ASPB News

THE NEWSLETTER OF THE AMERICAN SOCIETY OF PLANT BIOLOGISTS

Volume 32, Number 3
May/June 2005

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A Perfect World

(Yes, another Clint Eastwood movie title)

Roger Hangarter

In a perfect world, we would all be doing our part to better our profession and the human condition. In a perfect world, people from all racial and ethnic groups would be proportionally represented in the plant biology research community. Unfortunately, our profession does not come close to representing a perfect world. Any observant attendee at ASPB annual meetings will be aware of the dearth of underrepresented minorities among the participants. Clearly, ASPB, and our discipline as a whole, has yet to achieve anything close to a critical mass of underrepresented minorities.

The ASPB Minority Affairs Committee (MAC) was established in 1995 in recognition of the fact that ASPB's American membership does not reflect the demographic composition of the overall U.S. population. MAC's goal has been to work to change this status quo. To this end the committee has, over the past 10 years, instituted a number of activities at ASPB annual meetings. However, despite these efforts, we have seen only incremental changes in minority participation.

Although important to the Society's long-term goal, it is not sufficient to focus on attracting new members (i.e., students) to ASPB who happen to be minorities. ASPB and its membership need to develop ways to effectively engage in plant biology research faculty from institutions in which many minority students are educated. And at the same time, we also need to address the lack of minority representation at the higher levels of scholarship in plant biology.

Here, I would like to outline a couple of the ideas that MAC has been discussing that may help turn the tide. Hopefully, this discussion will help convince more ASPB members to become involved in the process and contribute additional ideas—as well as actions—that will help make our science and our Society more inclusive.

Many of the institutions that educate minorities in the United States consider themselves to be primarily "teaching institutions" and have not been able to make the kind of investments in the research

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The *ASPB News* is now available 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 September/October 2005 *ASPB News:* August 5, 2005

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ASPB News is distributed to all ASPB members and is published six times annually, in odd-numbered months. It is edited and prepared by ASPB staff from material provided by ASPB members and other interested parties.

Copy deadline is the 5th day of the preceding even-numbered month (for example, December 5 for January/February publication). Submit copy by e-mail whenever possible; submit all other copy by mail, ***not by fax.***

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infrastructure that are commonplace in the larger research institutions. These "minority serving institutions" (MSIs) often require their science faculty to engage in research to obtain promotion and tenure, despite the fact that many do not have the kind of major grant support that they need to do cutting-edge research or to attend scientific meetings. So one recommendation is that ASPB should identify and work with individual faculty and administrators at MSIs to educate them about the benefits of establishing a plant-based research program. Compared to animal research, plant research typically requires fewer resources, which translates into a greater likelihood of establishing an independent research program that could also provide rigorous scientific training for students. If we are going to persuade anyone of the merits of plant biology research, however, it will also be necessary to talk to these faculty and administrators about the broad range of career opportunities in the plant sciences and basic biology research that are not directly medically related.

Finding ways to support the professional development of MSI faculty represents another important plank in the platform that ASPB would like to help build. For example, MAC is investigating ways in which ASPB might facilitate the development of true working collaborations between investigators from an MSI and an established investigator at a larger research university. A related idea is to provide travel awards to MSI faculty members with the expectation that they would bring a number of students with them to the ASPB annual meeting. The point here is to seek to engage both faculty members and their students, which is likely to be more effective than focusing on just one component in the equation. Our hope is that the faculty engagement part will have long-term benefits because each positively affected MSI faculty member will interact with many students over future years. Additionally, the students that come to the ASPB meeting can be educated as to summer research programs in plant biology in addition to learning about career opportunities related to plant biology—information they in turn may pass on to other students.

Obviously, these and many related ideas not mentioned here will require not only money to implement, but also the active participation of many plant biologists. At this time, ASPB does not have sufficient resources to fully fund many of the ideas outlined here—we can only support pilot activities or small-scale projects—so MAC is looking into other sources of funding. But even if it acquires financial support to carry out its plans, MAC doesn't have enough members to execute these plans on its own. The successful engagement of minorities with the plant sciences will therefore require the active and dedicated participation of many individual plant biologists. In this regard, the ASPB membership represents a tremendous asset that can help make significant progress.

It is fundamentally right and good for the ASPB membership in the United States to reflect the demographics of the U.S. population. But there are reasons beyond the altruistic ones for getting involved. Ideas like those outlined here are all NSF category 2 compliant. So established investigators interested in helping to bring underrepresented minorities to the plant sciences can meet their NSF category 2 obligations with the National Science Foundation while doing so. MAC can provide assistance to investigators in developing an effective category 2 program that will help meet the goal of improving minority participation in the plant sciences. However, this is not to imply that ASPB members should leave the job to only NSF awardees or that other valuable category 2 activities should be compromised. All ASPB members can, and should, be engaged at some level in the process. Having more balanced representation of people from all racial and ethnic groups in plant biology may not result in a perfect world, but it would certainly be a better one.

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Call for Proposals—JUNE 7, 2005, DEADLINE

ASPB Education Foundation—Grant Awards Program

The ASPB Education Foundation seeks projects that address the aims of the Education Foundation and at the same time catalyze new opportunities for ASPB members to promote plant biology in the context of the Foundation's mission. A total of $80,000 is available from the Education Foundation Grant Awards Program (GAP) in 2005. Proposals must be submitted to the Foundation by June 7, 2005. Please see details and guidelines at the ASPB website: http://www.aspb.org/education/foundation/gap.cfm. For questions, contact Paula Brooks at paula@aspb.org.

ASPB's Response to NIH's Public Access Policy

The National Institutes of Health recently requested that authors whose research is supported in whole or in part by NIH deposit their peer-reviewed, accepted manuscripts in PubMed Central, NIH's central repository. NIH intends this manuscript repository to (1) provide an alternative means through which NIH grantees can partially fulfill progress reporting requirements and (2) be part of a central resource through which the public may view research funded by U.S. taxpayers. The full policy can be viewed at http://grants1.nih.gov/grants/guide/notice-files/NOT-OD-05-022.html.

ASPB and Free Access

Before addressing how ASPB is responding to the NIH policy, it may be helpful to point out the actual cost of publishing high-quality, peer-reviewed papers online. Online publishing is expensive, and ASPB pays for it by charging libraries for access to the most recently published material and assessing author fees. Proponents of the Open Access movement, such as the Public Library of Science (PLoS), would have us believe that modest author charges can easily cover the full cost of publication, but PLoS actually operates under benefit of multi-million dollar grants. Most societies, including ASPB, are not in that situation. The actual cost to publish an article in *Plant Physiology Online* is about $2,500, and in *The Plant Cell Online* $3,500. To shift the full cost of publication entirely to the authors would create undue hardship for many of our contributors, in the United States and abroad, and a financially unreliable situation for ASPB. The present combination of subscriptions and author charges has allowed the Society to make the content free in numerous ways. For example, all research content is made free after 12 months from the date of publication, both via the journal websites at HighWire Press and via PubMed Central. The Society has digitized the full content of T*he Plant Cell* in searchable PDF format back to volume 1, January 1989, and the full content of *Plant Physiology* back to volume 101, January 1993. We are also working closely with the National Library of Medicine and PubMed Central to digitize the rest of *Plant Physiology* back to 1926, volume 1. That project is nearly complete, and these historical articles are available to all at http://www.pubmedcentral.nih.gov/tocrender.fcgi?journal=69&action=archive. Further, ASPB participates in AGORA (http://www.aginternetwork.org/en/), which allows more than 70 participating nations immediate free access to the research content of both journals. As you can see, ASPB has a long history of making its research content as widely and freely available as possible within the bounds of fiscal prudence.

How ASPB Is Responding to the NIH Policy

The NIH policy is a request, not a requirement, for NIH-funded authors, and the agency has stated that awardee compliance with the policy will not influence future funding decisions. Even so, ASPB recognizes that some of our authors may choose to comply with the policy and wants to accommodate them in a manner that does not jeopardize ASPB's legitimate interests and long-standing practices. Therefore, both journals' copyright statements have been amended for articles accepted as of May 2, 2005, to include the following statement: "[*Plant Physiology/The Plant Cell*] allows authors whose research was funded in whole or in part by the National Institutes of Health to deposit their peer-reviewed, accepted manuscript to NIH for release in PubMed Central 12 months after the date of final publication by the journal." NIH advises that "authors and/or their institutions should ensure that their final manuscript submissions to PMC are consistent with any other agreements, including copyright assignments that they may have, or enter into, with publishers or other third parties."

At this time, PMC cannot accept articles submitted by third parties, e.g., publishers, although there are plans to implement third-party submission later this year. Therefore, authors will be responsible for submitting their accepted, peer-reviewed manuscripts to PubMed Central, if they choose to do so. NIH's instructions for submission are available via http://nihms.nih.gov. Please note that ASPB requires that authors submit the identical version of the paper that was accepted for publication. This version will be different from the final, copyedited article that ASPB will publish, and the journals will provide authors with language to append to their manuscript to indicate that it is has not been copyedited and may therefore differ in important ways from the authoritative version of the article published in *Plant Physiology* or *The Plant Cell*. NIH would prefer that the published article eventually replace the author's accepted manuscript, provided that the publisher concurs. ASPB has for five years been depositing final published articles in PubMed Central for release after 12 months, and we will continue to do so.

What's Next at ASPB?

ASPB fully recognizes the value to the scientific community of making the journals' research content freely accessible as soon as possible. On the other hand, with the full cost to publish an article in *Plant Physiology Online* averaging around $2,500, and in *The Plant Cell Online* about $3,500, we are seeking a middle ground. Thus, we will be launching in the next couple of months an Open Access "experiment," whereby any author who desires to provide free access from the moment of publication to a research article that he or she has authored can do so for a modest surcharge of $1,000—and just $500 if the author works at an institution with a subscription to the journals. Authors who elect this Open Access option can instruct NIH to release the peer-reviewed manuscript as soon as the published article appears on the journal site.

Roger Hangarter
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ASPB Plans Strategically for a Long and Illustrious Future

In general, things are going well for ASPB. Domestic and international membership renewal rates are good; registration for Plant Biology 2005 is running ahead of projections; *Plant Physiology* and *The Plant Cell* remain very highly ranked and continue to see increased submissions of excellent plant biology manuscripts from around the world; the Education Foundation has just released its second call for proposals; ASPB's public affairs activities are making vital impacts both nationally and locally; and the Society's annual operating budgets have been in the black for the past few years.

