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ASPP NEWS

Debby Delmer Assumes ASPP Presidency October 1

Dr. Deborah Delmer, professor and chair of the Section of Plant Biology at the University of California, Davis, will become president of the American Society of Plant Physiologists October 1, 1999. She will lead the Society in 1999–2000 and continue on as immediate past president in 2000–2001. She replaces Brian Larkins as president. Larkins will continue on as immediate past president in 1999–2000.

Dr. Delmer earned her A.B. degree in bacteriology with honors in 1963 from Indiana University and her Ph.D. in cell biology in 1968 from the University of California, San Diego, studying tryptophan biosynthesis in plants. Her long-standing research interest in the structure and biosynthesis of the plant cell wall began when she worked as a postdoc with Peter Albersheim studying the enzyme sucrose synthase. Prior to her move to California in 1997, she held faculty positions at The Hebrew University of Jerusalem and at the MSU–DOE Plant Research Laboratory at Michigan State University and was a principal scientist at the ARCO Plant Cell Research Institute in Dublin, California. During these years, her group was one of the first to initiate studies on the mechanism of glycosylation of plant proteins and to show that dolichol-based lipid intermediates are involved in the process. They also studied the structure of the cell wall of cotton fibers, modeled pathways of carbon flow in fibers, and developed novel techniques to measure the pore size of cell walls and the use of DMSO to determine the compartmentation of metabolites between the vacuole and the cytoplasm.

However, Dr. Delmer's major research focus has concerned the biosynthesis of cellulose in higher plants. Some of her surprising findings are that plant cells can be adapted to grow with almost no cellulose in their walls and the discovery of a membrane-associated form of sucrose synthase proposed to associate directly with glucan synthases. Together with colleagues at Calgene, Inc., Delmer's group was the first to identify plant homologs of bacterial genes that encode the catalytic subunit of cellulose synthase, and much of her current work is focused on a characterization of this complex gene family. In related work, she has studied the mechanism and regulation of callose synthesis in plants and also has an interest in the role of the small G-protein Rac in the regulation of the onset of secondary cell wall synthesis.

Debby Delmer

Most of Dr. Delmer's teaching has focused on classes in general and plant biochemistry. She has served on review panels for granting agencies in the United States and Israel; on editorial boards for *Plant Physiology, Plant and Cell Physiology,* and the *Annual Review of Plant Physiology and Plant Molecular Biology;* and as a member of both the nominating committee for the Gude Award and the ASPP Executive Committee.

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Providence, Rhode Island

ASPPNEWS

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Looking Back and Looking Forward!

This has been an exciting year to be president of ASPP. In addition to being involved in normal Society business, it was great fun to help plan and organize the special events for the 75th anniversary meeting. I was also able to help recruit a new executive director (John Lisack, Jr.), contribute to the decision that led to *not* starting a plant genomics journal, and recruit a new chair for the Education Foundation (Bob Goldberg). The year ended with the "excitement" (opportunities and problems!) of dealing with NIH's proposed electronic initiative, PubMed Central (previously referred to as E-biomed and E-biosci), which would create a free public database for all life sciences literature. If PubMed Central, or a relative facsimile, comes into existence, it will have a major effect on ASPP's publications and income. But whether or not PubMed Central becomes a reality, how ASPP adapts to the evolution of broad-based electronic publications will have a profound effect on the future of the Society.

In previous articles, I have tried to inform the membership about the activities of ASPP and the leadership role that the Society plays in advancing research and education in plant biology. If we are to continue to be the organization that leads in plant scientific research, it is essential that we cast a broad net to attract young scientists that work in the broad field of plant biology and not just as plant physiologists. In this regard, the Membership Committee and the Executive Committee have worked creatively to increase the Society's membership. We instituted a number of new membership initiatives (free access to the electronic version of the journals for ASPP members, a number of special one-year complimentary memberships, increased involvement in international membership activities, and so on). We believe it is essential to educate graduate students and postdoctorals about the mission of ASPP, and we want them to have greater involvement in the Society. People who join ASPP as graduate students tend to remain long-term members.

As a case in point, I attended my first ASPP meeting in 1972 in Calgary, Alberta, as a second-year graduate student. The meeting was held jointly with the Canadian Society of Plant Physiologists, and it was memorable for several reasons. First, I didn't know a soul, except for my Ph.D. adviser, Eric Davies, and the other graduate student in our lab, Joe Waldrum. I was intimidated when I got to Calgary because I didn't know anyone, and I was going to present my first talk at a scientific meeting as well! Things got off to a great start, though, at the opening reception. I accompanied Eric to the bar, and he ordered a scotch on the rocks. When he asked what he owed, the bartender replied, "It's an open bar sponsored by the CSPP." Eric handed him back the drink and said, "In that case make it a double." (I think that was the last time there was an open bar at one of our meetings!) By the end of the evening, we had met a great many people. When we left Calgary, all of us had become well acquainted with several up-and-coming young scientists, including Derek Bewley and Tony Trewavas.

At this year's annual meeting in Baltimore, I sat next to a young woman during the luncheon of the Committee on the Status of Women in Plant Physiology. She told me that this was the second ASPP meeting she had attended, having been at the meeting in Madison last year. She explained that although she enjoyed the scientific program in Madison, this year's meeting was much more fun, because she knew some people and recognized a number of familiar faces. I assured her that it gets better every year!

Regular attendance at the ASPP annual meeting engenders a strong sense of belonging to a society of plant biologists. You do not necessarily get that sense at many other meetings. I attended the XVI International Botanical Congress in St. Louis the week after the ASPP meeting. Although it offered a large and varied program, there were several thousand people in attendance, and it was easy to feel overwhelmed and disconnected.

One of the great things about the ASPP meeting, besides the fact that it brings together a group of scientists who share a common interest in understanding how plants grow and develop, is that it is large, but not too large. The meeting provides a wonderful opportunity to meet colleagues and discuss experimental results and to build relationships that last for many years. Many ASPP members attend every annual meeting. This creates a strong sense of family, as surely demonstrated at the 75th Anniversary Banquet in Baltimore, which was attended by more than 400 people. Included in the crowd were 52 former officers (including 25 of the 36 living presidents!), research award winners, editors-in-chief, executive directors, business managers, and publications and other staff. The seniority award went to Aubrey Naylor, who was president in 1960! I hope the banquet at the 100th anniversary meeting will be even larger!

To ensure that ASPP continues to publish the leading journals in plant biology at affordable prices and to provide effective leadership for plant science issues at the national and international level, we must continue to recruit young plant scientists. They need to know that ASPP has played a prominent role in helping to secure large increases in plant science and genomics research funding during the past few years. They need to know that ASPP is routinely called upon to provide expert information and advice regarding the utility and safety of transgenic plants. In the future, the ASPP Education Foundation will have the opportunity to become a key source of unbiased, scientifically accurate information about plants and genetically altered crops. This activity is an important one, for which ASPP is uniquely suited.

I encourage you to become an advocate for ASPP. Encourage your colleagues, students, and postdoctorals to join ASPP. Participation in ASPP is in the interest of all plant scientists, whether physiologists, biochemists, cell biologists, molecular biologists, or any other type of specialist. We must work as a cohesive group if we are to effectively promote the important things that we do for plant science and society in general.

Brian Larkins
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New Officers, Editor

The ASPP 1999 election results for new officers, which will be effective October 1, 1999, are as follows:

President-Elect: Dan Cosgrove, Pennsylvania State University
Secretary: Dan Bush, USDA/ARS, University of Illinois
Executive Committee Member: Becky Boston, North Carolina State University

Natasha Raikhel, MSU–DOE Plant Research Laboratory, Michigan State University, has been selected to succeed Maarten Chrispeels as editor-in-chief of *Plant Physiology*. The transition will occur in May 2000.

Dan Cosgrove Elected to Lead ASPP in 2000–2001

Dan Bush Elected Secretary 1999–2000
Becky Boston Elected to Executive Committee 1999–2002

Results of the 1999 ASPP election of officers were announced in late July at Plant Biology '99. Dr. Daniel Cosgrove, professor in the Department of Biology at Pennsylvania State University, will assume the office of president-elect on October 1, 1999. He will lead the Society as president in 2000–2001 and will continue on as immediate past president in 2001–2002.

Dr. Cosgrove earned a bachelor's degree in botany at the University of Massachusetts in 1974. From 1974 to 1979, he was a graduate student at Stanford University, where he received a Ph.D. in Biological Sciences, followed by postdoctoral stints at the University of Washington and the Nuclear Research Center at Juelich, Germany. In 1983, he joined the Penn State faculty as assistant professor, advancing in rank to associate professor in 1987 and professor in 1991.

Dr. Cosgrove's research focuses on the mechanisms of plant cell growth. In the early 1980s, he pioneered the use of the pressure microprobe to evaluate hydraulic constraints on cell enlargement. This work led to theoretical and experimental analyses of wall stress relaxation as the key biophysical process controlling cell enlargement. Searching for proteins with wall-loosening functions, his group was the first to isolate expansin proteins and to show that they are responsible for the acid-growth behavior of cell walls. Expansin cloning led to the recognition that expansins make up a large multigene family and to the discovery of a second family of expansins that include some notorious grass pollen allergens. Current work in Cosgrove's lab focuses on the developmental, structural, and evolutionary aspects of the expansin gene superfamily, as well as biochemical and biophysical studies of additional mechanisms controlling cell wall enlargement.

At Penn State, Dr. Cosgrove has taught introductory plant physiology and a variety of more advanced courses on plant growth and development, membrane transport, and laboratory uses of computers. He has served on the editorial boards of *Plant Physiology, Planta, Plant Cell and Environment, Physiologia Plantarum,* and other professional journals and on the governing boards for the American Society for Photobiology and the American Society for Gravitational and Space Biology. He was director of the USDA panel on plant growth and development in 1995 and is currently serving on an NSF Cell Biology review panel. His awards include the NSF Presidential Young Investigator Award (1984–1989), a Guggenheim Fellowship (1989), the Fulbright Senior Professor Award (1990), ASPP's Charles Albert Shull Award for outstanding investigations in plant physiology (1991), and the Alexander von Humboldt Research Award (1996–1997). In 1993, he was elected a fellow of the American Association for the Advancement of Science.

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Daniel Bush will serve ASPP as secretary for the 1999-2000 term. Dr. Bush received his B.A. in biology in 1978 from Humboldt State University, Arcata, California, and his Ph.D. in 1984 from the University of California, Berkeley. He is an associate professor in the Department of Plant Biology at the University of Illinois, Urbana-Champaign, and chair of the Program in Physiological and Molecular Plant Biology at UIUC. His research and academic interests include determining how plants regulate resource allocation between tissues; describing the transport properties, structure, and control of sugar and amino acid transporters; and dissecting sucrose-mediated changes in gene expression.

He was a member of the editorial board of *Plant Physiology* from 1991 to 1992 and was named Midwest Area Early Career Research Scientist of the Year, USDA/ARS, in 1992. His service to ASPP includes positions as elected secretary-treasurer, vice chair, and chair of the Midwest Section from 1991 to 1995; elected Midwest Section representative to the ASPP Executive Committee from 1995 to 1998, Midwest Section representative to the ASPP Executive Committee from 1995 to 1998, and chair of the Program Committee in 1998–1999. He is currently completing the 1998–1999 term as ASPP secretary.

