered, for example, that chymotrypsin inhibitor I accumulates transiently in potato leaves as a temporary storage protein before protein resources are allocated to the developing tubers. Extending his studies on PIs to other plant species, Bud observed the occasional and somewhat unpredictable accumulation of PI-I in tomato leaves, and he suspected that the expression of the inhibitor was influenced by environmental conditions.

On investigating this phenomenon more closely, Bud and Terry Green (a postdoc in the lab) found that tissue damage inflicted by Colorado potato beetles resulted in massive accumulation of PIs in potato and tomato leaves. This landmark discovery, which was published in *Science* in 1972, suggested that wound-inducible PI expression makes the host plant less nutritional and perhaps lethal to invading insects. The paradigm that plants, rather than being passive victims of insect assault, respond dynamically to herbivory through the production of defensive compounds pervades much of the molecular plant–insect interaction research to this day.

The 1972 Green and Ryan *Science* paper also reported that wounding of a single leaf causes PI expression in undamaged aerial tissues of the plant. This discovery implied that plants possess an intercellular communication system in which signals generated at the wound site are propagated to distal leaves to warn of impending danger. Wound-induced systemic expression of PIs has been adopted by many laboratories as a model system for studying long-distance signaling in plants.

Tragically, in 1976, Bud and Pat's oldest son, Steven, died in a scuba diving class accident. Later the same year, Joe Pat was killed when the car he was riding in was struck by a drunk driver. Somehow, Bud and Pat persevered through these terrible events.

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Bud Ryan
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By the late 1980s, Bud was focusing his research on understanding the signal transduction pathway leading to PI gene expression in wounded tomato leaves. But where should one start in such a project? Brady Vick and Don Zimmerman, researchers at the USDA Agricultural Research Service in Fargo, North Dakota, had recently elucidated the biosynthetic route of an interesting linolenic acid derivative called jasmonic acid (JA). At that time, JA's function was unknown, but experiments being conducted in Japan, Germany, and the United States suggested that it had various biological activities, including stimulation of the accumulation of "jasmonate-inducible proteins" of unknown function.

Fortunately, Bud had a nearly photographic memory of previous experiments conducted in the lab, and he recalled an early unpublished experiment by Mary Kay Walker-Simmons showing that linolenic acid treatment could stimulate PI production. Maybe linolenic acid was metabolized to JA to induce PIs? The first sample of JA to come into Bud's lab was found on the WSU campus. The compound, in the form of methyl-JA (MeJA), was sprayed onto tomato plants. The following day, the result was spectacular: MeJA had captured the laboratory record for a compound that induces the highest level of PI accumulation. It thus became clear that JA is an important regulator of plant defense responses. These early experiments performed in Bud's lab played an important role in transforming JA from a relatively obscure phytochemical to a full-fledged member of the plant hormone family.

Interestingly, the inducing effect of MeJA appeared to spread from the sprayed plant to nearby control plants, presumably as a result of MeJA's volatility. This observation immediately raised the exciting possibility that plants able to produce MeJA might be able to stimulate PI gene expression in neighboring tomato plants. Indeed, this prediction was confirmed in a now-classic Ryan lab experiment in which MeJA emitted from sagebrush *(Artemisia tridentata)* induced PI expression in nearby tomato plants. Although this experiment was conducted in an artificially closed system, the unequivocal demonstration of interplant communication sparked intense excitement within the community of plant biologists and ecologists. The role of plant volatiles in mediating plant-to-plant communication under natural conditions remains a highly active research area to this day.

Well before the discovery of JA and MeJA as endogenous regulators of PI expression, Bud's lab had been engaged in a long-term study to identify PI-inducing factors from tomato leaves. This effort relied on a simple bioassay in which fractionated leaf extracts were tested for PI-inducing activity in an immunodiffusion assay. In 1991, after tens of thousands of such bioassays, this work paid off with the discovery of systemin, which was the first peptide signal identified in plants. Bud's group would go on to publish a series of influential papers describing systemin's role in the wound response of tomato plants.

In 1999, at the age of 68, Bud "retired" from university administrative and teaching duties, only to take a more active role in his research on plant peptide signaling. During this period, Bud and his colleagues would discover several new classes of bioactive peptides, including hydroxyproline-rich glycopeptides (HypSys), rapid alkalization factors (RALFs) that regulate root development, and a small polypeptide (Pep1) from Arabidopsis involved in the control of defense responses against pathogen attack. As was the case for tomato systemin, these novel peptides are derived from proteolytic processing of larger precursor proteins. These pioneering contributions to our understanding of peptide signaling in higher plants show that Bud remained fully engaged at the cutting edge of plant biology research even after "retirement."