So why pause for reflection and begin work on a new strategic plan when everything appears to be going swimmingly for the Society? Well, because it makes much better sense to take time to think creatively about the future when we don't have some fiscal or other crisis staring us in the face. Or, to put it another way, if ASPB began developing a strategic plan only after it became abundantly clear that we needed one, the Society would have much less room in which to maneuver.

With these thoughts in mind, and after obtaining the assent of the Society's Executive Committee in February, ASPB president Roger Hangarter assembled an ad hoc strategic planning committee consisting of current ASPB leaders, plant scientists who have been members of the Society for various lengths of time, and senior ASPB staff (see sidebar).

Ably assisted by retreat facilitator Merianne Liteman of Liteman-Rosse, Inc., this ad hoc committee repaired to Airlie House in the bucolic Virginia countryside, where we spent a day-and-a-half in early April in conversation, reflection, and planning.

The most potent outcome of that work—a detailed but flexible strategic plan that will be lived and breathed by the Society's staff and leadership and in which the Society's membership is heavily invested—is probably at least a year off. But the committee has made an excellent start, and the general thrust of its initial conclusions—to continue to focus attention on those activities that the Society already does superbly, such as journal publishing, public affairs, and meetings—seems to me to bode very well for the next steps in the process.

Those next steps include work by the entire ASPB staff to flesh out the broad outlines established by the strategic planning committee, soliciting the committee's feedback on our efforts, and presenting a revised plan to the Society's Executive Committee for discussion—and, hopefully, approval—at its winter meeting in early 2006.

In the meantime, I intend to keep you all informed of our collective progress as ASPB's strategic plan evolves and, of course, on the shape that the plan ultimately assumes.

'Til next time…

Crispin Taylor
ASPB Executive Director
ctaylor@aspb.org

ASPB's Ad Hoc Strategic Planning Committee

Committee members include ASPB president Roger Hangarter; past president Mary Lou Guerinot; president-elect Mike Thomashow; and ASPB members Machi Dilworth, Ken Keegstra (president 1997–1998), Sabeeha Merchant, and David Stern—along with ASPB staff members Donna Gordon, Brian Hyps, Jean Rosenberg, Kim Snell, Crispin Taylor, and Nancy Winchester.

Future ASPB Annual Meeting Sites

2005: Seattle, Washington
July 16–20
Washington State
Convention & Trade Center

2006: Boston, Massachusetts
August 5–9
Hynes Convention Center

For more information go to http://www.aspb.org/meetings/.

Mark Your Calendars!

ASPB will hold its **2007** annual meeting in conjunction with the Botanical Society of America (BSA), the American Bryological and Lichenological Society (ABLS), the American Fern Society (AFS), and the American Society of Plant Taxonomists (ASPT). Mark your calendars for July 7–11, Hilton Chicago, Chicago, Illinois, and look for more updates in the coming months.

Important Dates in 2005

June 3–4
Northeastern Section Meeting
State University of New York at Binghamton

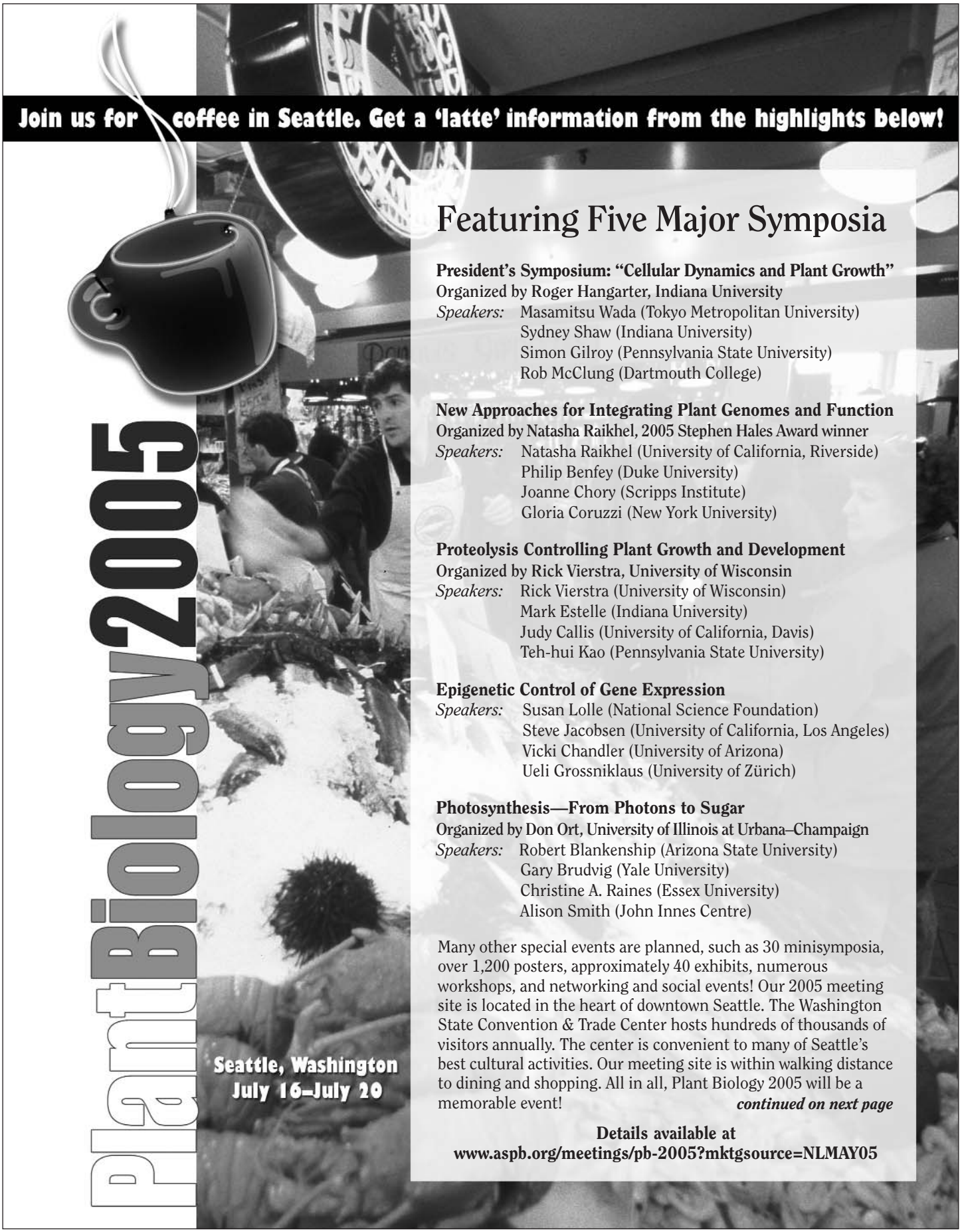
June 15
Last day to pre-register or register online for Plant Biology 2005

June 17
Housing cut-off for Plant Biology 2005

September—date to be determined
Mid-Atlantic Section Crab Feast
ASPB headquarters, Rockville, Maryland

October 12–16
Plant Genetics 2005
Snowbird, Utah

For more information on all ASPB events, visit http://www.aspb.org.



Join us for coffee in Seattle. Get a 'latte' information from the highlights below!

Featuring Five Major Symposia

President's Symposium: "Cellular Dynamics and Plant Growth"
Organized by Roger Hangarter, Indiana University
Speakers: Masamitsu Wada (Tokyo Metropolitan University)
Sydney Shaw (Indiana University)
Simon Gilroy (Pennsylvania State University)
Rob McClung (Dartmouth College)

New Approaches for Integrating Plant Genomes and Function
Organized by Natasha Raikhel, 2005 Stephen Hales Award winner
Speakers: Natasha Raikhel (University of California, Riverside)
Philip Benfey (Duke University)
Joanne Chory (Scripps Institute)
Gloria Coruzzi (New York University)

Proteolysis Controlling Plant Growth and Development
Organized by Rick Vierstra, University of Wisconsin
Speakers: Rick Vierstra (University of Wisconsin)
Mark Estelle (Indiana University)
Judy Callis (University of California, Davis)
Teh-hui Kao (Pennsylvania State University)

Epigenetic Control of Gene Expression
Speakers: Susan Lolle (National Science Foundation)
Steve Jacobsen (University of California, Los Angeles)
Vicki Chandler (University of Arizona)
Ueli Grossniklaus (University of Zürich)

Photosynthesis—From Photons to Sugar
Organized by Don Ort, University of Illinois at Urbana–Champaign
Speakers: Robert Blankenship (Arizona State University)
Gary Brudvig (Yale University)
Christine A. Raines (Essex University)
Alison Smith (John Innes Centre)

Many other special events are planned, such as 30 minisymposia, over 1,200 posters, approximately 40 exhibits, numerous workshops, and networking and social events! Our 2005 meeting site is located in the heart of downtown Seattle. The Washington State Convention & Trade Center hosts hundreds of thousands of visitors annually. The center is convenient to many of Seattle's best cultural activities. Our meeting site is within walking distance to dining and shopping. All in all, Plant Biology 2005 will be a memorable event!

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Details available at
www.aspb.org/meetings/pb-2005?mktgsource=NLMAY05

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Plant Biology 2005

Join us for coffee in Seattle. Get a 'latte' information from the highlights below!

Plant Biology 2005 T-Shirts
This year's meeting T-shirts will be in demand! They will feature the famous "flower clock" from the cover of the July 1999 issue of *Plant Physiology*. Reserve your shirt before the meeting as limited quantities will be available for purchase on-site. Register and reserve now, or if you've already registered, add the T-shirt to your registration.

Saturday, July 16 (pre-register to bring poster)
Undergraduate Networking Pre-Mixer/Poster Session
All undergraduate attendees are encouraged to attend and display their posters. Students will be free to mingle with each other, various Society leaders, and other meeting participants to share their research, network, and learn how to get the most out of the meeting.

Sunday, July 17
JSPP Special Presentation
The Japanese Society of Plant Physiologists (JSPP) will present "New Directions of Rice Research in Post-Genome Sequencing Era."

Sunday, July 17
Small Colleges/Primarily Undergraduate Institutions (PUI) Networking Breakfast
This annual event serves as an opportunity to bring people from PUIs together to network, share information on strategies for teaching and research in plant biology, and explore other opportunities. This event requires a pre-purchased ticket.

Sunday, July 17
Minority Affairs Committee–Sponsored Speaker and Luncheon "Making a Career in Science: Preparation, Opportunity, Courage and a Dash of Luck"
Speaker: Elma Gonzalez, University of California, Los Angeles
The Committee on Minority Affairs sponsors this annual luncheon for meeting attendees. This event requires a pre-purchased ticket.