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Rebecca Boston, who will begin her term as elected member of the Executive Committee on October 1, is professor in the Departments of Botany and Genetics, North Carolina State University, Raleigh. Her research interests include protein packaging and ER stress responses in seeds, protein–pathogen interactions and structure–function relationships of maize ribosome-inactivating proteins, and production of value-added products in crop plants. She teaches plant molecular biology, cell biology, and professional development in biotechnology courses. Her Society activities include membership on the *Plant Physiology* editorial board in 1988–1989, the Executive Director Search Committee in 1998, the Dennis R. Hoagland Award Committee from 1994 to present, and the Committee on the Status of Women in Plant Physiology from 1998 to present.

Bob Goldberg to Chair ASPP Education Foundation

"I have always felt that one of the most important things we must do as scientists is to communicate the nature of our research and what we learn to the general public in terms that they can understand," states Bob Goldberg, newly appointed chair of the ASPP Education Foundation. "All of us who spend our lives looking into the problems of 'nature' have a responsibility to teach what we do to non-scientists so that they can understand what we do, how we do it, and why it is important for society in general."

At Plant Biology '99, the recent ASPP annual meeting in Baltimore, ASPP President Brian Larkins announced the appointment of Bob Goldberg to chair the Education Foundation board of directors. Dr. Goldberg is the founding editor and first editor-in-chief of THE PLANT CELL and has been an active participant in ASPP. He is a professor in the Department of Molecular, Cell and Developmental Biology at UCLA.

In taking on the chairmanship of the foundation, Goldberg states, "The ASPP Education Foundation offers a unique opportunity to educate the general public in an objective way about what plant scientists do, how important plants and agriculture are to the world in which we live, and about all of the exciting advances in crop improvement that have come about because of advances in plant genetic engineering."

Although Goldberg stretches the frontiers of science research and inspires students to pursue basic science research, he focuses much of his attention on teaching science to non-scientist students. "We, as scientists, are trying to push back the frontiers of knowledge so that we can have a positive impact on the future of humanity," says Goldberg. "I target non-science majors in my courses ("Genetic Engineering and Society" and "The Human Genome: Prospects for the Super Race?") because the students who take these courses will be using advances in genetic technology on a daily basis in the future and will be the decision makers of tomorrow."

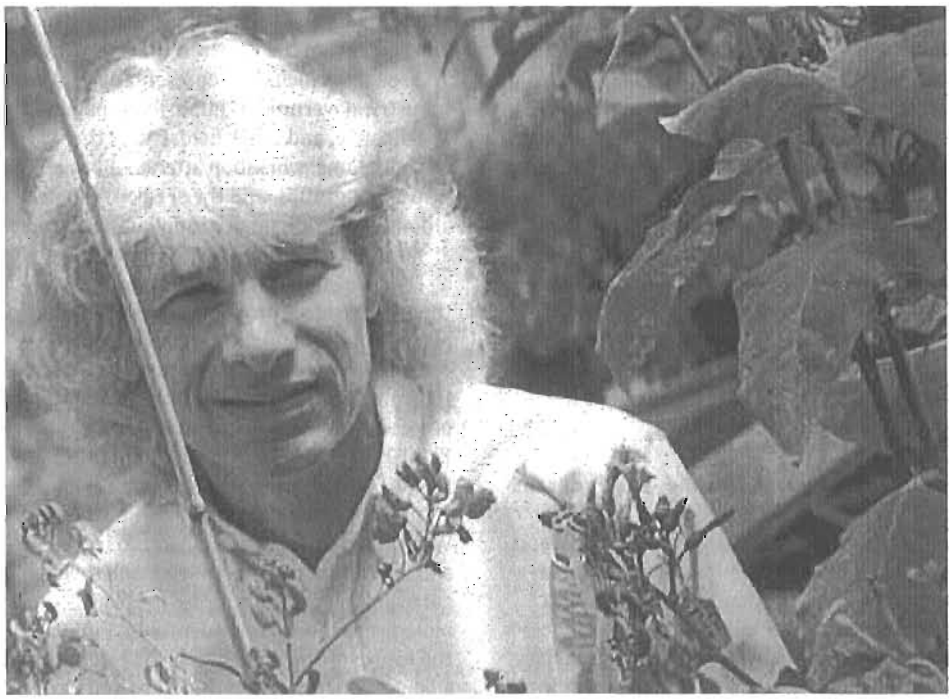
"In the lab, Bob Goldberg's research in genetic engineering may lead to new generations of super plants. But it is in the classroom where his influence perhaps is greatest, as he sows the seeds that will blossom into the newest crop of young scientists," stated Dan Gordon, freelance writer. "Dr. Goldberg is an honored professor of molecular, cell and developmental biology, a teacher par excellence and a man whose push-the-envelope research may change the face of agriculture well into the next century," wrote Gordon in an article in the Summer 1999 issue of *UCLA Magazine*. "The field of biology," says Goldberg, "is moving at warp speed, almost to the point of rendering last year's notes useless."

Goldberg's discoveries of genes that are active during plant reproduction and genetic regulatory processes and a novel method to control male fertility for hybrid breeding are helping ignite an agricultural revolution in which genetic engineering promises notably higher crop yields with major implications for the world's food supply attribution. Goldberg and scientists at Plant Genetic Systems in Gent, Belgium, made a plant reproduction breakthrough and designed a breeding process for hybrid canola seeds that has produced a 15 percent increased yield. This process is being applied to other crops with similar results.

> "The field of biology is moving at warp speed, almost to the point of rendering last year's notes useless."
>
> —Bob Goldberg

In 1997, Goldberg cofounded Ceres Inc., a gene-discovery company providing commercially important plant genes and traits to the seed, food, fiber, agrochemical, and chemical industries. In April 1999, Ceres Inc. and the University of California announced a partnership to create the Seed Institute, a consortium of university laboratories dedicated to identifying the genes necessary to create a seed. "Think about it," Goldberg says. "We'll be able to make more seeds, bigger seeds, better seeds. And if we could get these engineered crops to reproduce themselves, you could buy the super seeds and the crop would perpetuate itself."

Dr. Goldberg received his B.S. degree in botany from Ohio University, his M.S. in genetics from the University of Arizona, and his Ph.D. in genetics from the University of Arizona. He has received four Distinguished Teaching Awards, including the UCLA Gold Shield Award for Excellence in Teaching and Research (1998). He was recently given the National Order for Scientific Merit from the president of Brazil and was named the UCLA Faculty Research Lecturer for 1999, the highest research award given by UCLA to a faculty member. In 1993, he received ASPP's Distinguished Service award for his contributions in founding THE PLANT CELL.



Bob Goldberg. Photo by Seth Joel.

Plant Biology '99—Celebrating ASPP's 75th Anniversary!

More than 1,600 attendees converged on Baltimore, Maryland, for Plant Biology '99 and the celebration of the 75th anniversary of the American Society of Plant Physiologists. Many special events were held to commemorate the occasion. Despite the hot, humid weather, a near-record number of attendees participated in numerous scientific and social events. Here are a few of the highlights!

Special President's Symposium: Global Issues in Plant Biology

One of the major highlights of Plant Biology '99 was the President's Symposium on Wednesday, July 28. This special 75th anniversary symposium was conceived of several years ago by ASPP President Brian Larkins. It focused on global issues that plant scientists face as we enter the 21st century. Featured were three prominent scientists whose various perspectives helped to frame the state of the world and the challenges that we face, as well as the options and opportunities afforded us.

Dr. Lester Brown, president of Worldwatch Institute, monitors the state of agriculture and the environment worldwide. In addition to its annual publications *State of the World* and *Vital Signs*, Worldwatch publishes a number of publications dealing with health and safety. Several years ago, Dr. Brown authored a provocative book entitled *Who Will Feed China?* that very clearly describes the challenges facing world agriculture in the coming decade.

Dr. Peter Raven is director of the Missouri Botanical Garden, and his scientific interests center on population biology, evolution, and ecology.

Dr. Robert Fraley is president of Ceregen, a division of Monsanto and a leader in plant biotechnology applications in agriculture. Monsanto has played a leading role in the development of the first transgenic crops and is aggressively exploring the application of genetic engineering to agricultural production.

The symposium was well attended and thought provoking. (For more about the presentations, see page 10.)

Online Abstracts, Schedule, and Program

The electronic submission of abstracts once again made it possible for the abstracts and program schedule to be available in a fully searchable format and printable as a PDF through ASPP's Web page several months before the meeting. Many attendees used the new feature to create and customize a personal meeting agenda. And a more complete abstract supplement and printed program were delivered to those who attended the meeting.

Dynamic Meeting Format—Afternoon and Evening Poster Sessions

The format for Plant Biology '99 was modeled after the more dynamic meeting schedule that debuted last year. The Program Committee selected 23 minisymposia from among the submitted abstracts, suggestions from the membership, and "hot" topics. In addition, the four lunchtime and two evening poster sessions featured more than 1,000 posters, which were on display for four full days. Key highlights of our program were the five major symposia: Auxin Biology, Cell Cycle Regulation, Functional Plant Genomics, Biochemical Genetics, and the President's Symposium.

Variety of Workshops

Plant Biology '99 featured workshops in several strategic areas. The Committee on Public Affairs sponsored a workshop entitled "Perspectives of Science Leaders." This session was very well attended and featured the distinguished Dr. Rita Colwell, National Science Foundation director.

A special Careers Workshop targeted to postdoctoral associates and graduate students was organized by the Committee on the Status of Women in Plant Physiology. The workshop featured brief introductions by speakers with a Ph.D. in some field of plant biology who chose career paths divergent from the research university track. The speakers included representatives from industry, government, publishing, patent law, finance, and other fields. After the introductions, workshop attendees broke into small groups, and the speakers rotated among tables for small group question-and-answer sessions. (See story on page 14.)

The Education Workshop, sponsored by the ASPP Education Committee, examined present uses of and future trends in the Internet in undergraduate education. A live Internet connection was set up for the presentations, and the use and utility of the Plant-Ed newsgroup were demonstrated as a tool for obtaining assistance from other plant educators. A discussion on how to use Web resources for teaching and in lecture and laboratory courses ensued, and several gateways to useful resources for plant biology education were identified. Finally, the future of course delivery was explored via a demonstration of a commercial software package that provides a user-friendly environment offering content delivery, announcements, online quizzes, automatic scoring and cumulative grading, threaded discussion groups, chat rooms, drop boxes for written assignments, and internal capability for student e-mail accounts and Web pages.

Featured Luncheons and Speakers

The conference also featured two luncheon programs. The Committee on Minority Affairs sponsored a luncheon featuring Dr. Terry Medley, director of regulatory affairs at DuPont. Dr. Medley was formerly the chief administrator of the USDA/APHIS (Animal and Plant Health Inspection Service). He was the highest-ranking African American in the USDA and headed the 8,000-person APHIS. He has a doctorate in law and a solid understanding of biotechnology and was primarily responsible for developing the regulatory framework at USDA.

The Committee on the Status of Women in Plant Physiology held a luncheon featuring Eileen Dowse of Human Dynamics, Inc., Research Triangle Park, North Carolina. Ms. Dowse spoke on "Communicating to Overcome Resistance and Increase Success." The ability to communicate effectively is paramount in any relationship. Outstanding leaders succeed by developing effective communication styles. They are committed to improving relationships by openly and honestly discussing and resolving issues.