Bud received numerous honors for his outstanding contributions to science, including election to the U.S. National Academy of Sciences (1987) for his early work on proteinase inhibitors and plant–herbivore interactions. He was the first faculty member from WSU elected to the academy. Bud received the Stephen Hales Prize from the American Society of Plant Physiologists (1992) and was a member of both the academic and athletic halls of fame at Carroll College. In recognition of his outstanding and long-term contributions to plant biology and service to the Society, Bud was named a member of the inaugural class of ASPB Fellows in 2007.

To many of us who were fortunate enough to work with Bud, he will always be remembered as a wonderful mentor and colleague, whose enthusiasm for science was contagious. With modesty and a steady stream of humor, Bud created a stimulating research environment in which students and postdocs could thrive. As the jasmonate and systemin stories were unfolding in the late 1980s and through the 1990s, the work was often carried out at a fast pace and with a sense of excitement and camaraderie. The "hot" results of the day were typically discussed around the coffee pot, and new experiments were planned. The atmosphere that Bud created made his laboratory an exceptional place in which to conduct research.

Bud was in good health up until the time of his death. He was an avid golfer and fisherman. Until the last two years, he was still playing basketball with the noon group at the gym. When he finally retired from basketball, he took up a new sport, ice skating. Proving it is never too late to learn something new, Bud and Pat took skating lessons and hit the ice before work twice a week.

Bud Ryan is survived by his loving wife Pat, his two daughters, Jamie Ryan and Janice Thrall (Terry), and two special granddaughters, Kymberly and Haleigh Thrall. The family suggests that contributions be directed to the Steve & Joe Pat Ryan Memorial Fund, Carroll College, 1601 N. Benton Ave., Helena MT 59625-0002.

Ted Farmer
University of Lausanne
Gregg Howe
Michigan State University
Greg Pearce
Washington State University
Andreas Schaller
University of Hohenheim

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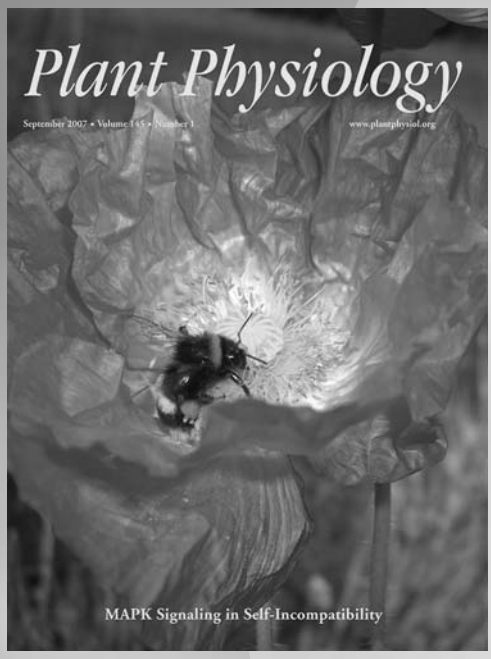

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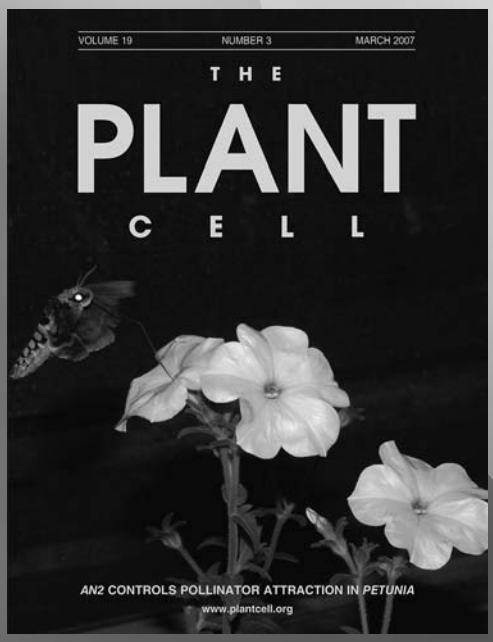

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