Sunday, July 17
Post-Docs & Graduate Students "Career Workshop I—Where the Other Jobs Are" and "Career Workshop II—Getting and Keeping a Job"
Organized by the ASPB Women in Plant Biology Committee, the two career workshops are always one of the most popular events of the meeting. Food and beverages will be served. This event requires a pre-purchased ticket. Attendance is limited!

Monday, July 18
Women in Plant Biology Committee–Sponsored Speaker and Luncheon "The World According to Garth"
Speaker: Judith Verbeke, NSF
Come and enjoy excellent food, network with fellow students and professionals, meet members of the Women in Plant Biology Committee, and hear from one of today's leading women in science. This event requires a pre-purchased ticket.

Tuesday, July 19
Plant Biology 2005 Dinner & Dance at Seattle's Pacific Science Center
This renowned center has been the host of many social events. It's a place where you can dance under the stars, delight in a tropical environment among hundreds of butterflies, and dine with dinosaurs. The center, originally built for the 1962 World's Fair, houses over 200 hands-on exhibits. This will be one of the social highlights of Plant Biology 2005. It's the place for the kid in all of us—there will be good fun, music, and great conversation. This event requires a pre-purchased ticket. Attendance is limited!

See you in Seattle!

PHOTO COURTESY OF SEATTLE'S CONVENTION AND VISITORS BUREAU

WIPB Committee Inaugural Column

Beginning with this issue, the ASPB Women in Plant Biology Committee plans to run a column in every issue of the *ASPB News*. These short essays will focus on women doing science, and they will offer perspectives, ideas, and suggestions for those just starting careers in plant biology as well as those further along in their careers as teachers, administrators, editors, government scientists, or academics.

It is our pleasure, then, to introduce in this issue our inaugural column by Wendy Boss and her niece Jessica Farmer. Their story describes how the scientific method is a very human endeavor, a natural reflection of human thinking and imagination, rather than just a set of esoteric and incomprehensible tasks carried out by remote scientists in lab coats.

Tapping the Puzzle Piece: The Legacy of Pride in Science

It would begin the second night after her arrival, after we had all had our say on whether or not the Thanksgiving turkey was done enough and had drunk a sufficient amount of wine. We would gather in the living room by the fire. My brother would dust off the brown vinyl card table and bring it up from the basement; then Grandmother Mary would pull out that year's jigsaw puzzle from her suitcase. We'd spend some time examining the cover of the box, sometimes an elegant cathedral in Europe, sometimes a bucolic country scene. With a quick shake and a flourish, she happily removed the lid and dumped the contents onto the table.

There were never enough chairs, so my nieces would have to stand or kneel beside her. There would be some division of labor, who would work on the border, who would focus on the treeline, who would begin the spire of the cathedral, but it was always collaborative. "I found a piece of a cloud!" someone would exclaim. "This looks like part of a horse's leg," my sister-in-law would say. After a little while, food and wine would begin to take effect, and we'd grow drowsy or impatient. After trying one piece for several minutes, my mind would invariably wander, and I'd pass my frustrating piece on to Grandmother Mary. She would finger it thoughtfully, peering down at the table from behind her spectacles. She would try it in various places, some that I had already tried, and some where it seemed to me it clearly did not fit. I walked around the table and looked over her shoulder, trying to see just what she saw. Never rushed, she enjoyed the search, but she loved the find. When she finally got it to fit, and she always did, she would briskly tap the piece three times before sliding it neatly into place.

Grandmother Mary was not a scientist, but there was something very scientific in her approach to "puzzling," as she called it. The methodology used is very much like that which goes into scientific discovery. Spread out before you on the table is the work of the thousands who have come before you; the challenge is to find where your piece fits. And each individual piece, each finding, each paper, is a puzzle in itself, comprising countless hours in the field collecting data, in the lab running experiments, and behind a computer screen examining and articulating what has been learned. Oftentimes, this toil only leads to the realization that the piece doesn't fit and you have to reposition it, rerun the experiment, and reexamine the data to see what went wrong. Through this endeavor comes true wisdom, the ability to admit when you are wrong and the fortitude to stick with it to figure out why. Good scientists recognize that this is an integral part of the process, and the only path to the "eureka" moment of discovery when your piece fits just right and a larger picture begins to emerge. Through this methodology, old truths are challenged and new ones take form.

Throughout my career I have been fortunate to work with people who were stimulated by scientific discovery, who recognized the beauty of the process and were thrilled to do science for science's sake. Their achievements have built on what came before and contribute to what is to come in ways that only the future can show. Because all science is connected, these eureka moments of discovery are not a victory for the individual alone but for modern science as well. Science is, then, about community. In any individual paper or experiment, there are many people involved. Though the long nights in the lab may be solitary, the completion of the puzzle is never the work of a single scientist. Tapping the puzzle piece celebrates the pride in that work, the thrill of learning something new, and the pride that individual derives from a contribution to the greater whole, whether or not it brings notoriety. I often wondered if Grandmother Mary would tap the piece if we weren't there with her at the table; I have no doubt that she would.

We educators have the difficult yet marvelous task of passing on this enthusiasm for discovery, for the beauty of the process, to the next generation of scientists. We must convey that to do the process right takes time, but by giving yourself space to explore, you can arrive at new insights and new questions that you could not have imagined at the onset. In this space, new theories and careers are born. Unfortunately, competition today in science is threatening to rob young scientists of the eureka moment by creating a culture that rewards those who try to jam in as many pieces as possible in the shortest amount of time. This leads to "flash in the pan" science, sloppy research, and legwork that devalues

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the science, and for many, sucks the joy out of the process. Not all scientific work will rewrite the textbooks, but all good science, well-placed pieces, contribute to the larger puzzle. Putting one piece in correctly, whether it is the one that reveals the final image or the one that fills in the background, is important. And each individual has a role to play; whether sitting at the table for the pleasure of the company and the excitement of the moment or to complete the final image, each of us has a place at the table.

Conveying this message of pride in work is critical in science, because science holds a unique place in society for its ability to transcend politics and prejudice and present society with tools to better understand the world. It tells us how things work, and challenges what is known to be true. In this way, science exists at the edge of imagination. Ask the right questions and anything is possible. One needs only to look at the recent scandal at the *New York Times* to see what happens when institutions that hold the public's faith are degraded by individuals who cut corners in pursuit of fame. In order for science to play its crucial role, it must be sound, it must be accurate, and it must be good.

So it is against this precipitous race for glory that we educators must position ourselves. The number of papers and where they were published will be forgotten all too soon. The legacy that we must leave is the love of discovery and the determination to follow through until we get it right. It is mostly unglamorous work, and the stress of deadlines is real, but through it all the students must see us tapping the puzzle piece. We must continue to be engaged in the discovery, to be thrilled when a new student enters the lab, or when a colleague shares an insight over lunch. Let the students see that this is the best job a person could have. Come to the table, accept the challenge, and tap on your puzzle piece. Capture the excitement and pass it on.

Some might place just one piece in a lifetime, and some may place 20. Some may slip the last piece in the middle and say they finished the puzzle, but that can never be true. This Thanksgiving, we will gather around the table to construct yet another puzzle. Grandmother Mary has been gone for nearly 10 years, but when my piece slides into place and the picture starts to emerge, I will tap it and smile.

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Available in Print and Online—Volume 56, June 2005
ISSN: 1543-5008 ISBN: 0-8243-0656-2

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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: Guichuan Hou
Title: Research Microscopist
Place of Work or School: Center for Biotechnology, University of Nebraska–Lincoln
Research Area: Plant developmental and cell biology
Member since: 2002

1. **Why has being a member of ASPB been important?**
   ASPB has provided excellent opportunities for me to learn from and to interact with other colleagues. The annual meeting and electronic publications at the ASPB website always help me keep up with new findings and ideas in plant biology.

2. **Was someone instrumental in getting you to join ASPB?**
   Dr. Elison Blancaflor, the adviser for my postdoctoral research at The Samuel Roberts Noble Foundation, encouraged me to join ASPB and attend the 2002 Plant Biology Meeting in Denver. I am glad that he helped me get started with ASPB.

3. **What would you tell colleagues to encourage them to join?**
   My own experience attests that by being a member of ASPB, you can anticipate great opportunities to learn and to interact with other members of the plant biology community. The ASPB network functions very well in providing every member with the latest technology and research breakthroughs. Everyone in ASPB is enthusiastic and always ready to help. And if that isn't enough, please go to http://www.aspb.org for further information.

4. **Have you enhanced your career using ASPB job postings or through networking at an ASPB function?**
   Not yet. But I am sure I will do so in the future.

5. **Have you had any success at finding candidates as a result of a job posting at the meeting or on our online Job Bank?**
   No.

6. **Do you read print journals? If so, where do you usually read them?**
   Not really any more. Our libraries at UNL have subscriptions for many electronic journals. I browse and read every recent issue of electronic journals relevant to my research and interest. But I do print out papers of great interest so that I can review them when time allows.

7. **What do you think is the next "big thing" in plant biology?**
   I would think to "map" gene(s) to developmental processes and pattern formations in plant model species. I am also excited that comparative biology has developed to the genomic level and will extend beyond.

8. **What person, living or deceased, do you most admire?**
   That is my master's adviser Li Yanghan, professor emeritus at the College of Life Sciences of Nanjing Agricultural University, China. He is kind as a person, serious as a scientist, and humorous as a friend. I still play Tai Chi and exercise regularly, which is one of several important lessons I learned from him.

9. **What are you reading these days?**
   Beyond my field, I am reading a book and papers on alternative medicines.

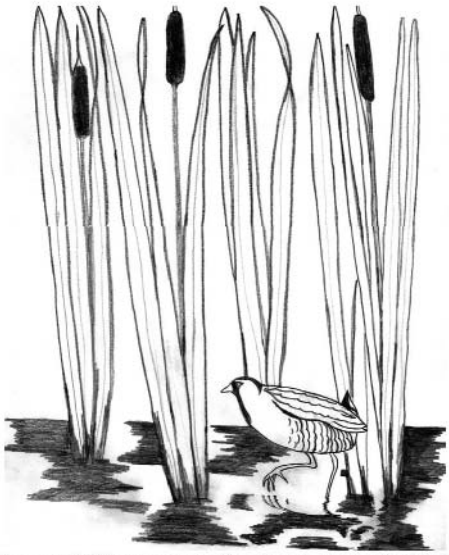
10. **What are your hobbies?**
    I enjoy playing basketball and riding my bicycle. As mentioned above, I practice Tai Chi regularly.