New Time and Spotlight for Awards Symposium and Ceremony

The ASPP Awards Symposium and Ceremony was highlighted as the opening event on Saturday afternoon. President Brian Larkins announced the 1999 award winners, and Dr. Hans Kende delivered the ASPP Hales Prize address, "A Wondrous Journey Through Hormoneland." In recent years, this event had been held on Sunday evening. The Program Committee would appreciate any feedback on the change in the scheduling of this important function.

Business Meeting

The ASPP annual business meeting was held Tuesday, July 27. President Brian Larkins and Board of Trustees Chair Doug Randall gave a brief report on the Society's activities, financial health, and budget for the year 2000. Maarten Chrispeels, editor-in-chief of *Plant Physiology*, and Crispin Taylor, managing editor of THE PLANT CELL, gave updates on their respective journals.

Most of the meeting was actually spent discussing E-biomed (later termed E-biosci and now called PubMed Central), the NIH proposal to provide rapid, free, and complete access to the primary research literature in the biological sciences. Shortly before the meeting, Society staff had electronically broadcast to all ASPP members a document they had prepared to summarize the issues and concerns surrounding PubMed Central, especially the profound financial impact the initiative might have on the Society, whose operations and activities depend largely on the surplus generated by *Plant Physiology* and THE PLANT CELL. This document and other information regarding PubMed Central are now available on the ASPP Web site at http://aspp.org/ebiosci/ebiosci.htm.

Members attending the business meeting voiced a range of opinions about whether the Society should participate in PubMed Central. (The Executive Committee authorized staff at its July 23rd meeting to commence discussions with NIH to explore the possibility of ASPP signing on.) A lively question-and-answer session ensued with staff and President Brian Larkins, who led the discussion. Staff will keep members apprised of developments in PubMed Central via the ASPP Web site, where occasional updates as well as responses from readers to the various postings will appear.

Baltimore Orioles Game

More than 200 Plant Biology '99 attendees ended the conference by unwinding Wednesday evening at a major league baseball game between the Baltimore Orioles and the Texas Rangers. Orioles Park at Camden Yards is a state-of-the-art ballpark located just a few minutes from the Baltimore Inner Harbor hotels and the Convention Center.

ASPP Photo Collage

In celebration of ASPP's 75th anniversary, the photo collage collection created by Ray Bressan of Purdue University was on display during the meeting for all members to enjoy. Thanks are extended to Ray for creating this wall of memories and transporting it to and from Baltimore.

Job Fair

Throughout the meeting, attendees visited the on-site job information exhibits sponsored by Pioneer Hi-Bred International and Novartis. Thanks also to Pioneer for generously sponsoring the popular portfolio cases for all meeting attendees.

Exhibits and Product Presentations

A record number of exhibitors presented their products and services to attendees in the Exhibit Hall for three days. In addition, two vendors, Promega Corporation and InforMax, Inc., conducted special product presentations and demonstrations during the evening poster sessions on Sunday and Monday. This format was well received and will be expanded at future meetings.

Special Functions

Other functions at the meeting included the Small Colleges/Primarily Undergraduate Institutions Breakfast, which enjoyed a successful turnout and lively discussion on Sunday morning; the Plant Runners Stampede 5k and 10k Fun Run on Tuesday morning, which took place around the Inner Harbor; and the Chesapeake Bay Crab and Chicken Feast, with live dance music and plenty of good food and libations, held Tuesday evening at the Baltimore Museum of Industry on the Baltimore Harbor.

Plant Biology 2000

The 75th anniversary landmark meeting is now history, and the Program Committee is already immersed in planning Plant Biology 2000, which will be held July 15–19, 2000, in San Diego, California, at the Town & Country Convention Center and Resort. This meeting and the annual meeting of the Phycological Society of America are scheduled to run concurrently in San Diego. Sessions and activities of mutual interest will be planned. We look forward to an exciting week of science and other diversions in sunny California! Mark your calendars and watch the *ASPP NEWS* and the Society's Web page for further details!

Dan Bush, ASPP Secretary and
Program Committee Chair
Susan Chambers, ASPP Program
Committee Staff Liaison

Aubrey Naylor, past president.

President-elect Debby Delmer with past presidents Harry Beevers (left) and Jim Siedow.

Jody (Carlson) Moore, former ASPP publications director; Mary Helen Goldsmith, past president; Bernie Phinney, past president; and Ann Hirsch, CSWIPP chair.

Award Honorees at Plant Biology '99

Following are the citations for the awards that were presented July 24, 1999, at the Annual Awards Ceremony at Plant Biology '99, the annual meeting of the American Society of Plant Physiologists, held this year in Baltimore, Maryland.

Corresponding Membership Award
Anthony J. Trewavas

This award, initially given in 1932, provides life membership and Society publications to distinguished plant physiologists from outside the United States. The honor is conferred by election on the annual ballot.

Professor Anthony J. Trewavas's scientific contributions are characterized above all by the breadth of his interests and by the creativity and scholarship he brings to a wide array of topics.

His scholarly and provocative papers on how plant growth substances work stimulated widespread debate and popularized the concept that variable sensitivity to plant hormones is a key regulator in plant development. He developed this theme further in studies identifying developmental windows in which specific cells are sensitive to growth regulators.

He was an early advocate of population and threshold-based approaches to the study of developmental processes, dormancy, and growth.

He pioneered the use of aequorin and other intracellular probes as in vivo reporters, allowing detailed real-time studies of fluctuations in cytoplasmic calcium concentrations in response to diverse signals.

Calcium-dependent protein kinase cascades are now recognized as fundamental cellular regulators of a wide array of processes, and Dr. Trewavas has made seminal contributions to our knowledge of plant protein kinases.

In addition to innovative experimental work, he has also produced insightful reviews and uniquely creative and perceptive hypotheses that have guided research in diverse fields of plant physiology.

Martin Gibbs Medal Award
Steven D. Tanksley

This award, initiated in 1993, honors Martin Gibbs for his outstanding service to the Society as editor-in-chief of *Plant Physiology* from 1963 to 1993. This award is given biennially to an individual who has pioneered advances that have served to establish new directions of investigation in the plant sciences.

The 1999 Martin Gibbs Medal is awarded to Steven D. Tanksley. Through his pioneering work in the area of molecular plant breeding, Dr. Tanksley made important advances in the area of plant genomics well before the term gained its current popularity. Dr. Tanksley and his colleagues developed the first molecular linkage map of a plant genome, using this information to perform the first map-based cloning of a disease resistance gene—the *Pto* gene for resistance to bacterial speck in tomato. Tanksley also pioneered the development of comparative maps in crop plants, providing a bridge for integrating information across genera and investigating the common evolutionary heritage of higher plants. He has contributed significantly to the development of linkage maps for rice, wheat, oat, potato, and pepper.

Again using tomato as their first model, Dr. Tanksley and his colleagues have also demonstrated that wild relatives of crop plants can contribute genes that enhance performance (e.g., yield or fruit size), even when the wild species lack the desirable traits. This surprising and counterintuitive result has been confirmed for many *Lycopersicon* species and traits, and similar results have been obtained in other crops.

Through his pioneering scientific discoveries, Dr. Tanksley has trained some of the leading investigators in plant genomics, and he has markedly influenced the course of modern plant biology. In recognition of these many accomplishments, Dr. Tanksley has won other awards, including election to the National Academy of Sciences in 1995.

Charles Albert Shull Award
Sabeeha Merchant

The Charles Albert Shull Award was initiated in 1971 by the Society to honor Dr. Charles A. Shull, who was primarily responsible for the founding and early growth of the Society. The award is made biennially by the Society for outstanding investigations in the field of plant physiology by a scientist residing in North America who is under 40 years of age or within 10 years of having earned a doctoral degree.

Sabeeha Merchant is awarded the 1999 Charles Albert Shull Award in recognition of her research on the role of metals in regulating the biosynthesis and assembly of metalloproteins in photosynthetic eukaryotes. Her innovative investigations established the critical role of trace metals as regulatory agents in the biogenesis and accumulation of electron transport components required for a functional photosynthetic apparatus and provided new insights into the molecular mechanisms underlying these fundamental processes.

Starting as a postdoctoral fellow, Dr. Merchant charted an independent course as she recognized that in algae, the copper-regulated reciprocal expression of plastocyanin and cytochrome c_6 offered a unique and powerful system for investigating how trace metals control gene expression. Using *Chlamydomonas reinhardtii* as a model system, she demonstrated that the differential accumulation of plastocyanin versus cytochrome c_6 depends on two distinct mechanisms: Plastocyanin accumulation is regulated by proteolysis, whereas cytochrome c_6 levels depend on transcriptional activation. This work led to the definition of a copper sensor with an extraordinary and specific sensitivity and a number of tightly coordinated changes in biochemical activities in response to copper availability in the medium. Specifically, Dr. Merchant found that adaptation to copper deficiency involves the de novo accumulation of cytochrome c_6 induction of heme synthesis, activation of a copper transport system, and rapid degradation of plastocyanin. Dr. Merchant's work has revealed two major processes induced by low levels of copper: the heme biosynthetic pathway and an assimilatory copper transport system. Dr. Merchant's dedication to research is matched by her dedication to the research community. She is an exciting lecturer, a scholarly reviewer, an effective supporter of plant research, and a valued mentor.

In summary, Sabeeha Merchant has pioneered the identification and elucidation of critical regulatory processes in gene expression in photosynthetic eukaryotes. She has brought to light a complex system with interrelated components and precisely coordinated mechanisms that operate at the levels of transcription, RNA processing, and protein degradation to ensure the function of a key biochemical pathway that is dependent on metalloproteins.

Charles Reid Barnes Life
Membership Award
Harry Beevers

The Barnes Award is the oldest ASPP award. It was established in 1925 in honor of Dr. Charles Reid Barnes, the first professor of plant physiology at the University of Chicago. It is an annual award of life membership in the Society given to recognize the recipient for meritorious work in plant physiology.

Harry Beevers is one of the notable plant physiologists of the 20th century. He has richly and profoundly contributed to the advances in our understanding of plant metabolism and plant cell biology with more than 200 research publications and two texts.

With his coworkers, Harry Beevers elucidated the salient features of a number of key pathways of plant metabolism. Among these are the first experimental demonstration of CO_2 fixation in crassulacean acid metabolism; cyanide resistance of *Arum* respiration; contributions elucidating respiratory pathways and their regulation, including the fate of specific glucose carbons in the glycolytic and pentose phosphate pathways; and elucidation of the glyoxylate cycle in fatty seeds.

In 1967, his laboratory discovered the glyoxysome and showed that key enzymes for the conversion of fats to carbohydrates in fatty seed tissues via β-oxidation and the glyoxylate cycle were localized in this organelle. This discovery led others to discover leaf peroxisomes and stimulated further understanding of the role of peroxisomes in animals. Harry Beevers has also been active in ASPP. Among his many services to the Society and the profession, he was ASPP president in 1961–1962.

Harry Beevers has been an outstanding teacher, mentor, colleague, and, above all, friend to many around the world who have been touched by his warmth, humor, and honest interest in them as both individuals and scientists.

Special Citation
Pat Richter-Cherry

The Special Citation Award recognizes outstanding service to the organization.

Pat Richter-Cherry is awarded a Special Citation from the American Society of Plant Physiologists for outstanding service to the organization. Acting largely on her own initiative while business manager, she was responsible for arranging the donation of the Gude Estate to the Society. This enduring gift made it possible for the Society to obtain excellent office facilities in a beautiful location. This headquarters facility has enabled ASPP to host a spectrum of events, including countless committee meetings, the annual crab feast of the Washington Section, and conferences of scientific advisers to the president of the United States. The Society gratefully acknowledges Pat Richter-Cherry's unselfish efforts and warmly recognizes her extraordinary contribution to the advancement of plant science. Henceforth, the conference room at ASPP headquarters will be known as the Pat Richter-Cherry Conference Room and will feature a plaque designating it as such.

LET US HEAR FROM YOU!

ASPP NEWS welcomes comments on topics covered in the newsletter and on other points of interest to the profession. Letters are published as space permits and may be edited for clarity and length. Submissions may not necessarily be published; receipt is not acknowledged. Mail letters to Editor, ASPP NEWS, 15501 Monona Drive, Rockville, MD 20855-2768; e-mail nancyw@aspp.org.

Award recipients honored at the ASPP 75th anniversary meeting included (from left) Pat Richter-Cherry, who received a Special Citation Award; Harry Beevers, who received the Charles Reid Barnes Life Membership Award; and Sabeeha Merchant, who received the Charles Albert Shull Award. ASPP President Brian Larkins (third from left) presented the awards.

President's Symposium: Global Issues in Plant Biology

The President's Symposium of Plant Biology '99 featured perspectives on the diversity of life, the need to meet growing demands for food, and the prospects for plant scientists to help meet those demands for food while conserving environmental resources.

Dr. Peter Raven, director of the Missouri Botanical Garden, gave a history of the development of life forms on earth. He noted that it is believed that life began on earth 3.8 billion years ago. Some 430 million years ago, life emerged on land. However, some 65 million years ago, two of every three living organisms disappeared, most likely as a result of the effects of an asteroid hit near the Yucatan. Raven pointed out that, curiously, there appears to be a greater enthusiasm among the public to find life on Mars than to learn more about diverse life forms on earth.

There are now about 250,000 described species of plants. There may be as many as 300,000 species, as Raven noted that we probably have another 50,000 species to discover. A greater knowledge of plants on earth offers substantial benefits to the public. Plants provide food, oxygen, medicines, clothing, shelter, and aesthetic satisfaction. Raven warned that more must be done to prevent the loss of biodiversity in the next century and to meet the nutritional needs of a growing population.

Dr. Lester Brown, president of Worldwatch Institute, said that the population in the developed world is not expected to grow over the next few decades. However, in the developing world, the number of people will greatly increase, possibly by as many as 3 billion. Brown noted, however, that human disease is checking population growth in some developing countries such as Zimbabwe.

As incomes rise in developing nations, consumption of animal protein can be expected to increase, putting further demands on farmers to increase crop yields for animal feed. However, there will likely be less farmland available as farms are encroached by more dwellings and industrial development.

Brown said that by the year 2037, it is expected that India will surpass China in population. He questioned whether there will be enough fresh water for agriculture in large developing countries such as China and India. With its $40 billion surplus in trade with the United States, Brown noted that China could well afford to purchase grain from American farmers.

Dr. Robert Fraley, vice president for research at Monsanto/Ceregen, cited some global trends that are similar to those identified by Brown: a growth in global population, changing and expanding diets, an aging global population, and a need for sustainable development.

"I have no doubt that when we look back, we will be impressed with what biotechnology will bring" in meeting increased demands for food resulting from these global trends, Fraley said. He added that we are just at the early stage of the biotechnology revolution, which is bringing increased yields and higher-quality crops. Some imported petroleum-based products used for industrial chemicals and fuels may be replaced in part by bioenergy sources as green plants are converted into biochemical factories.

> "I have no doubt that when we look back, we will be impressed with what biotechnology will bring [in meeting increased demands for food]."
>
> —Robert Fraley

Fraley said that 850,000 fewer gallons of insecticide were used in the United States from 1996 to 1998 because many farmers converted to the use of modified cotton plants developed by Monsanto. He noted that people in China have called this "miracle cotton."

He also added that insect-protected maize has gone from an idea to reality. A sometimes overlooked benefit of this development is the reduced risk of mycotoxin contamination in milk. Foods with healthier benefits for humans are expected as scientists develop high-stearate canola and soy oil for margarine and spreads. Future advances in plant research will lead to human health benefits, such as cholesterol reduction, lower blood pressure, prevention of some cases of cancer, and reduction of deficiencies in vitamin A.

Advanced genomics will further accelerate the discovery of new crops and products, Fraley said. Combining advanced breeding techniques with genomics will accelerate improvements in crops and crop yields. He noted that genomics research increases the resource pool for plant development one-million-fold. Some 14 percent of the yield gain in cotton results from new genes added in the development of modified cotton.

In addressing resistance to modified foods in Europe, Fraley noted that the European Union does not have a science-based regulatory system as is found in the United States He said industry must do a better job of listening and responding to the issues and concerns raised.

Coordinated by ASPP President Brian Larkins, the President's Symposium emphasized public issues affecting plant biology. It marked a departure from past formats in which the newest developments in an area of science were addressed. As always, a large number of ASPP members attended the symposium.

Members can now update mail/e-mail/phone with a new form on the ASPP Web page. Visit our Web site at http://aspp.org/member_services/update.htm.

ASPP's 75th Anniversary Banquet

On Sunday, July 25, 1999, more than 400 ASPP members, current and former officers, editors, award winners, and staff members convened at the Baltimore Hilton to attend a special banquet honoring ASPP's first 75 years. ASPP President Brian Larkins came up with the idea for a special banquet early in his presidency, and invitations were sent to all former officers and award winners, as well as to key past staff members. More than 80 invitations were accepted, and more than 300 additional banquet tickets were purchased by Plant Biology '99 attendees.

The evening began with a cocktail hour to give guests time to mingle with old friends and reminisce. Former ASPP President Jim Siedow (1994–1995) was the master of ceremonies for the event. President Brian Larkins greeted and welcomed all the special invitees. After dinner, Dr. Siedow introduced the program speakers, and former president Harry Beevers (1961–1962) offered the opening remarks. Three editors-in-chief spoke: Martin Gibbs, *Plant Physiology,* 1963–1992; Bob Goldberg, founding editor, THE PLANT CELL, 1988–1993; and Maarten Chrispeels, *Plant Physiology,* 1992–present. The audience also heard from past presidents Winslow Briggs (1975–1976), Joe Key (1976–1977), and Mary Helen Goldsmith (1991–1992). Remarks by Debby Delmer, president-elect (1998–1999), rounded out the program.

After many interesting stories from the past and some proposals for the future, Dr. Delmer and guests toasted the future with special 75th anniversary wine glasses. The event closed with a resounding rendition of "Lloyd George" led by past presidents Harry Beevers and Russell Jones.

More photos from the event and the text of some of the speeches can be found by clicking on http://aspp.org/meetings/75thAnniversaryBanquet.htm. A professionally taped video of the program portion of the event is available for $10 from ASPP headquarters. Please contact Donna Gordon at dgordon@aspp.org if you are interested.

Martin Gibbs, former editor-in-chief, *Plant Physiology.*

Debby Delmer, ASPP president-elect.

Bob Goldberg, founding editor and former editor-in-chief of THE PLANT CELL.

Maarten Chrispeels, editor-in-chief, *Plant Physiology.*

Past presidents Harry Beevers (left) and Russell Jones.

Brian Larkins, president and former editor-in-chief of THE PLANT CELL.

Executive Committee Meets in Baltimore

The ASPP Executive Committee met twice during Plant Biology '99 in Baltimore—on July 23rd and 27th—and addressed a full agenda. President Brian Larkins opened the first meeting by announcing the election results, the appointment of an International Committee, and the high level of activity of all committees. The highlights of the meetings follow.

- Activity reports were received from all committees, boards, and staff.
- The annual audit was "clean" and showed the Society to be in a strong financial position.
- Investments showed a 13.4 percent return on conservative investments.
- An added service, discounts on selected related journals, was approved for our members.
- The 2000 budget was approved at a funding level of $5,298,933.
- The following committee appointments were approved. Publications Committee: Becky Chasan as chair and Doug Cook as a five-year member; Constitution and Bylaws Committee: Subhash Minocha as chair and Mark Jacobs as a three-year member; Board of Trustees: Don Ort as chair and Ken Keegstra as a three-year member.
- Funding and a Web link were approved for an educational program prepared by Peggy G. Lemaux geared to assist colleagues in communicating the importance of our science to decision makers and the general public.
- The Constitution and Bylaws Committee was asked to outline the procedure that would be required to change the Society's name.
- Staff were directed to continue a dialogue with the NIH leadership regarding the E-biomed (now called PubMed Central) proposal and concurrently solicit input from the ASPP membership.
- Staff were authorized to negotiate with journal aggregators, so long as Society revenues are not jeopardized.
- The International Committee was directed to develop criteria whereby up to 20 complimentary or subsidized online subscriptions might be given to under-funded institutions.
- $8,000 was approved for the year 2000 from "good works" funding for an ASPP exhibition at the National Science Teachers Association Convention in Orlando, Florida, April 6–9, 2000.
- One free color figure was approved for invited articles in *Plant Physiology*, pending the editor's approval.
- The Program Committee was asked to explore the possibility of conducting the ASPP meeting in conjunction with the Arabidopsis meeting.
- The appointment of Bob Goldberg as chair of the ASPP Education Foundation was announced.
- $5,000 from the year 2000 "good works" fund was allocated for the NAS/ASPP Symposium. The ASPP Southern Section expressed an interest in hosting the symposium.
- The appointment of an additional member to each award committee was approved, bringing the total on each committee to five.
- Progress on the textbook *Biochemistry and Molecular Biology of Plants* was reviewed. Publication is expected in mid-2000.

One of the special moments during the meeting was the recognition of members completing their term on the Executive Committee. Ken Keegstra, Natasha Raikhel, Doug Randall, and Marc Cohn (not present) were presented with plaques and acknowledged for their dedication to the Society.

John Lisack, Jr.
Executive Director

Magic Monday: Members Flock to CSWIPP-Sponsored Events in Baltimore

Greetings from the Committee on the Status of Women in Plant Physiology (CSWIPP)! To the right, you will see our new logo, which was drawn by Margaret Kowalczyk of UCLA. For those of you who are botanically inclined, the logo represents an apical meristem with spiral phyllotaxis. We will use it to highlight any CSWIPP-sponsored events as well as the CSWIPP column in the *ASPP NEWS*. Maybe someday, there will even be T-shirts!

CSWIPP activities filled a busy day at the recent ASPP annual meeting in Baltimore. After an early-morning committee meeting, nearly all the tables were filled for the luncheon talk on Monday, July 26. Committee member Becky Boston introduced our guest, Eileen Dowse of Human Dynamics, Inc., Research Triangle Park, North Carolina, who spoke about "Communicating to Overcome Resistance and Increase Success." Ms. Dowse gave an entertaining and exceptionally informative talk interspersed with magic tricks, flying bricks, and numerous tips on how to communicate with people at home and in the workplace. Not many of us will forget how important body language is in communication! Pioneer Hybrid, DuPont, and Monsanto all provided generous contributions toward the luncheon, and the committee is grateful for their support.