11. **What is your most treasured possession?**
    A great memory of many stories that my father told me when I was a child.

12. **What do you still have left to learn?**
    There is always too much to learn! Beyond science, I need to learn how to be a better father and friend to my two boys.

Cattails—But Of Course

I have spent some time in the past few weeks thinking about cattails; specifically, whether or not to remove some of them from the shoreline of two small ponds that grace the entryway to my neighborhood. The neighborhood is called "The Ponds at Overland Trail," which, in the minds of some, turned out to be something of a joke because the original brochures of the neighborhood in the mid-1990s, designed to lure prospective buyers, evidently showed several large sparkling blue ponds, and what is actually present today are some muddy cattail swamps and a couple of duck puddles surrounded by, you guessed it, more cattails. So now I find myself part of a neighborhood committee considering such weighty matters as the fate of cattails. This has brought back memories. Twenty years ago, I spent nearly all of my time thinking about cattails, and a fair number of hours mucking about in them as well, as my master's thesis in botany was on nitrogen fixation associated with the roots of cattails in Minnesota wetlands. As cattails go, those in my current neighborhood are relatively mild mannered and well behaved. I can see part of a large patch from my window—it is perhaps 100 yards wide and most plants appear no taller than two to three feet. In my forays in the marshes of Minnesota, I was often completely swallowed in a sea of green, where the noise of a highway a mere hundred yards away could be drowned by the wind blowing through slender stalks towering nine or 10 feet high. In addition to the ubiquitous geese, mallards, great blue herons, and red-winged blackbirds, I encountered a surprising number of lesser known birds in the cattail marshes: yellow-headed blackbirds, little green and black-crowned night herons, and very shy bitterns and Sora rails. The little marsh in my foothills neighborhood is too small to house many birds, but, thanks to the cattails, there is a healthy population of red-winged blackbirds, a pair of mallards, and even an occasional great blue heron. I like to imagine a few rails, keeping well hidden amongst the tallest stalks. Rails will be active in this area over the next two months, and I plan some early-morning walks to listen for the distinctive whinny of the Sora or grunt of the Virginia rail. I think a couple of aerating fountains in the center of the open water would be nice and will help keep the algae down, but shall we speak again of eliminating cattails? Don't be ridiculous.



Sora rail (*Porzana carolinus*) and *Typha latifolia*
N. Eckardt

Nan Eckardt
neckardt@aspb.org

Congressman Pastor Champions Energy Biosciences Research, Supports Hiring of Needed Program Staff

The Department of Energy's Energy Biosciences program, experiencing voluntary resignations of all staff, has received major assistance from a key member of Congress.


Congressman Ed Pastor

Following is the question that was submitted by Congressman **Ed Pastor** (D-AZ) as part of the Hearing Record of the House Appropriations Subcommittee on Energy and Water Development hearing March 15 regarding the fiscal year 2006 budget request of the DOE Office of Science:

"I understand that the administrative assistant of the Energy Biosciences program has retired and that a couple of plant biologists have recently given notice that they too will be leaving. These departures have raised concerns in the plant science community in Arizona that the program's ability to award competitive research grants will be adversely affected if these experienced staff members are not promptly replaced. Are there plans to quickly replace retiring staff members in this program to ensure continuity of the program's mission? If not, why not?"

Congressman Pastor and his staff brought important attention to the serious attrition problem at Energy Biosciences with this question. Committee on Public Affairs member **Karen Schumaker** and a number of her colleagues at the University of Arizona had sent a letter to the congressman explaining concerns with the program and seeking assistance. Joining Schumaker in sending the letter were ASPB past presidents **Vicki Chandler** and **Brian Larkins;** Committee on Public Affairs past member **Robert Leonard; Ramin Yadegari, Rod Wing, David Galbraith, Martha Hawes,** and **David Gang.** ASPB public affairs staff discussed this issue with Congressman Pastor's excellent staff.

Shortly after Congressman Pastor raised his question, a hiring was made of an administrative assistant working with Energy Biosciences. The previous administrative assistant had retired more than a year ago. Program manager **Sharlene Weatherwax** resigned in March to move to the DOE Office of Biological and Environmental Research, and team leader **James Tavares** retires at the end of June. Efforts are currently being made to hire new program staff.

The Energy Biosciences program supports leading basic research on plants and microbes conducted primarily by university-based scientists throughout the country. Basic research on plants and microbes contributes to advances that address the nation's future demands for domestically produced energy sources.

Hangarter Encourages Hiring of Needed Energy Biosciences Staff, Urges Budget Increases for DOE Office of Science, Energy Biosciences

Roger Hangarter, ASPB president and professor at Indiana University, submitted testimony on behalf of the Society March 18 in support of the Department of Energy's Office of Science, including the Energy Biosciences program.

Hangarter urged the House Appropriations Subcommittee on Energy and Water Development to increase funding 7 percent above current-year levels for the Department of Energy's Office of Science and for the Office of Basic Energy Sciences, including its Energy Biosciences program. ASPB joined with the Energy Sciences Coalition in recommending the increase, which would be significantly more than the department's fiscal year 2006 budget request of $3.46 billion—a nearly 4 percent reduction for the Office of Science compared to the present fiscal year.

The testimony cited the high quality of research conducted by Energy Biosciences grantees. Energy Biosciences grantees include scientists who have received recognition from a number of distinguished science institutions and organizations, including national and international science societies, the National Academy of Sciences, and a Nobel Prize selection committee. Basic research on plants and microbes contributes to advances that help address the nation's future demands for domestically produced energy sources such as energy crops.

There is concern in the plant science community that the current attrition of staff administering the Energy Biosciences program will adversely affect the program unless they

are promptly replaced, the testimony noted. Following are more excerpts from ASPB's testimony:

"Please encourage and support expedited efforts by the department to hire two plant biologists to replace [the] two plant biologists who are Biosciences Team Leader and Program Manager and who have announced resignations. Please also encourage and support expedited efforts to hire the Energy Biosciences administrative assistant to replace the administrative assistant who retired. [This hire was subsequently made.]

Continued full staffing of the Energy Biosciences program will allow the program to continue to convene panels, review proposals, and award grants for the best research proposals following the highest scientific merit selection standards. This would enable future discoveries that will make environmentally benign, home-grown energy sources more plentiful and cost competitive with imported petroleum products, such as gasoline and industrial chemicals.

Advances in modern plant research made possible by support from the Energy Biosciences program are facilitating a shift toward use of feedstocks from domestically grown plants for chemical products. Plant-produced products can provide the chemical industry with much greater diversity than is available from the comparatively limited structures found in crude oil.

Plants are a major source of renewable and alternative fuels in the United States. Greater knowledge of the basic biology of plants will lead to further economies in domestic production of renewable fuels.

We deeply appreciate the continued strong support of the subcommittee for innovative research on plants and microbes sponsored by the Office of Science through its Energy Biosciences program."

(Please see related story in this issue on page 14: "Congressman Pastor Champions Energy Biosciences Research, Supports Hiring of Needed Program Staff.")

NSF Contributes to Knowledge, Educated Workforce Needed by Business Community

ASPB joined with a number of other science societies in recommending at least $6 billion in fiscal year 2006 appropriations for the National Science Foundation. ASPB submitted testimony April 8 to the House Appropriations Subcommittee on Science, State, Justice and Commerce, and Related Agencies. The NSF budget request is for a 2.4 percent increase to $5.6 billion.

Following are portions of ASPB's comments:

This level of funding ($6 billion) will enable NSF to continue to play its key role in establishing a leadership position for the United States in science and technology. U.S. leadership in a wide range of science disciplines is needed to compete and survive in the increasingly challenging global market.

Support for NSF contributes to new job-creating discoveries while at the same time, training a highly skilled work force. Despite the attractions of lower wages and benefits costs to companies considering moving jobs offshore, it is the highly skilled workforce in the U.S. that plays a major role in contributing to job starts and business expansions here at home. The business magazine, *Forbes,* looked at the best places of the 150 largest cities to start a business in the U.S. in its May 24, 2004 issue. One of the major criteria mentioned by *Forbes* in assessing the best places for businesses was an educated workforce. "To assess the qualifications of the work force, we took into account the concentration of college graduates and Ph.D.s in an area," *Forbes* said.

At the top of its list was Madison, Wisconsin, largely because of research and education at the University of Wisconsin and its educated workforce. In Madison, 41 percent of the population has a college degree—almost twice the national average. That helps create a tight labor market where unemployment is the lowest of any of the 150 largest metro areas, the article noted.

"Brains power the Madison economy: The university, which employs 17,000 souls but has helped create 70,000 jobs in Madison, generates $4.7 billion a year in direct and indirect output, reports NorthStar Economics," *Forbes* noted. "Outsourcing may be all the rage these days, but many companies are still looking homeward—with good reason: low business costs and an educated workforce."

Contributions of NSF and other federally supported research to universities and their local economies are also found in many cities beyond Madison. Second on the *Forbes* list, Raleigh-Durham, North Carolina, with its strong base of universities, has Research Triangle Park, which is home to nearly 40,000 employees at more than 130 companies. Total job growth was expected to rise 14 percent in the next five years. Charlotte, North Carolina, was also ranked high in the business magazine's rankings. Austin, Texas, with the University of Texas, was selected three by *Forbes.* Also highly ranked in Texas for appealing to business are Houston, Fort Worth, Dallas, and San Antonio.

The Washington, DC, northern Virginia area captured the number four spot in the business-appeal rankings of the nation's 150 largest cities. "It ranks among the top regions for educated workforce, income growth, and culture and leisure. Only high costs keep it from ranking first overall," the *Forbes* ranking said.

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Huntsville, Alabama, captured a top-10 position in the business-appeal rankings, as did Atlanta, Georgia; Provo, Utah; Boise, Idaho; Lexington, Kentucky; and Richmond, Virginia. Virginia was the only state with two cities/areas in the top-10 rankings of the article.

California, with its large base of research universities, has many cities highly ranked for their business appeal: San Diego (17) followed by Orange County (40); Santa Barbara (41); Sacramento (47); Ventura (48) and many other cities. Providence, Rhode Island, with its strong base of universities, ranked in the upper third. Albany, New York, was ranked by *Forbes* at 18. Philadelphia, Pennsylvania, was also in the higher rankings of the 150 surveyed, as was Baton Rouge, Louisiana. A number of gulf- and ocean-side cities in Florida were also in the higher half of rankings for their business appeal, under the *Forbes* analysis.