The third ASPP careers workshop, entitled "Where Are the Job$?" was also held on Monday, but in the evening. After pizza and drinks, short talks were presented by the speakers, all of whom obtained degrees in plant biology or related fields but have made their careers outside universities and small colleges. The speakers—Becky Chasan (American Institute of Biological Sciences; editor, *BioScience*), Ellen Johnson (Wilmington Friends School), Dale Hunt (Knobbe, Martens, Olson and Bear, LLP), Stefan Kirchanski (Graham and James LLP), Shawn Anderson (DuPont), Virginia Goldman (Gillette Research Institute), and Steve McCurry (Cargill)—described their jobs, how they came to be doing them, and the kinds of advantages afforded by their degrees to the sold-out and enthusiastic crowd of more than 120 people. Rob McClung and Beth Hood, CSWIPP members, chaired the workshop, and they, Ann Hirsch, and Becky Boston helped move the speakers from table to table for the roundtable discussions that followed the formal presentations. Initial feedback on the workshop from both panelists and participants was positive, and it is the committee's intention to sponsor at least one similar event when ASPP meets next summer in San Diego for Plant Biology 2000.

ASPP-Sponsored Teaching and Research Workshop in Greece

A teaching and research workshop titled "Plant Sciences: Perspectives Beyond 2000" was held at the Mediterranean Agronomic Institute of Chania (MAICh) on the island of Crete, Greece, from July 5 to July 16, 1999. The worskhop was co-organized by Dr. Kriton K. Hatzios (ASPP) and Dr. Andreas Doulis (MAICh) and was co-sponsored by ASPP and MAICh. Twenty-two participants (graduate students and faculty) from 12 Mediterranean countries attended the course. Countries represented in the workshop and the number of student participants from each country were as follows: Albania (3), Algeria (1), Bulgaria (1), Egypt (1), Greece (7), Hungary (1), Lebanon (3), Palestine (1), Slovenia (1), Tunisia (1), Turkey (1), and Yugoslavia (1).

Fourteen professors (eight from the United States and six from Greece) participated as instructors in the workshop. The participating American professors were Carole Cramer, Virginia Tech; Richard Cyr, Penn State University; Elizabeth Grabau, Virginia Tech; Kriton Hatzios, Virginia Tech; Eva Pell, Penn State University; Ilya Raskin, Rutgers University; Athanasios Theologis, USDA Plant Gene Expression Center; and Fabricio Medina-Bolivar, Virginia Tech. The participating Greek faculty were Phillipos Aravanopoulos, Aristotelian University of Thessaloniki; Polydeukis Chatzopoulos, Agricultural University of Athens; Andreas Doulis, MAICh; Angelos Kanellis, Aristotelian University; Nikos Panopoulos, University of Crete, Heraklion; and Athanasios Tsaftaris, Aristotelian University.

Lectures focused on the impact of emerging technologies—for example, biotechnology, bioinformatics, and functional genomics—on plant biology and agriculture, and topics ranged from weed control to the use of plants for the bioproduction of pharmaceuticals and edible vaccines. Ten laboratory sessions provided the students with hands-on experience on the following topics: analysis of gas exchange during photosynthesis of plants, light microscopy, isolation of natural products from plant tissue cultures, screening for ethylene mutants in Arabidopsis, plant transformation using *Agrobacterium tumefaciens* and *A. rhizogenes,* and the use of recombinant DNA techniques (genomic DNA isolation, DNA amplification via PCR, restriction digestion of plasmid DNA, DNA analysis by agarose gel electrophoresis, DNA cloning, DNA ligation, transformation of bacterial cells by electroporation and plating of transformants, plasmid DNA minipreps, and analysis of recombinant plasmids by gel electrophoresis).

Although each workday's schedule was full and rather intense, evening strolls at the old port of Chania and a field trip to Heraklion, which included visits to the Archaeological Museum, the Minoan Palace of Knossos, and the Institute of Molecular Biology of the University of Crete, provided the participants with some time for relaxation and social interactions. By the honest admission of all participants, the "Plant Sciences" workshop at Chania was immensely successful and a memorable and productive experience for all student and faculty participants. Thanks to ASPP and MAICh for providing 36 scientists from 12 different countries with the opportunity to discuss current and future trends in plant science research and for sowing the seeds for future interactions and collaborations.

Kriton Hatzios
Virginia Polytechnic Institute &
State University
Blacksburg

Group photo of student and faculty participants at the ASPP–MAICh Workshop in Chania, Greece.

Council of Scientific Society Presidents Meets

The Council of Scientific Society Presidents (CSSP) met in Washington, DC, May 1–4, 1999. CSSP is an organization comprising the presidents, presidents-elect, and immediate past presidents of more than 60 scientific societies and federations whose combined membership numbers well over a million scientists and science educators. Since its inception in 1973, CSSP has served as a strong voice in support of science and science education. Martin Apple, CSSP president, has encouraged the executive directors of the member societies to attend the meeting to provide continuity in understanding the important role CSSP plays. To that end, John Lisack, Jr., ASPP executive director, represented the Society.

The meeting's goal was to answer the question, Has science become the "Greatest Story Never Told"? The meeting featured a number of congressional leaders, including the Honorable Pete Domenici (R-NM), chair of the Senate Budget Committee; noted researchers such as Nobel Laureate and National Science Medalist Dudley Herschbach; and visionaries such as Lester Brown, president of Worldwatch Institute. Consensus was that scientific societies must work together to adapt public policy positions on science and to foster ways to enhance the public understanding and appreciation of science. Lofty goals that we must all pursue!

Dr. John LaPidus, president, Council of Graduate Schools, and John Lisack, Jr., ASPP executive director, at recent CSPP meeting.

Monsanto Supports ASPP Education Foundation

Monsanto Company has made a significant annual donation to the ASPP Education Foundation. Monsanto's life sciences companies are involved in pharmaceuticals, agriculture, and consumer health care in the United States, Latin America, Asia, Europe, and Africa.

"The biotechnology revolution is rapidly changing the international seed industry, and Monsanto has been a key player in this arena," stated Ernest S. Micek, Cargill chair and CEO. In June, Cargill combined its germplasm and international research and marketing and distribution network with Monsanto's leadership in biotechnology.

For several years, Monsanto has joined ASPP in its efforts to increase the understanding of basic plant research in its applications to agricultural biotechnology and pharmaceuticals. ASPP member Rob Horsch, who is company president of Monsanto's Sustaining Development Sector and general manager of Monsanto's Agracetus Campus, participates on the ASPP Education Foundation Board.

The collaboration of plant science researchers in academia and corporate participants in the Education Foundation provides a broad and practical perspective on the goals and activities of the foundation. This cooperation facilitates the mutual goal of promoting an understanding of plant sciences in solving global needs for high-quality food, fiber, and renewable resources.

PubMed Central

Visit the ASPP Web site at http://aspp.org/ebiosci/ebiosci.htm for a summary of PubMed Central—NIH's proposal to distribute the life-sciences literature free of charge—as well as for reader feedback on the initiative and updates as they develop.

NSF Director Rita Colwell's Vision for Science Eyed Enthusiastically by Plant Scientists

On July 24, before a large crowd of attendees at the ASPP 75th anniversary meeting in Baltimore, National Science Foundation Director Rita Colwell provided an exciting look into the future of science.

Widely acknowledged as one of the great visionaries in science today, Dr. Colwell explained the key expanding role for plant scientists in making future shared discoveries with colleagues in information technologies and other disciplines. ASPP President Brian Larkins noted that ASPP was honored to welcome Dr. Colwell, who is charting a course for the future of science that will capture the advances of all science disciplines and send them on a journey together to find exciting new destinations.

Following is the major portion of Dr. Colwell's remarks:

It is interesting to contemplate that the only individual organisms still alive to have seen the dawning of the last millennium are plants. There aren't many that have survived this long, but we know some have. It is just one reminder of how much we can learn from the flora all around us. Maybe at the end of the next 1,000 years, we will be able to communicate with plants and . . . I can ask them what they thought of my talk!

Seriously, looking ahead, we cannot exaggerate the importance of your work as plant scientists in the next millennium. Last year, in an editorial in *Science,* Philip Abelson wrote, "Today, humans employ the capabilities of only a few plants. A major challenge is to explore the opportunities inherent in some of the hundreds of thousands of them."

Abelson predicts, and I agree, that genomics—in particular plant genomics—will be the next great technological revolution. It will bring changes comparable to the Industrial Revolution and to the computer-based revolution that grips us now.

We see this taking hold in many of the talks being presented here. I noticed one session on Functional Plant Genomics that features a number of NSF-supported researchers. Suffice it to say, the revolution is well under way, and it is up to all of us to make it work for science and society.

As a community, we are ideally positioned to tackle the challenges ahead. We've already seen this in such areas as the Plant Genome Initiative, in key education initiatives, in our shared concern for a diverse scientific workforce, and in the growing recognition for the importance of reaching across disciplines, to name just a few examples. A superb example of this is one of the minisymposia next Wednesday morning on the topic of "Plant Research Benefiting Human Health." All of these are areas in which NSF and you as a society have much in common and much to discuss.

> "Genomics—in particular plant genomics—will be the next great technological revolution. It will bring changes comparable to the Industrial Revolution and to the computer-based revolution that grips us now."
>
> —Rita Colwell

I know we would agree in characterizing NSF's support as very significant for the plant sciences. Many of us have been the recipients of NSF funding. The other side of the coin is that your guidance and feedback are extremely important to us at NSF.

I'd like to set the scene with an observation that encapsulates how I view NSF's present and future—a perspective that underlies our new directions. This is a quotation from John Muir, who wrote early in the century, "When we try to pick out anything by itself, we find it hitched to everything else in the universe." This is a sweeping and integrated vision, and it has prefigured a powerful trend we see today—the push toward interconnections between the many fields of science and engineering. In fact, these linkages are one of the most striking and dynamic features of scientific progress today. We see great excitement at the boundaries of disciplines, always fueled by progress in the core fields. This is central to NSF's overall investment strategy, and it drives the need for increased investment in research and education.

NSF is the fulcrum for all for science and engineering. We're the only agency whose mission covers research in all fields as well as education at all levels—cradle to grave. We support the fundamental work that benefits the other federal agencies right down the line. That's why we need to continue to support investments that reach all fields and all disciplines.

Let me turn to what this means for NSF in immediate terms. Our three investment priorities for this year's NSF budget reflect this embracing vision of science and engineering. I'd like to explore each of them a bit with you. The first area is the study of biocomplexity. By now, some of you may be familiar with this term, but some may not. We're moving beyond the old approach of just cataloging species or looking at an eternity in isolation. The living systems that sustain us all exhibit biocomplexity, which results in the whole being more than the sum of its parts.

I like to think of biocomplexity as the kind of concept that Ralph Waldo Emerson had in mind when he wrote, "Certain ideas are in the air. . . . This explains the curious contemporaneousness of inventions and discoveries." Indeed, we are seeing new research approaches and new institutes springing up everywhere. They differ in details but share a focus on complexity. Biocomplexity is that kind of compelling idea that has been percolating to the surface in many minds and many places. Our focus at NSF is on the biocomplexity that arises from the interactions of living organisms with all facets of their external environment. It's obvious that the plant sciences will play an integral role in these studies. Plants so fundamentally shape and are shaped by the environment.

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Biocomplexity is often characterized by nonlinear or chaotic behavior, so it is difficult to describe and study experimentally. This has hampered our ability to understand and predict the behavior of many environmental systems. Now, however, thanks to new computational, observational, and analytical tools, we're on the brink of a breakthrough. As scientists and engineers from a broad spectrum of fields, we're poised to tackle the integrated research necessary to understand the biocomplexity of our environment.

NSF is proposing a comprehensive strategy to place the nation at the forefront of biocomplexity research. This year we're holding a competition of biocomplexity that focuses on understanding the role of microorganisms in structuring environmental systems. The ecology of our planet is proving more diverse and complex than we ever expected. We will deepen our understanding of the links and feedbacks between life forms deep in the earth's crust and in the most extreme environments of our planet. Our goal is to make more reliable predictions of the processes that shape our environment.

In fiscal year 2000, we plan to move to a more ambitious phase. If approved by Congress, NSF will sponsor a $50 million focused initiative on biocomplexity that supports interdisciplinary research on nonlinear dynamics and emergent phenomena and on how biological systems evolve and interact across the spans of time and space. We expect the program to continue over five years. It's clear that the major environmental challenges that we face call for creative approaches that will emerge from these studies. They must integrate information across temporal and spatial scales, embrace multiple levels of organization, and bridge disciplinary boundaries. We expect all NSF directorates to participate in this initiative, an initiative that is key to maintaining a healthy and habitable planet. These new and more sophisticated ways of thinking about our world both rest upon and are fed by information technology.

This is also the focus of NSF's second major budgetary initiative this year: Information Technology for the 21st Century, called IT^2 for short. This is an interagency initiative. NSF has the lead role, and it responds to a presidential committee's finding that long-term research on information technology has been "dangerously inadequate." IT^2 calls for investment in several critical areas:

- We need research aimed at understanding how human beings and computer systems interact.
- We need larger, more secure information systems.
- We need much more research on how the computing revolution is transforming our society and our workforce.
- And we also need to extend the frontier on the high-end computing necessary to attack a host of key science and engineering problems.

I do not need to tell this audience how advances in IT^2 dovetail with progress in biology. As *The Economist* noted recently, "many of the challenges in biology, from gene analysis to drug discovery, have actually become challenges in computing." The article goes on to describe a "desperate shortage of specialists capable of developing the computational tools that biologists need." A pertinent example is the Plant Genome Initiative, which in itself has transformed the study of plant physiology. This is the type of venture that makes a disparate group of researchers more than the sum of its parts. It has spurred the plant sciences to assume their rightful place at the cutting edge of biology and has fostered the notion of nutritional genomics. It was featured in the July 16 Plant Biotechnology special section of *Science*, and it will be the subject of the [July 27] morning symposium at Plant Biology '99.

This is also the sort of work that produces an avalanche of data, the sort of massive information inundation that our physical scientist colleagues have been much more adept at handling. Here, we need to change. It has been predicted that in the future, genetically altered plants will produce most of our food, fuel, and industrial chemicals and many phamaceuticals. This is a prime example of why it is so essential for biologists to work with mathematicians and computer researchers. We need tools to mine the genomics data. But, computing can help us expand our horizons even further, to wonderful ways to visualize, to develop what amounts to a virtual plant.

Advances in information technology are essential to bringing the disciplines together. An excellent example of intersection is nanotechnology, which must supply most of the materials and technologies that we need. I like the concept that one nanometer—or one billionth of a meter—is a magical point on the dimensional scale. Within two orders of magnitude on either side are the smallest of human-made devices, at the micro level, and the atoms and molecules of living systems at the atomic scale. Nanoscale science and engineering will underpin innovation in areas from information and medicine to manufacturing and the environment.

Rita Colwell

Our third budget highlight for this coming year may be the biggest challenge of all: educating our 21st-century workforce. You may not be aware that NSF invests about one-fifth of its budget in education at all levels. I know this priority resonates with many of the ongoing efforts here at ASPP. I compliment all of you for the imaginative outreach you have brought to both formal and informal education. And I applaud your efforts to sponsor mini-symposia like the one being held here on examining the role that researchers play in learning. I'd just like to mention two examples. First is the project at Epcot Center, which demonstrated how basic research on plants is critical to feeding the world. That's clearly had a major impact. Second, I've been impressed by your work on identifying the principles of plant biology. This has turned into an excellent means for linking K through 12 educational community with ongoing research activities. It's a great start.

I've seen time and again that plants are a great window into science for children and the public. I can't forget visiting a second-grade classroom in Philadelphia not too long ago. I sat behind a desk built for a seven-year-old, and was sitting among kids who were wide-eyed as they engaged in discovery. They were learning about the biology of plants, and the teacher was doing much more than conveying raw facts. She was turning the kids into problem solvers. I should add, as an aside, that I visited that classroom the day before the president announced my nomination as NSF director. That's why I tell people I got this job the day after I got out of second grade. It was an appropriate way to begin, because improving the math and science education in our schools is absolutely critical to our future.

We all know we face a troubling paradox. Some of you may know about the Third

International Math and Science Study, better known as TIMSS. It revealed a very disturbing fact. Our economy and society are on an unprecedented upward path in science and technology, yet our students simply aren't getting the education they need to succeed. It will take many creative minds to turn this around. As an active researcher myself, I believe that no group should feel more responsibility for math and science in the classroom than scientists and engineers. It's time for our universities to become an integral and accountable partner in national efforts to advance this educational priority. We have maintained a vast chasm between our elementary science and math education and our graduate education system, all without rational foundation. We must connect these systems. For this reason, I'm particularly excited about one of our education initiatives at NSF this year. That's our pilot program to place graduate teaching fellows in K–12 classrooms.

Just last month I was able to speak to the panelists who are reviewing the proposals to that new program. The commitment and enthusiasm of the group were electric! They were very excited about the program and the overwhelming response to it. We're expecting the new K–12 fellows program to boost the content of elementary and secondary education and the quality of graduate and undergraduate education at the same time. The program implicitly gives recognition to teaching in a scientific career. This is a great example of how we can encourage progress on integrating research and education.

Let me sum up by saying once again how much I appreciate the chance to share with you some of my excitement about new directions at NSF. I know there is always some trepidation at taking risks, and I know the question on some minds will be, "How can we afford to do all of this?" The answer to that question really is, "We can't afford *not* to do all of this."

I'm describing a scenario in which interdisciplinary research and the core disciplines are really two sides of the same coin. Rather than being in any kind of opposition or competition, they exist in a kind of enriching interplay, each healthier in the presence of the other.

I'm very much aware that all of this adds up to a very ambitious agenda for science and technology, and I've concluded that we need to work to increase the funding for NSF. That won't be easy. Congress is working with a very tight budget allocation for discretional spending. At NSF, we're now at just about $4 billion, but a much greater investment is needed. This boost won't happen overnight, but I want to get us off the mark and on the way to a budget that reflects the importance of NSF's work to our economy and to our society. We cannot even begin to do any of this without your help.

I hope I've given you a few things to think about, and maybe a few things to cheer for, beyond the Orioles. Most of all, I look forward to hearing from you.

Budget Caps, Low Allocation Limit NSF FY2000 Recommendation in House

The House Appropriations Committee has made its recommendation for fiscal year 2000 funding for the National Science Foundation. Because of the strict budget caps and resulting low allocation to the House Subcommittee on VA (Veterans Affairs), HUD (Housing and Urban Development) and Independent Agencies, the House Appropriations Committee recommendation for NSF is below the current-year level. However, level funding is recommended for the Biological Sciences Directorate, which supports basic plant research.

House floor action on the legislation and Senate Appropriations Committee and Senate floor consideration are expected after the summer recess. Although faced with a very low allocation, Senator Kit Bond (R-MO), chair of the Senate Appropriations Subcommittee on VA, HUD and Independent Agencies, is seeking to find additional funds for plant research.

The FY2000 recommendation for NSF by the House Appropriations Committee is $3,646,825,000. This compares to the FY99 appropriation of $3,671,200,000.

For NSF Research and Related Activities, the House Appropriations Committee FY2000 recommendation is $2,778,500,000. The appropriation for Research and Related Activities covers all NSF programs except Education and Human Resources, Salaries and Expenses, NSF Headquarters Relocation, Major Research Equipment, and the Office of Inspector General. These are funded in other accounts in the bill. The Research and Related Activities appropriation includes United States Polar Research Programs and Antarctic Logistical Support Activities and the Critical Technologies Institute, which were previously funded through separate appropriations.

The committee's recommendation for Research and Related Activities includes the following program levels, to which it expects NSF to adhere: (1) Biological Sciences, $391,000,000; (2) Computer and Information Science and Engineering, $312,670,000; (3) Engineering, $369,000,000; (4) Geosciences, $473,000,000; (5) Mathematical and Physical Sciences, $735,000,000; (6) Social Behavioral and Economic Sciences, $138,000,000; (7) U.S. Polar Research Programs, $183,000,000; (8) U.S. Antarctic Logistical Support Activities, $62,600,000; and (9) Integrative Activities, $114,230,000.

Within the amount provided to the Computer and Information Science and Engineering Directorate, $35,000,000 is to support individual and team research projects consistent with H.R. 2086, the Networking and Information Technology Research and Development Act, which, as introduced, authorizes a sizable increase for Information Technology (IT) research over the next five fiscal years.

Included in the amount provided to the new Integrative Activities directorate are $35,000,000 for the new Biocomplexity Initiative; $50,000,000 for Major Research Instrumentation; $25,000,000 for Science and Technology Centers; and $4,230,000 for the Science and Technology Policy Institute.

The committee recommends a total of $56,500,000 for the major research equipment account for FY2000. This appropriation reflects the budget request levels of $8,000,000 for the Millimeter Array, $15,900,000 for the Large Hadron Collider, $12,000,000 polar support aircraft upgrades, $5,400,000 for continued construction of the new South Pole Station, and $7,700,000 for the Network for Earthquake Engineering Simulation.

The House Appropriations Committee noted that the NSF's Education and Human Resources activities are designed to encourage the entrance of talented students into science and technology careers; to improve the undergraduate science and engineering education environment; to assist in providing all precollege students with a level of education in mathematics, science, and technology that reflects the needs of the

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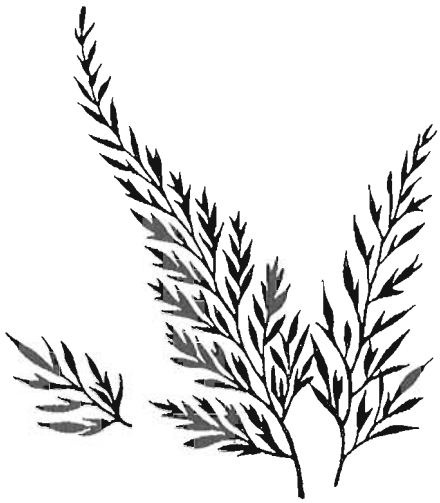
nation and is the highest quality attained anywhere in the world; and to extend greater research opportunities to underrepresented segments of the scientific and engineering communities.

For FY2000, the committee recommends $660,000,000 for Education and Human Resources, a decrease of $2,000,000 from last year's appropriated level. The committee's proposal includes the following program funding levels: (1) Educational System Reform, $114,200,000; (2) Experimental Program to Stimulate Competitive Research (EPSCoR), $48,410,000; (3) Elementary, Secondary and Informal Education, $193,520,000; (4) Undergraduate Education, $103,540,000; (5) Graduate Education, $69,650,000; (6) Human Resource Development, $73,680,000; and (7) Research, Evaluation and Communication, $57,000,000.