States that did not have one of the 150 largest cities were not included in the publication's rankings. However, NSF-sponsored research and education at universities of less-populated states and in smaller cities makes significant contributions to local business development and to the overall local economy. (Examples cited in previous paragraphs are in states of a number of members of the ASPB Public Affairs Committee.)

Strong contributions by universities conducting NSF-supported research to the local economy also contribute to a stronger national economy. With the higher labor, housing, transportation, commercial, and industrial property and related costs found in the U.S. compared to a number of world nation competitors, federal investment in science and education through support of NSF helps keep the nation's businesses afloat in a global sea of keen competition.

NSF support for basic plant research contributes to the local economies nationwide, including rural areas, while helping to secure the food supply of all Americans. As the first step of every food chain, plants and research on plants plays an essential role in meeting the nutritional needs of people here and abroad. The NSF Directorate for Biological Sciences sponsors examination of basic research questions on plants and other organisms. A number of plant research discoveries were cited by NSF among its most significant advances in science over the first 50 years of the agency's existence.

NSF supports world leading plant genomic research as part of the Plant Genome Research Program. The National Plant Genome Initiative Progress Report was published January 2005 by the National Science and Technology Council Committee on Science Interagency Working Group on Plant Genomes. The report noted, "Plant genome research holds enormous promise for solving global problems in agriculture, health, energy and environmental protection. Much still remains to realize this potential and the U.S. scientific community is clearly working toward that goal."

The report cited the importance of research on economically important crops and on the model plant *Arabidopsis thaliana*—a plant with a small and simple genome. Knowledge gained from the Arabidopsis genome facilitates understanding of other economically important plants through use of comparative genomics.

Advances in plant genome and other basic plant research combined with modern biotechnology will lead to superior food and energy crops, more nutritious foods, more environmentally benign plant production practices, and new plant-produced lifesaving medicines. These advances will significantly benefit America's farmers and consumers.

ASPB Cites Essential Contributions of NRI, ARS to Agriculture, Environment

ASPB submitted comments on April 8 to the House Appropriations Subcommittee on Agriculture, Rural Development, Food and Drug Administration and Related Agencies. ASPB urged support for the fiscal year 2006 budget request of the Department of Agriculture of $250 million for the National Research Initiative Competitive Grants Program (NRI) and for increases in the Agricultural Research Service budget.

ASPB noted that the Department of Agriculture and NRI have been very responsive to recommendations from Congress, the National Academy of Sciences, and the science community to improve upon an already excellent competitive grants program.

In response to recommendations, the NRI has increased the funding amounts and duration of individual grants to address researchers' needs. At the same time, however, increased grant award amounts can result in fewer overall grants. The $70 million increase recommended for the NRI to $250 million, which includes some transfers of existing research programs, would enable the research community to address more research questions America's farmers need answered.

Following are some additional portions of ASPB's comments:

"Advances in science made possible through the NRI have already led to widespread plantings of crops naturally resistant to pests. This reduces the dependency of American farmers on pesticides, which thereby protects our fresh water supplies, soils, and fragile ecosystems.

ASPB conducts education outreach efforts to further explain to the public the huge benefit for the environment made possible through basic plant research leading to pest-resistant crops. The support of this Subcommittee for the NRI and the Agricultural Research Service in sponsorship of plant research is one of the most significant and effective contributions made by any public or private entity for a cleaner environment.

Continued support for a balanced research portfolio in the department including intramural and extramural research is needed to address the many and sometimes devastating problems farmers face in growing crops. The Department of Agriculture's Agricultural Research Service (ARS) has a record of addressing effectively many important research questions for American agriculture.

Research supported by the NRI provides profound benefits for Americans and our world neighbors. For example, NRI-supported research conducted by Professor **Daniel Gallie** at the University of California, Riverside, has led to a genetically engineered breed of corn with half the usual amount of carbohydrates, but twice the protein. Gallie has since been contacted by several companies interested in developing the crop for consumers adhering to low-carbohydrate diets. The protein-packed corn could also offer America's farmers high-quality corn for their livestock. In addition, this new corn breed could supplement protein-deficient diets in Africa and South America. Protein malnutrition is the leading cause of death of children in developing countries.

We urge the subcommittee to increase support for the NRI and ARS in fiscal year 2006. As requested by the president, ASPB urges appropriating $250 million to the NRI in fiscal year 2006. We urge a significant increase for ARS over the fiscal year 2005 appropriation.

We deeply appreciate the Subcommittee's support for research sponsored by the NRI and ARS—research that has been essential to producing the nation's food supply and protecting our environment."

ASPB Comments on Research Instrumentation Needs to National Academies Committee

ASPB submitted comments April 11 to the National Academies Committee on Advanced Research Instrumentation Disciplinary Society Survey of Instrumentation Funding and Support.

The survey is part of the instrumentation's committee's study, which is being conducted in response to a provision in the National Science Foundation Authorization Act of 2002 enacted by Congress. The committee has been seeking the input of science societies and researchers to get a better understanding of the issues related to instrumentation and related federal policies. The study is examining federal programs and policies related to advanced research instrumentation used for interdisciplinary, multidisciplinary, and disciplinary research. If needed, the committee will propose policies to make the most effective use of federal agency resources to fund such instruments.

The ASPB Public Affairs Committee, ASPB president **Roger Hangarter,** and **David Galbraith** developed ASPB's comments. Following are survey questions and ASPB's responses:

1. Unless permission is otherwise given, the responses provided in this survey will only be used in an aggregated fashion in the committee report. Your society will be listed as a respondent to the survey.

   a. May we use the comments you have provided verbatim in the report (Y/N)? *Yes*

   b. May we attribute these comments to your society (Y/N)? *Yes*

   Please share your perspective on instrumentation:

2. In the fields represented by your society, what types of advanced research instrumentation (instrumentation with capital costs between $2 million and $100 million) are used? What is your assessment of the availability of and additional need for these instruments?

   A cyclotron-based mass spectrometer would be very useful for high throughput, high accuracy proteomics. Needed instruments include a computer cluster of appropriate size and an extreme high-end electron microscope. There is a need for more use of high frequency Nuclear Magnetic Resonance (NMR) spectrometers for doing whole cell/whole plant functional metabolomic studies. The cost is $5 million to $7 million for a high field, 900 MHz instrument not including housing and related costs. NMR spectroscopy is a diagnostic tool that operates on the same principle as magnetic resonance imaging (MRI). However, instead of looking at structures at the anatomical level, scientists use NMR spectroscopy to study structures at the atomic level. Through NMR, scientists get atomic-level pictures of biologically important molecules including proteins, nucleic acids, and carbohydrates. This contributes to an understanding of how molecules function. For example, NMR helps researchers understand how proteins recognize and interact with carbohydrates on the surfaces of cells.

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There needs to be a recognition that plant growth facilities such as greenhouses that provide critical control of lighting, temperature, watering, and humidity are instruments. There is a tremendous need for support in this area. Often greenhouse facilities are viewed as building projects by universities and government agencies and are therefore very difficult to fund. However, modern greenhouses are in fact sophisticated instruments necessary for controlled experimentation with plants. Modern greenhouse facilities cost several million dollars.

3. What new kinds of instrumentation in the $2 million to $100 million price range do you think researchers in your society will be interested in five years from now?

One would be a cyclotron-based mass spectrometer, which would be very useful for high throughput, high accuracy proteomics. Another would be a computer cluster of appropriate size. It is possible that instrumentation starting in this price range will drop in cost as the market develops. These two items would be very useful in the future of genomics and its attendant ~omic disciplines. There will be a continued demand for high-end electron microscope and nuclear magnetic resonance spectrometers.

As plant research moves more toward understanding the functions and interactions of all plant genes in crop plants, it will become increasingly important to use highly controlled growth conditions. The technologies needed to provide controlled lighting, temperature, water, and humidity control depend on elaborate and expensive equipment. We will see in the next five years that researchers in our society will become increasingly interested in having sophisticated plant growth facilities.

4. Besides additional federal funding, what is the primary federal agency policy issue your field faces and what is your assessment of current agency policies for advanced research instrumentation?

Biological instrumentation is frequently vested in a technician-run core facility, and it is often overtly stated as a requirement for federal funding that shared-use instrumentation be placed in such a facility. This attitude is old-fashioned and has the effect that the instruments and their applications are run only at the education level of the technician. Cutting-edge activities are automatically discouraged. A policy shift is needed to fully integrate technology and instrument development and operation, with biological questions and research directions. This can be done only through faculty-led development and operation of the instruments and the development of collaborative programs that emphasize the synergy of instrument development and use and the uncovering of new biological knowledge.

Committee on Public Affairs, Leadership, Visit Congressional Offices, USDA: Urge Support for Energy Biosciences, NSF, NRI, ARS

The overall constriction of the non-security federal budget as it relates to research programs was considered by the Committee on Public Affairs and leadership at the committee meeting held February 28 through March 2 in Rockville, Maryland, and Washington, DC.

Congressman David Price

Congressman Tom Latham

With regard to the Energy Biosciences program within the Department of Energy Office of Basic Energy Sciences, the voluntary attrition of all Energy Biosciences Program staff in the Department of Energy was a matter leading to considerable discussion and planning.

Program manager **Sharlene Weatherwax** resigned in March and team leader **James Tavares** announced his retirement effective the end of June. The administrative assistant had resigned more than a year earlier. These positions represent all program staff.

Committee members and leadership urged their congressional offices to seek support for the Energy Biosciences program and the Office of Science on several visits March 2. ASPB staff and past president **Ken Keegstra** subsequently met with Division of Chemical Sciences, Geosciences and Biosciences Director **Walt Stevens** at ASPB later that week to discuss future plans for the program.

Support for basic research (including basic plant research supported by DOE, NSF, and USDA) was expressed by a number of key offices, including the offices of Congressman **Ed Pastor** (D-AZ; please see related story on page 14) Congressman **David Price** (D-NC), Congressman **Tom Latham** (R-IA), Congressman **Michael Rogers** (R-MI), Senator **John Sununu** (R-NH), and Senator **Barbara Boxer** (D-CA). ASPB Campus Contacts were asked to join in a letter-writing campaign to their members of Congress in support of the

Energy Biosciences program. Many additional public affairs activities have been conducted in support of the Energy Biosciences program in response to committee and leadership deliberations.