The committee noted that it believes it is important to promote agricultural and related environmental awareness through improved curriculum and materials development targeted at the K–12 level of education. Recent reports by the National Research Council, the Farm Foundation, and other organizations have highlighted the need for improved education efforts in this vital area for all students. The committee urges NSF to actively encourage and to provide appropriate support for competitive proposals that will improve agricultural and environmental literacy, promote critical thinking and problem-solving skills, and improve the quality of agricultural and environmental education materials being used by K–12 teachers in our nation's schools. Such efforts should be coordinated with similar efforts to be undertaken by the U.S. Department of Agriculture, particularly as it incorporates several years of effort developed by the National Resource and Conservation Services to prepare an agro-ecosystem curriculum for teachers focusing on land, food, and people, the committee said.



Keegstra, Ryals, Clutter Join All Witnesses Supporting NSF Plant Genome Research at Congressional Hearing

The first-ever congressional committee hearing focused entirely on NSF's Plant Genome Research program elicited strongly favorable comments for NSF's successful program.

The hearing, titled "Plant Genome Science: From the Lab to the Field to the Market," was held by the House Science Subcommittee on Basic Research, chaired by Congressman Nick Smith (R-MI). Rep. Smith made clear his strong support for plant genomic research at this hearing held August 3 in the Rayburn House Office Building.

Among the five witnesses, Ken Keegstra, of Michigan State University and ASPP immediate past president, provided his views as the scientist witness conducting plant genomic research sponsored by NSF. "Plants are particularly important objects for genomic study because they not only are the base of our entire food supply, but they also are the major energy transducers on earth, transforming solar energy into chemicals that humans use for fuel, fiber, pharmaceuticals, and industrial purposes," Keegstra said.

Keegstra provided to subcommittee members ASPP posters developed by his Michigan State University colleague John Ohlrogge titled "Plant Functional Genomics: The New Engine for Biological Discovery." Keegstra explained how the use of DNA microarray analysis depicted on the poster allows scientists to study most or all of the genes in an organism simultaneously. The poster explains how this research could help lead to discoveries that could increase yields of oil in plant seeds, such as soybean. Keegstra added that microarray analysis could also be used by scientists to develop cold-tolerant and drought-tolerant crops. The drought-tolerance example was provided at a time when the Mid-Atlantic states were in the midst of the second-worst drought of the century.

The industry scientist perspective was provided by ASPP member John Ryals, president and CEO of Paradigm Genetics, Inc. Ryals said there are two technology areas that promise to reshape the agricultural sector: agricultural biotechnology and plant genomics. "Agricultural biotechnology comprises a technological revolution. It is a revolution not unlike the advent of power and light, aviation, or computer technology, and the impact of the technology will be felt by every American in every facet of life," Ryals said. "Fifteen years into agricultural biotechnology, there are 70 million acres of genetically modified crops in cultivation. Within the next 35 years, all crops will be genetically engineered and every agricultural product will be affected. We know how to move genes into organisms in very efficient ways; however, we are limited in knowing what should be put in. An emerging area of science and technology that has the potential to relieve this rate-limiting step is genomics," Ryals explained.

Ryals said that research in genomics and agricultural biotechnology will lead to healthier foods to help people resist life-threatening diseases. "The pace at which these types of advances will become a reality will be proportional to the amount of funds available for research and the talent, the vision, and the dreams of the people inspired to work on these problems," Ryals said.

Mary Clutter, NSF assistant director, Directorate of Biological Sciences, provided the subcommittee with specific examples of practical applications that have resulted from Arabidopsis genomic research. For example—

- Arabidopsis was used to prove that plants can be directed to produce pure biodegradable plastics in quantities suitable for industrial production.
- Complex pathways by which a plant produces various oils have been elucidated in

Arabidopsis, and several key genes have been identified and cloned. These genes have been used to modify canola and soybeans to produce oils of improved nutritional value. The same genes can be used to produce industrial lubricants as well.

- A gene identified in Arabidopsis that is resistant to a commonly used herbicide, sulfonylurea, is being used to develop crops that are suitable for low-till agriculture.
- Scientists have used Arabidopsis to show that plants can be modified to effectively clean up heavy metals in the environment such as mercury and cadmium.
- Scientists have discovered by use of Arabidopsis how plants take up iron and other micronutrients in the soil. The information is immediately applicable in producing crops that contain high iron and other essential mineral nutrients. Similarly, other scientists have shown with Arabidopsis that a plant naturally fortified with vitamins can be developed. Indeed, such research has opened up a new area termed "nutritional genomics."

Dr. Clutter said the expanded Plant Genome Research program initiated in fiscal year 1998 will provide fundamental knowledge and new technologies that are essential for further research leading to crop improvement and novel value-added, plant-based products. "These results will be exploited by a broad community of plant biologists in agriculture, energy, environment, and health fields and by plant-based industries in developing improved plants of high economic value," she said.

Dr. Clutter noted that the next step for the program is a concentration on functional genomics research. "The plant biology community has set its next 10-year goals for the Arabidopsis genome research project—to exploit the revolution in plant genomics by understanding the function of all Arabidopsis genes (and by extension, the genes of all flowering plants) within their cellular, organismal, and evolutionary context and to create an information structure to coordinate, integrate, analyze, and make accessible this knowledge."

Taking its cue from the community and seizing upon the unprecedented scientific opportunity created by the impending completion of the Arabidopsis sequencing project, NSF is planning a new initiative called the "2010 Project," Dr. Clutter said. She said the goal of the 2010 Project is to determine the function of all the genes in the Arabidopsis genome by the year 2010.

"In order to accomplish this goal, new experimental and computational tools will be needed. Among these are microarray and gene chip nanotechnologies that are being developed at Michigan State University," Dr. Clutter stated. "In addition, there is a great need to train new plant biologists and bioinformaticists who will be able to exploit these tools to the fullest. NSF, with its strategic goal of the integration of research and education, is poised to provide both the tools and the trained researchers to use them."

Eileen Kennedy, USDA deputy undersecretary for research, education and economics, said the department believes that the discoveries made by scientists supported by the Plant Genome Research program will help solve some of the difficult challenges facing American farmers and humankind in the 21st century. She cited the Arabidopsis and new rice genome sequencing projects jointly sponsored by USDA, NSF, and DOE for the contributions they will offer to agriculture.

Kennedy said that in addition to genomic research efforts in partnership with NSF, the USDA National Research Initiative Competitive Grants Program also awards more than $8 million per year in grants for research to develop new technologies for gene isolation, mapping, and transfer and creation of new crop varieties.

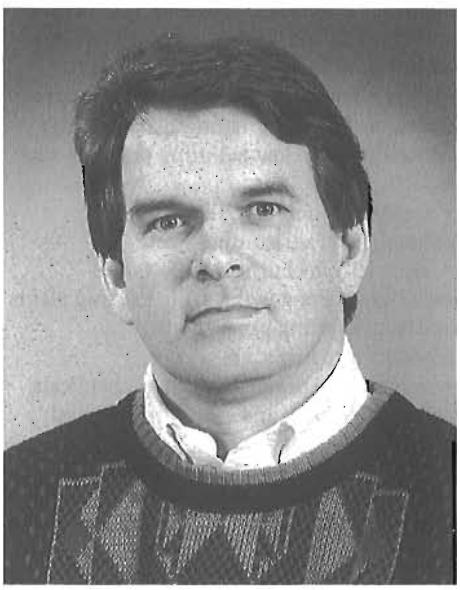
Susanne Huttner, director of the Systemwide Biotechnology Research and Education Program for the University of California, cited the essential role of public investment in plant research. She said funding for the NSF Plant Genome Research program is helping expand needed fundamental research in genetic and biochemical pathways.

Members of the subcommittee generally expressed support for plant genome research, although Congresswoman Lynn Woolsey (D-CA) voiced some concerns. She said she is very suspect about whether changing genes in plants will have a long-term positive effect. Keegstra responded, explaining that he believes it is generally safer to transfer one known gene using modern transformation technologies than to transfer hundreds of thousands of unknown genes through traditional plant breeding.

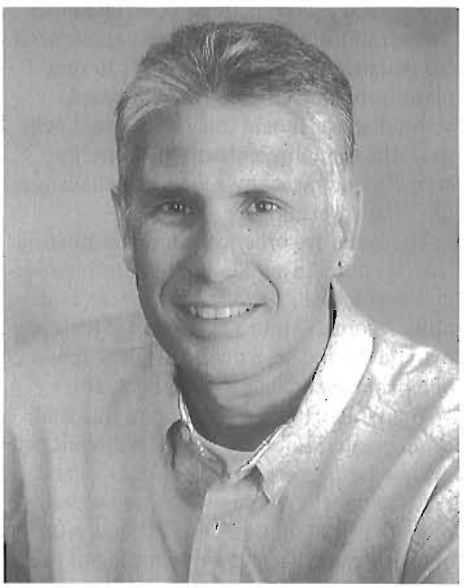
Also during the hearing, Keegstra cited the efforts of the ASPP Education Foundation to explain to the public the benefits of research in this area. Rep. Smith commented to his staff that they should look into ways in which the subcommittee could contribute to these efforts.

Complete statements of all of the witnesses can be seen at http://www.house.gov/science/106_hearing.htm#Basic_Research.

Mary Clutter



Ken Keegstra



John Ryals

Larkins Explains Benefits of Biotechnology in *Wall Street Journal*

Following is a letter to the editor written by Brian Larkins that was published in the *Wall Street Journal* on July 29. Editorial and op-ed pages of newspapers are among the battlegrounds where opponents and proponents of modified foods seek to influence public opinion. This letter turns around an opposition claim on allergen research by offering an example of ASPP past president Bob Buchanan's research to remove allergens from foods. It also points to the importance of more nutritious modified foods, such as corn with higher-quality protein.

Biotech Is Creating Better, Safer Foods

In the July 13 letter to the editor "Genetic Engineering Is Not Crossbreeding," the writers assert that new food allergies could be possible consequences of biotechnology. While one cannot refute the remote possibility that this could occur, the removal of allergens through biotechnology has already been accomplished. The methods of genetic engineering are being used both to understand the allergic response and to remove allergens from foods. For example, research by Prof. Bob Buchanan at U.C. Berkeley makes use of biotechnological methods to render allergenic proteins in wheat and milk products (and possibly other foods) less harmful to those who would otherwise have violent reactions to them. This type of research will figure heavily in the next wave of food products developed through biotechnology.

In addition to safer foods, biotechnology also has the potential to bring about the creation of more nutritious foods. My research using biotechnology is leading to corn with higher-quality protein. This is particularly important in some developing nations where corn is the staple in the diets of most people. Insufficient protein can lead to afflictions such as retarded mental development. High-quality protein from corn has been shown to reverse and prevent these afflictions. While there are risks associated with any technology, it would be a significant loss to humanity if the many benefits of biotechnology were not realized because of concerns that have little basis in scientific fact.

Brian Larkins, Ph.D.
President, American Society of Plant Physiologists
Professor, Department of Plant Science
University of Arizona, Tucson

ASPP President Brian Larkins.

Executive Order Would Spur Bio-Based Technologies

In a presentation August 12 to representatives from ASPP, agricultural producers, processors, government officials, and other organizations, President Clinton announced his issuance of an executive order to spur plant technologies and other bio-based technologies. He said this order would help grow the economy, enhance U.S. energy security, and meet environmental challenges like global warming.