Congressional visits addressed the need to support the Energy Biosciences program, National Science Foundation, National Research Initiative Competitive Grants Program, and Agricultural Research Service in the fiscal year 2006 budget. The NRI would increase to $250 million from the current-year level of $180 million if the president's budget request is approved by Congress. (See related stories in this issue on ASPB comments filed in support of NSF, NRI, ARS, and Energy Biosciences.)

ASPB immediate past president Mary Lou Guerinot and Senator John Sununu

The committee and leadership met March 2 with **Mark Poth,** research programs director of the USDA Cooperative State Research, Education, and Extension Service (CSREES) Competitive Programs and with NRI national program leaders responsible for plant research programs. Committee members commended the excellent work of Poth and national program leaders **Ed Kaleikau, Liang-Shiou Lin, Ann Lichens-Park,** and **Gail McLean** in managing their highly regarded research programs.

Further actions taken by the committee and leadership include the following:

- Submission of an ASPB proposal for a USDA–CSREES stakeholders' workshop on plants and pest biology was approved.
- Guidance was given on addressing the NIH public access policy (see story on page 5).
- Past president Mary Lou Guerinot will present the ASPB exhibit of NSF-sponsored research at the 2005 Congressional Exhibition and Reception of the Coalition for National Science Funding.
- Richard Jefferson was selected to receive the 2005 ASPB Leadership in Science Public Service Award for outstanding contributions to science and society.
- The legislative proposal for a National Institute for Food and Agriculture was reviewed.
- ASPB public education efforts on plant biotechnology and genetically engineered foods were reviewed.

ASPB Committee on Public Affairs Seeks Student Participant

The Committee on Public Affairs explains the interests of plant science to Congress, the Executive Branch, and the public. The committee provides comments to appropriate members and committees of Congress, coordinates interactions with officials in Congress and federal agencies, and assists Society members in contacting and providing information to policy makers. The committee meets twice a year—once at the ASPB annual meeting in the summer and once in Washington, DC, generally in March.

The committee is seeking an undergraduate or graduate student who is a member of ASPB to participate on the committee at these two meetings. Travel costs are reimbursed by ASPB. If you are interested in participating, please submit a CV and a one-page description of why you are interested to Brian Hyps at bhyps@aspb.org.

This commentary originally appeared in the Daily News of Los Angeles (CA) *on December 5, 2004. It is reprinted here by permission of the author.*

Field of Dreams

Science Makes Exciting Ag Advances, but "Natural" Naysayers Stand in Way

by Robert B. Goldberg

Sunday, December 5, 2004—During the next 50 years, we will need to produce more food than in the entire history of mankind. And we will need to do this on a rapidly shrinking amount of land that is suitable for agriculture.

Los Angeles illustrates this point dramatically. In the 1920s, Los Angeles County was one of the most productive agricultural areas in the United States. Bean fields, citrus orchards and dairy farms were scattered across the county and the new southern branch of the University of California—now known as UCLA—had an agricultural college that provided assistance and new technology to local farmers, educated a new generation of agriculturists and plant scientists, and helped launch the California avocado industry that thrives to this day.

Fast forward to the present. Agriculture has vanished from Los Angeles County, with housing developments, freeways and shopping malls replacing the fertile fields of the past. A similar story could be told in many parts of California and the United States. Ironically, from the 1920s to present time, food production in the U.S. has increased almost 300 percent and the number of workers required to produce our food has shrunk from over 50 percent of the labor force to less than 2 percent. And the percentage of our income that we spend on food has decreased from 40 percent to only 15 percent.

How was this achieved and what are the implications for the future?

About 100 years ago, at the turn of the past century, Mendel's experiments with peas were rediscovered, and the science of genetics was born. New breakthroughs in genetics were used by plant breeders to develop hearty new crop varieties that produced more food on less land. Technological advances such as the tractor, novel irrigation systems, fertilizers and chemicals to fight off pests and weeds, as well as new discoveries about how plants grow, contributed significantly to the cheap, plentiful supply of healthy food that we buy in grocery stores today.

The achievements of the past using old technologies, however, are not sustainable in our current era of burgeoning population growth and limited resources. Just as our parents and grandparents turned to science to help give us the most productive agriculture in the world, we must do so today if we are to meet the challenge of producing a healthy supply of food with limited water, land and other natural resources.

There has never been a more exciting time for agriculture and the plant sciences. The new field of plant genomics is uncovering genes that confer resistance to drought and pests and that can increase the yield of crops significantly above what has been done by conventional breeding over the past 100 years. These discoveries have the potential for creating a new green agriculture, one that is sustainable and that can provide an adequate supply of food to the world's growing population on less land and with much smaller inputs of water and chemicals. A green agriculture that can spawn new industries, such as biofuel production to replace our dependence on oil and reduce the harmful environmental effects of burning fossil fuels.

Sadly, just as new opportunities and advances in agriculture are within our reach, an ideological battle is raging that is slowing to a snail's pace the transfer of exciting laboratory discoveries to reality in the field.

The anti-science forces of darkness have proclaimed that the same genetic engineering technologies that have given us miracle drugs that can treat cancer, diabetes and heart disease should not be used to produce new crop varieties that require small amounts of water, are resistant to pests, require no pesticides and yield significantly more food than conventional varieties.

Why? Because they are not "natural," claim the naysayers.

Yet agriculture has never been natural. The vast majority of food in a grocery store has been produced on land cleared of trees, fortified with nutrients either in the form of manure or fertilizers, and irrigated with water that is piped to the fields. This has been going on since agriculture was invented by our ancestors 10,000 years ago and is the result of a simple biological fact—plants need land, light, water and food in order to grow. Most crops that we use as food have been bred for thousands of years not to grow in the wild, but in the artificial environment that we call a farm.

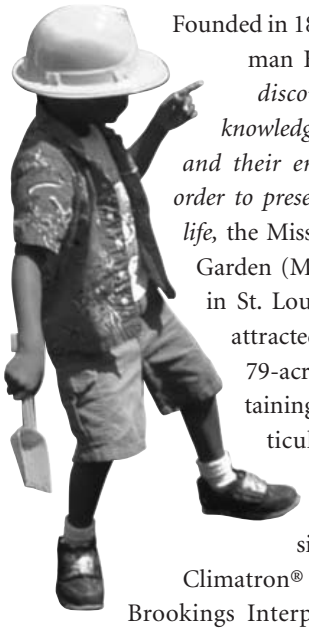
If we are going to create a new kind of agriculture that is both sustainable and productive, we will need to use all of the scientific tools and discoveries at our disposal, including genetic engineering. Not to do so would break a continuous path of agriculture breakthroughs that has advanced the progress of mankind for thousands of years. In a future of rising populations and shrinking natural resources, turning our backs on modern science's potential would be a major tragedy for us and our children.

Robert B. Goldberg is a UCLA professor of molecular, cell and developmental biology and a member of the National Academy of Sciences. He is an active, long-standing member of ASPB who has chaired the ASPB Education Foundation and served on numerous committees. He was the first editor of The Plant Cell *and has published extensively in* The Plant Cell *and* Plant Physiology *as well as other prominent scientific publications.*

Compiled and edited by Lawrence R. Griffing, Texas A&M University, Department of Biology, College Station, TX 77843; griffing@neo.tamu.edu

Informal Learning & Public Understanding of Science at the Missouri Botanical Garden

by Amy Haake, Coordinator of Garden Programs, and Jennifer Wolff, Exhibit and Information Coordinator



Founded in 1859 by Englishman Henry Shaw *to discover and share knowledge about plants and their environment, in order to preserve and enrich life,* the Missouri Botanical Garden (MBG) is located in St. Louis. Visitors are attracted to the main 79-acre campus containing beautiful horticultural displays of great diversity in design and style, a Climatron® Conservatory, Brookings Interpretive Center, the Kemper Center for Home Gardening, an inquiry-focused 24,000-square-foot state-of-the-art Center for Science Education, and the soon-to-be-opened Children's Garden.

In addition to the main campus, the MBG has four satellite sites, located within a 30-mile radius, including a 2,400-acre nature reserve inclusive of an overnight field-based science education center, a 34-acre outdoor ecology study center, a restored Victorian home serving as an energy/resource conservation exhibit, and an inspiring 8,000-square-foot conservatory with thousands of tropical butterflies in free flight in addition to a native habitat for local and migratory species. Last year, the attendance at all five locations was 870,321 visitors.

Through its dedication toward developing a scientifically literate citizenry, the MBG is working in partnership with local schools providing programs for 145,000 children and 30,000 adults each year, including nearly 3,000 teachers. The MBG serves the entire community through educating children and adults about plants, ecology and the environment, energy/resource conservation and sustainability, and critical plant and animal interactions, thereby improving science education in the St. Louis metropolitan area.

While conducting and participating in some 25 floristic projects, the MBG Research Division sends expeditions to investigate ecosystems in over 30 countries around the world. In addition, the MBG offers a nationally renowned graduate degree program in plant biology in partnership with St. Louis–based Washington University.

Concentrating on informal adult education, the Horticulture Division offers a living museum of plants and landscapes and represents the institution's capacity to attract and inform a diverse clientele, from school children to professionals. Outdoor and indoor natural classrooms are provided for life-long learning opportunities in the plant sciences through plant labels, story signs, special displays, exhibits, classes, tours, and professional gardening assistance.

A tropical lowland rain forest is simulated in the Climatron® Conservatory, which houses 1,200 species of the garden's total tropical plant collection, estimated at 160,000 species. Here visitors are introduced to tropical plants and are given a glimpse of a warm moist forest, as well as an illustration of the rainforest and many of its many special characteristics. About half the plants in the Climatron® were collected in the field, which gives them more scientific value than plants raised in a greenhouse.

In conjunction with the garden's commitment to environmental stewardship through example, the Brookings Interpretive Center gives a vivid look at the central role of plants in Earth's ecosystem and was designed to help

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Children with kiddie construction hats help break ground for the new Children's Garden.

Above: One of the volunteer interpreters exploring plant defenses with visitors.
Inset: Young visitors investigating the Natural Recycling exhibit.

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visitors understand why plants are vital to the balance of life on Earth. The *Paradise Is Being Lost* diorama of life-size figures dramatizes the global crisis of deforestation and features "environmental conversations" between an ecologist, a forest dweller, a land developer, and a farmer. Manipulative panels provide "point–counterpoint" arguments on many sides of environmental issues. Linking the living exhibits in the Climatron® with the Shoenberg Temperate House and the site of the future Desert House, the Brookings Center, visitors to the center learn about biodiversity, why it is important, and what they can do to help preserve it.

Stimulating thought and interaction among visitors, staff, and plants, Volunteer Interpreter Carts contain hands-on, sensory-based materials and activities used to provide visitors with a deeper understanding of the flora of specific gardens and basic botanical concepts, give individualized information to visitors about seasonal attractions and special features, and engage families in science discovery by facilitating interaction with the garden's collection.

The garden extends its educational efforts through the Internet with MBGnet (http://mbgnet.mobot.org/). The MBGnet project began as a collaboration between the MBG and the Evergreen Project that resulted in the production of a series of videos about terrestrial biomes and aquatic habitats called *What's It Like Where You Live?* This video series spawned the development of the MBGnet, which is a child-friendly website that provides an in-depth look into Biomes of the World, Freshwater Ecosystems, and Marine Ecosystems. The garden launched its newest addition to the site earlier this year: *The Biology of Plants,* which is based on the Biology of Plants video series.

The garden has recently embarked on one of its most innovative and transforming projects during the 32-year tenure of its director, Dr. Peter Raven. Culminating from more than two years of self-evaluation and benchmarking, the garden has dedicated a 2.6-acre tract for a unique Children's Garden with the goal to attract and engage children and their families in a compelling and enjoyable experience that underscores the importance of plants in their lives.

The purpose statement for this new feature is *to engage children and their families in an adventure-filled journey through the diverse ecosystems and settlements of 19th century Missouri, while fostering curiosity and an understanding of plants in the world around them.* The true reward of the Children's Garden will be to stimulate interest among its visitors so that they will want to learn more about plants and the environment.

The educational program for the Children's Garden, which is undertaken as the Children's Garden Education Initiative, will reflect the same educational priorities that drive the MBG. In general, six learning themes have been defined for The Doris I. Schnuck Children's Garden:

- Missouri's long and rich history with an emphasis on the Mississippi River basin
- Biodiversity
- Adaptations
- Agriculture/horticulture
- Conservation and research
- Ecosystems.

Supporting life-long learning, a pivotal goal of the Children's Garden is to positively affect environmental attitudes of children and thus their future environmental behaviors by presenting them with positive play experiences in an outdoor, naturalistic setting.

Education in botanic gardens does not always happen just within the environs of the garden. As educators and those responsible for interpretation, we know that our message and mission should reach not only our visitors, but also the whole community. Through outreach programs and projects designed to function both within and outside the garden walls, we can also raise awareness of environmental issues and problems, provide support to schools, and contribute to the nature of learning. More and more, public gardens are playing the critical role of providing quality learning opportunities that increase the general public's knowledge and understanding of plants and the role of plants in the world.

ASPB Exhibit at National Science Teachers Association Conference 2005

Education Committee chair Larry Griffing using the scanning device to keep track of teachers visiting the ASPB booth during NSTA 2005.

ASPB and Wisconsin Fast Plants (WFP) once again were partners in a double exhibit booth for the 2005 National Science Teachers Association conference in Dallas, Texas. The conference ran from March 31 to April 3. The WFP team was headed by Paul and Coe Williams, and ASPB was represented by Suzanne Cunningham and Sherry Fulk-Bringman of Purdue University's Agronomy Outreach Department and ASPB Education Committee chair Larry Griffing of Texas A&M University.

"The NSTA meeting is a great place for ASPB members to talk with all kinds of teachers and teacher educators," reported Griffing. "It is somewhat humbling, being a much bigger meeting than many scientific society meetings, such as ours. There were 10,000 attendees at the conference and many, many exhibitors. We probably had 1,000–2,000 people come by the combined booth to interact with us. Many were interested in hearing about current research in plant biology. I spent several hours explaining what the *Plant Physiology* 2004 poster was all about to many attendees. It was a nice attention-grabber and it was very interesting to hear what people had to say about it. There was considerable interest in Arabidopsis as a model organism and how teachers could put Arabidopsis into the classroom along with Fast Plants. Many more teachers were interested in just getting more plant biology into their classroom."

Wisconsin Fast Plants

Griffing remarked how the WFP program does such a splendid job of placing plant science in the classroom. "The teachers are really interested in them, and the WFP group does an amazing job with the teachers. I noticed that although Fast Plants are carried by Carolina Biological, the main activity in Fast Plants was at our booth where there were many active demonstrations, new ideas, and some nice Fast Plant necklace freebies. On the other hand, the Carolina Fast Plant display had, when I saw it, hardly anyone at it. The continued enthusiasm and insight of Paul and Coe Williams and Dan Lauffer and other WFP staff is a joy to behold."

Coe Williams conveyed the thoughts of the WFP staff when she reported, "Overall it was a most satisfactory and positive outreach experience. Although we on the WFP side of the booth were not doing the screening of booth visitors, our guess is that the vast majority of teachers were from Texas or nearby states. Given the fact that our booth was in the farthest corner of the convention hall, we felt that the number of visitors was pretty fantastic. We heard several people say, 'You guys always have good, new stuff,' which made us think that certain teachers are indeed seeking out the booth year after year."

Attendees making seed germination necklaces: How fast are Fast Plants?

The WFP program offered three "make and take" activities, two of which were offered at any given time. The staff was kept busy. "For the first day-and-a-half, we were two deep at both activity tables. It was gratifying that teachers were still showing up on Sunday morning to make and take an activity. We had three to four people working the booth at any given time: Dan Lauffer, Paul Williams, and Coe Williams; Hedi Baxter from the System-wide Change for All Learners and Educators (SCALE) program; and Whitney Hagins and Ken Bateman, teachers at Lexington High School in Massachusetts."

One WFP activity was a seed germination necklace, complete with little "tools" and a water container (essentially a necklace with three microcentrifuge tubes) with an accompanying question, "How fast are Fast Plants?" WFP had pre-prepped with 500 copies of the instruction card to start. By Friday night the WFP staff were back at Kinko's and Home Depot, having another 300 copies of the instructions printed and buying more nylon cord for the necklaces and then prepping more "seed wedges" at the hotel. All 800 of the instruction postcards were dispensed, and the staff estimate that teachers made 1,000 germination necklaces. Some even came back a second time with colleagues to have them make a necklace. The last couple of necklaces were made on Sunday morning.

The second WFP activity was a "Discovery Cup" garden complete with a live sow bug and dead ladybug. The Discovery Cups were little

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portion cups that were also strung onto a necklace. Into each one went four tiny plants: a selaginella, a moss, a heartwort, and a kalanchoe. The sow bug also went into the cups with a bit of "habitat," whereas the ladybug was put into a microcentrifuge tube and teachers were asked to decide what to do with the ladybug. The sow bug was added to address the question of what the sow bug would choose to eat. The ladybug came with a question: "What purpose does the ladybug serve; or why a ladybug?" Through ongoing observation, the teachers will find that the ladybug provides an excellent source of fertilizer for the plants in their Discovery Cups. The activity was called "Discovery Cup Garden Necklace—Sow Bug's Quest." This was the "necklace" that caught the attention of teachers all over the convention hall. WFP gave away 500 of those and could have done more, since they ran out mid-afternoon on Saturday. In total, 2,000 tiny plants were given away in the Discovery Cup necklaces. WFP stated, "We owe our thanks to Dr. Lisa Darmo at Carolina Biological for providing the sow bugs."

The third WFP activity began on Saturday afternoon and was offered until the convention closed. This was a phototropism activity in a film can called "Which Color Do Plants Lean Toward—Red, Green or Blue?" It involved three colored windows punched into a film can and three germinating Fast Plants seeds inside. Coe Williams explained, "We decided on this activity this year because we thought it would complement the work being done by Roger Hangarter. Two hundred of these experiments were set up and taken away by teachers."

Also featured in the Fast Plants side of the booth was a new Plant Light Box display made from plastic crates. This is a low-cost method for educators to create a light box. The plastic crates can be purchased at any of the office supply outlets for $6 to $8, and, with the spiral light and cord, can be put together for growing plants in the classroom for under $15.

At each corner of the two "hands-on tables" was an "umbrella tree" from which were hanging various bottle biology constructions such as the "film can hand lens" and mature Discovery Cup gardens. On the back tables were Plant Light Boxes with several Fast Plants growing systems, genetic stocks, and one Plant Light House with the Brassica butterfly.

Purdue Agronomy Outreach

The Purdue Agronomy display was also very hands-on and informative for K–12 teachers, being quite popular and busy all the time. An abundant supply of experiments and a handout for educators on how to obtain both the printed and online version of K–12 experiments was available from Purdue's Agronomy Outreach Department. Suzanne Cunningham and Sherry Fulk-Bringman conducted a "smiling faces" experiment using corn seeds, starch/agar gels, saliva, and iodine. They also demonstrated the "digestion in action" experiment showing the process of starch digestion and discussing the role enzymes play in seed germination and food digestion. They discussed with teachers how the educators could explain enzymes to their students and creatively demonstrate how enzymes work using Lego™ blocks and jigsaw puzzles—especially effective for ninth-grade biology. Purdue staff displayed experiments illustrating soil characteristics such as electric charge (clays/organic matter have a negative charge), texture (great for youngsters), and color. In addition, they showed water binding capacity (applicable to high school environmental courses), how plants and mulch prevent erosion (bottle experiment shown last year with expanded applications), the role of vermiculite in our potting soil (why it holds so much water), and how nutrients bind to soil and the role of plants in preventing nitrate leaching.

Interaction with educators helped the Purdue staff refine its own presentation methods. "I think we are going to rewrite our lab text applying these inexpensive techniques and applying each experiment to plant and soil science," said Suzanne Cunningham. For a title she was inspired by the phrase "Dirt Cheap Hands-on Experiments in Plant and Soil Science." Purdue Outreach had examples of activities for children of all ages and gave out a handout showing access to its website. Throughout the four-day event, staff were tweaking their experiments to show teachers how they could be applied to the grade level being instructed or the particular subject matter being presented.

ASPB Education Outreach

Larry Griffing observed, "ASPB really has some great 'hooks' for teachers as well. The two flyers 'How Many Plants in a Fast Food Burger?' and 'Plants in the House' are quite popular. The *12 Principles of Plant Biology* brochure is a wonderful way for ASPB to get across some key concepts and stand for something, connecting with the teachers as an organization in a way that is useful and edifying for them and their students. The bookmarks are very popular." Two other exhibits were ones sponsored partly from ASPB Education Foundation Grants. One was a DVD presentation of images from Roger Hangarter's (Indiana University) website "Plants in Motion" (http://plantsinmotion.bio.indiana.edu). The other display was sent by Peggy Lemaux, University of California at Berkeley, depicting how genetics relates to food. This was accompanied by five different "baseball cards" of DNA/genetic information: "What Is DNA?," "Classical Genetics," "New Genetics," "Genetics at Work," and "How Much DNA Do You Eat?" For those who want additional information on how to "rent" their own informational display, visit Lemaux's website at lemauxpg@nature.berkeley.edu.

Griffing wondered about the value of having a presence at NSTA: "Will teachers go away knowing the ASPB name and logo?" He answered his own question with, "Maybe not right away, but as we continue our presence and continue to be associated with these great ways for individuals to take scientific investigation into the classroom, it will come." The ASPB Education Committee plans to conduct a follow-up survey of more than 320 attendees whose information was captured at the booth.

This article is a compilation of reports from Larry Griffing, Coe and Paul Williams, and Suzanne Cunningham.

Summer Undergraduate Research Fellowship 2005 Recipients

SURF Undergraduate Fellowships

Ten students mentored by ASPB members were selected to receive ASPB Summer Undergraduate Research Fellowships (SURF) for 2005. The $3,000 fellowship will permit each student to devote full-time effort to his or her research project for a 10-week period this coming summer. The award also includes $500 to the mentor for lab supplies, a free student membership in ASPB until August 2006, and travel grant assistance to attend the 2006 ASPB Plant Biology Meeting.

This is the fifth year of the SURF program. In previous years the SURF program supported eight students, but this summer the funding was increased to support 10 students. There were 30 Category A (Research and Doctoral Universities) applicants and 12 Category B (Masters Universities, Baccalaureate Colleges, and Associate of Arts Colleges) applicants for a total of 42 highly competitive projects. The reviewers were impressed by the high quality of all the applicants' projects and the commitment of the students and their mentors to their ongoing research.

The SURF program was once again co-chaired by Mark Brodl, Trinity University, who was joined this year by Mary Williams, Harvey Mudd College. (Jon Monroe, James Madison University, who started the program with Brodl and has served as a co-chair for the past four years, is on sabbatical this year.) The co-chairs express their appreciation to the ASPB Executive Committee for providing ASPB Good Works funds to support the fellowship program and to the reviewers who contributed many hours in selecting the recipients. It was agreed that this was the most difficult year ever to choose recipients from the many outstanding projects presented. Complete project descriptions can be viewed at the ASPB website: http://www.aspb.org/education/undergrad.cfm.

The committee hopes that this award will enable the students to strengthen their interests and skills in plant biology and to share the satisfaction that comes from asking and answering difficult questions. ASPB mentors will want to keep an eye on the ASPB home page, starting in December 2005, for the next SURF announcement. E-mail announcements of SURF opportunities are sent to all ASPB members.

CATEGORY A

Research and Doctoral Universities

Kelli Davies, University of Arizona, Tucson
Project: *Post-embryonic roles of* TOAD1 *and* TOAD2, *leucine-rich repeat receptor-like kinases in* Arabidopsis thaliana
Mentor: Frans E. Tax, University of Arizona, Department of Molecular and Cellular Biology

I am so happy to be selected as a SURF recipient this year! It is really exciting to receive acknowledgment and support from ASPB for my research endeavors, especially at this early point in my academic career. I am eager to begin working on my research full-time this summer. I want to express my gratitude to the American Society of Plant Biologists for providing this unique opportunity to aspiring plant biologists such as myself. I am also grateful for all the help provided by my mentor, Dr. Frans Tax, as well as Michael Nodine and all the other wonderful people in my lab.

Bradley Dotson, University of Wisconsin–Madison
Project: *Analysis of hormonal regulation in* dab4-1, *a mutant in* Arabidopsis thaliana *with delayed abscission, male sterility, delayed meristem arrest, and strong apical dominance*
Mentor: Sara E. Patterson, University of Wisconsin–Madison, Department of Horticulture

I would like to thank ASPB for this wonderful opportunity. I am so glad to be accepted by ASPB. This is a great milestone in my professional development. Plant genetics and biology have been a passion of mine ever since I came to Madison. I am planning to further my career after graduation from the University of Wisconsin–Madison in the acquisition of a Ph.D. ASPB can only help in this endeavor. I am humbled by ASPB's generous gift. I only hope to repay the research community with my tireless efforts over this summer, as the work I do will pour indefinitely into my senior research experiments.

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CATEGORY A (continued from page 25)
Research and Doctoral Universities

Susan Christy Sanchez Monzon, University of New Mexico, Albuquerque
Project: *Activation of red form I algal Rubisco from* Plocamium cartilagineum
Mentor: David T. Hanson, University of New Mexico, Biology Department

I'm so honored to be a recipient of the 2005 ASPB Summer Undergraduate Fellowship. This is a tremendous commitment that will allow me to expand my horizons in plant biology. This summer will be full of learning and mentoring as I work toward reaching the goal of higher learning.

Okello Mukua, Principia College, Elsah, Illinois (note: Okello Mukua is an international student from Kenya)
Project: *Characterization of genes central to phenylpropanoid metabolism in* Rhizophora mangle
Mentor: John Cheeseman, University of Illinois, Plant Biology Department, Urbana

Wow! What a privilege to be one of the great 10! I cannot be more excited. Thanks to ASPB not only for selecting me for the fellowship, but also for recognizing my research efforts at this early stage in my education. Thanks to my mentor too, for supporting my ambitions all through. It is with great honor that I accept this fellowship and look forward to an engaging summer of scholarship!

Bryce Seifert, Clemson University, Clemson, South Carolina
Project: *Identification of new mutant lines in* Medicago truncatula
Mentor: Julia Frugoli, Clemson University, Genetics, Biochemistry and Life Science Studies

I am thrilled to be selected for such a prestigious award. I cannot wait to continue my research with *Medicago truncatula* and show my experience and discoveries in 2006 in Boston. Once again, thank you!

Patrick C. Still, Virginia Commonwealth University, Richmond
Project: *Nitrogen starvation and the regulation of symbiotic gland development in Gunnera*
Mentor: Wan-Ling Chiu, Virginia Commonwealth University, Biology Department

I am grateful and thrilled to have the opportunity to start my career with such a distinguished research fellowship. Next year's ASPB conference will be an honor and a joy to attend.

Honorable Mention CATEGORY A

Ngoc-anh Hoang, University of Utah, Salt Lake City
Project: *The SCARFACE gene encodes an ARF-GAP: Does this regulate PIN localization?*
Mentor: Leslie E. Sieburth, University of Utah, Biology Department

Dyllon Ivy Martini, Colorado State University, Fort Collins
Project: *Copper delivery for photosynthesis: Biological roles of two plastid metallo-chaperones*
Mentor: Marinus Pilon, Colorado State University, Biology Department

CATEGORY B

Masters Universities, Baccalaureate Colleges, and Associate of Arts Colleges

Laura Wayne, SUNY College of Environmental Science and Forestry, Syracuse
Project: *Characterization of a guard-cell-specific enhancer trap line of* Arabidopsis thaliana
Mentor: Larry Smart, SUNY College of Environmental Science and Forestry

Thank you, ASPB, for awarding me with the Summer Undergraduate Research Fellowship and acknowledging my hard work and dedication. This fellowship will provide me with the opportunity to continue my research and discovery, preparing me for what lies ahead in graduate school. I am ready to dive into my research project this summer and immerse myself in the world of researching, learning, and discovering one small aspect of how plants function. I am thrilled to become a part of your scientific community.

Mallory Ann Havens, Knox College, Galesburg, Illinois
Project: *RT-PCR analysis of gene expression in soybeans grown in elevated carbon dioxide and ozone atmospheres*
Mentor: Robert G. Ewy, Knox College, Department of Biology

I was thrilled and honored to have been given the opportunity to conduct this research. Receiving notification of the award made my day.

Mohammad Shuja Shafqat, Wilkes University, Wilkes-Barre, Pennsylvania
Project: *Determining parent–offspring distances in oak forests by DNA fingerprinting*
Mentor: William Terzaghi, Wilkes University, Biology Department

I am so grateful to ASPB for giving me this opportunity. I hope this summer of research brings me closer to my goals. I would like to thank everyone who has supported me in all my pursuits, especially my parents. Research has been such a large part of my life, and I hope to continue it as long as I can.

Sesh Sundararaman, Williams College, Williamstown, Massachusetts
Project: *3-D Imaging of cyanobacteria through electron microscope tomography rationale*
Mentor: Claire S. Ting, Williams College, Biology Department

I am honored to have been chosen to receive the ASPB Surf Fellowship. It is exciting to have the opportunity to pursue my own research in understanding how differences in cyanobacteria genomes manifest themselves in cellular ultrastructure. I am thankful for the opportunity I have been given and look forward to the continuation of my research as well as attending next year's ASPB-sponsored meeting.

Honorable Mention CATEGORY B

Emily Harper, Hope College, Holland, Michigan
Mentor: Debbie Swarthout, Hope College, Biology Department
Project: *The use of plant–fungal interactions as a model system in understanding complex biological processes*

ASPB Headquarters

Telephone Extensions and E-Mail Directory

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

● Our office telephone number is 301-251-0560

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Missing journal issues							●						
Subscriptions, institutional and individual						●							
Plant Physiology (except missing issues)													
Disposition of a manuscript												●	
All other questions										●			
The Plant Cell (except missing issues)													
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All other questions										●			
ASPB News									●				
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The Plant Cell										●			
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Accounts payable/receivable problems			●										
ASPB meetings		●											
Public affairs/government relations								●					
Education								●					
Society governance	●												
ASPB Education Foundation								●					
International issues	●												
Awards	●												
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Website													●
Online orders													●

ASPB News

American Society of Plant Biologists
15501 Monona Drive
Rockville, MD 20855-2768 USA

ASPB News (ISSN 1535-5489; Online ISSN 1544-9149) is published bimonthly by the American Society of Plant Biologists, 15501 Monona Drive, Rockville, MD 20855-2768 USA, telephone 301-251-0560, fax 301-279-2996. Members' dues include a subscription price of $2 per year to *ASPB News.* Subscription price to nonmembers is $30 per year. Periodicals postage paid at Rockville, MD, and at additional mailing offices. Postmaster: Please send address changes to *ASPB News,* 15501 Monona Drive, Rockville, MD 20855-2768 USA.