The executive order calls for coordinating federal efforts to accelerate these technologies—which can convert crops, trees, and other "biomass" into a vast array of fuels and materials—and set a goal of tripling U.S. use of bioenergy and bioproducts by 2010.

The White House said meeting this goal could create $15 billion to $20 billion in new income for farmers and rural America and reduce annual greenhouse gas emissions by more than 100 million tons, the equivalent of taking more than 70 million cars off the road. In addition, the president called on Congress to approve his proposed research funding and tax credits to promote energy efficiency, bioenergy, and other clean energy sources. The White House pointed out how advances in the biological sciences are fueling a revolution in the use of biomass (trees, crops, and agricultural and forestry wastes) to make low-polluting products such as—

- transportation fuels, like cellulosic ethanol, from agricultural waste
- electricity, by burning willows and switchgrass along with coal in existing plants and by converting paper industry by-products into fuel gases
- commercial products, such as chemicals, glues, and paints, and even furniture and textiles.

Bioenergy and bioproducts can dramatically reduce greenhouse gas emissions that contribute to global warming, the White House said. Because crops absorb carbon during growth, their use for energy and other applications results in near-zero net carbon release. In addition, the deep-rooted plants commonly used for biomass are helpful in controlling erosion, filtering chemicals from water runoff, and slowing floodwaters.

Meeting the president's goal of tripling our use of bioproducts and bioenergy will allow us to cut back on the almost 4 billion barrels of oil we are projected to import in 2010, which contributes to energy security.

The White House noted that leading scientific and industry groups are calling for a stronger federal role to help move these promising technologies from the laboratory to the marketplace. The executive order creates a new research management team focused on an ambitious set of goals. The executive order—

- establishes a permanent council consisting of the secretaries of DOE and USDA, the administrator of the EPA, the director of the National Science Foundation, and other

agency heads to develop a detailed biomass research program to be presented annually as part of the federal budget

- directs the council to review major agency regulations, incentives, and programs to ensure that they effectively promote the use of bioproducts and bioenergy
- creates an outside advisory group with representatives from bio-based industries, farm and forestry sectors, universities, and environmental groups.

In a separate executive memorandum, the president instructed the secretaries of energy and agriculture to prepare a report within the next 120 days on options for modifying existing DOE and USDA programs with a goal of tripling U.S. use of bio-based products and bioenergy by 2010. See the following story for comments made by the president concerning the executive order.

Remember!

Job listings on ASPP's Web site are updated every Friday, so be sure to check in frequently. Some jobs listed online are not listed in the newsletter.

http://aspp.org/JOBS

Remarks by President on Executive Order to Spur Bio-Based Technologies

At the U.S. Department of Agriculture, Washington, DC, on August 12, President Clinton spoke on his executive order to encourage bio-based technologies. Following is the major portion of his remarks.

One of the most important technological advances of this century came 90 years ago in a old farmhouse overlooking Lake Michigan, where William Merriam Burton, who was a chemist for Standard Oil, figured out how to launch the modern petrochemical industry. He understood that this new contraption called the automobile was about to create a huge demand for petroleum products, and he understood that he had to squeeze more power from every molecule of petroleum. And because he did that, we had the prosperity we enjoyed, and we have many of the challenges we face today—because of what he did in that small place, so long ago.

This paved the way for the automobile era. It showed us the power of science to change the paradigms that govern our world. And on the verge of the 21st century, we may be nearing a similar breakthrough—a technological fix that can help us meet our economic challenges, maintain our security, sustain our prosperity, and ease the threat of global warming. Science will be the key to our progress.

If we can make the raw material of tomorrow's economy living, renewable resources instead of fossil fuels, which pollute the atmosphere and warm the planet, then the future of our children and our grandchildren, the likelihood that there will be greater prosperity—and peace, the likelihood that all these sci-fi movies about the 21st century will be nothing more than a figment of someone's imagination—all that will be far greater. One hundred years from now, people will look back on this time and compare it to the time when Mr. Burton figured out how to get more out of every petroleum molecule, if we do our jobs.

If you look at what is going on with trees and plants today, it is very impressive. Once we used only a seed or a kernel and tossed away the rest. Now we are learning how to use entire plants. Microscopic cells are being put to work as tiny factories. They convert crops and even waste into a vast array of fuel and material—everything from paints to pharmaceuticals to new fibers. And our ability to use waste in these ways will also be critical to our future. . . . Why? There are four reasons.

First, the potential economic benefits are staggering, not only for farmers—that is obvious, because they can raise raw material—but for the timber industry, chemical manufacturers, power companies, and small entrepreneurs. Vice President Gore is in Iowa today discussing how these technologies can help close the opportunity gap between urban and suburban and rural America by bringing new high-tech jobs to rural areas that have not yet participated fully in our prosperity.

Second, by substituting domestic renewable resources for fossil fuels, we ease our growing dependence on foreign oil. And because inflation has been low and growth has been high, no one is paying attention to this. But we are going to have, with the growth of population here and around the world and the increasing economic activity around the world, enormous competition for oil, which will make its supply more problematic and its price much higher within a relatively short time unless we do something to ease our dependence. It is important for our economy, for our security, for our environment.

Third, as the Council of Advisors on Science and Technology concluded in a recent report, we can help developing countries meet their own soaring needs for energy in ways that, again, improve the global environment and stabilize economies and societies.

And, fourth, this will help us meet the challenge of climate change, which I am convinced will be the most formidable environmental challenge the world faces over the next 20 to 30 years.

Scientists tell us this decade is probably the warmest in a thousand years. The heat and drought of this summer and the natural disasters of the past few years are probably only a taste of what is to come, unless we act now to deal with this challenge. Bioenergy is a means to achieve all these objectives—to heat our homes, to fuel our vehicles, to power our factories while producing virtually no greenhouse gas pollution.

To make the most of these opportunities, government and industry must work together as partners. In "industry" I include agriculture and small and big business, government, and everyone in the private sector who is involved in this. The govern-

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ment provided critical leadership in developing the semiconductor and the Internet. We must also nurture these fledgling bioindustries in the same way.

In a few moments, I will sign an executive order to accelerate development of these 21st-century technologies, to strengthen our economy, and to protect our environment. I'm establishing a cabinet-level council to develop strategic plans to help bring bio-based technologies from farms, forests, and labs to the marketplace.

In addition, I am setting a goal of tripling America's use of bioenergy and bio-based products by 2010. That would generate as much as $20 billion a year in new income for farmers and rural communities while reducing greenhouse gas emissions by as much as 100 million tons a year, the equivalent of taking more than 70 million cars off the road. In this way, we plant the seeds of a new technology for a new century, to sustain both our prosperity and our environment.

In addition to exploring the further use of bioenergy, there are other things we need to do as well. We need to do more to accelerate the development of flexible-fuel vehicles. If we develop these energy sources, there must be something to receive them.

We also must recognize that there are available today, at prices that are attractive today and that will grow increasingly attractive tomorrow as oil prices go up, elemental technologies that promote conservation and cut costs, so people save energy and money in homes, in farms, in factories—elemental technologies that still are not being maximized.

We just had a big announcement a couple of days ago about a new light bulb that I believe will be much more attractive than the conservation lighting systems that have been developed so far and that will save people millions and millions of dollars and an awful lot of energy. We need to be sensitive to all these things if we expect to have the world we want for our children.

I am very grateful that last year Congress voted for another billion dollars to research and develop clean, energy-efficient technologies, including bioenergy. In my present balanced budget, I have proposed further investments in these technologies, as well as tax credits for businesses and consumers who choose energy-efficient cars, homes, and appliances. I know that Senator Lugar has a specific piece of legislation that would dramatically increase our investment in bioenergy research.

Anything we can do in this area, in my judgment, will have huge paybacks. And so, I ask that you do what you can during this August period, and when Congress comes back, to put this issue beyond partisan politics, to put it beyond the debate. We are talking about a tiny fraction of the budget for the combined recommendations we have made that can change the whole future of this country and this world, in the way that the automobile and the perfection of petroleum processing did at the beginning of the century.

I can hardly tell you how strongly I believe this can happen. And when it does happen, we will look back and be amazed that we took as long as we did to do it and at how cheap it was considering the benefits we got out of it. Anything you can do to . . . ensure that more of our farm families get to stay on the farm and that people can make a decent living in rural America in an environmentally sustainable way, liberate America and other countries from their dependence on unstable sources of petroleum, break the mindset that exists among too many—both here and around the world—that you cannot have economic development without burning more fossil fuel and that burning up the planet is therefore just the inevitable consequence of getting ahead—anything you can do to roll back those problems and to create opportunities will be profoundly important to the kind of world our children live in and what people say about you and our generation 100 years from now. It is hard to think of a greater gift we could give at the turn of the century or a new millennium than a clean energy future.

ASPP and Fast Plants Focus on National Science Education Standards and *Principles of Plant Biology*

The ASPP Education Committee and Education Foundation, together with the Wisconsin Fast Plants Program, will offer ASPP members a 2½-day workshop on the uses of Fast Plants for teaching general biology, plant science, genetics, ecology and evolution, and plant breeding. The focus will be on the high school and college levels, and the emphasis will be on the alignment of educational material with the National Science Education Standards. Activities illustrating the ASPP *Principles of Plant Biology* will be featured.

Additional emphasis will be given to the uses of Fast Plants in independent undergraduate- and high school–level research projects. The Wisconsin Fast Plants Program is rapidly expanding its use of the Internet as a primary source of new materials and to facilitate coordination among Fast Plants users (see RL-2000 at http://fastplants.cals.wisc.edu).

- *Costs:* Consideration is being given to having ASPP underwrite participant costs and expenses.
- *Presenters:* Paul Williams, John Greenler, and Wisconsin Fast Plants staff.
- *Date:* Friday, January 14, to Sunday, January 16, 2000.
- *Location:* University of Wisconsin–Madison.
- *Participant limit:* 24 people.
- *Application deadline:* November 30, 1999.

College Students Conduct Phytoremediation Experiment for Community Enhancement Project

In a vacant city lot in Hartford, Connecticut, where the soil is saturated with dangerous levels of lead, a group of Trinity College students and their professors are raising an experimental garden with a variety of plants. The plants have the ability to absorb pollutants and may lead to a simple, inexpensive method for cleaning the land and making it safe for future use.

According to an August 9 news release from Trinity College, the six undergraduate students and their two professors are growing Indian mustard, white mustard, Sudan grass, and sunflowers at a site that is currently off-limits to residents because it is contaminated with lead up to 10 times above the allowable federal limit. The students' project will add to a growing body of research that has demonstrated that Indian mustard can absorb lead from the soil and will determine the potential effectiveness of the other plants in doing the same. Following is additional information from the news release.

The research is being supported with funds Trinity received under a grant from the W. K. Kellogg Foundation and is being followed closely by a New Jersey–based biotechnology company that provided seeds and expertise for the project as part of its effort to explore the possible commercialization of the process known as phytoremediation, or the use of plants to remove pollutants from the environment or to render them harmless.

Phytoremediation promises potentially huge environmental and financial rewards because the use of plants poses a simple, safe, and cost-effective approach to the remediation of soils and water. The Environmental Protection Agency estimates that there are more than 30,000 sites requiring hazardous waste treatment services throughout the United States. Lead represents a particularly difficult problem because there are no permanent, low-cost solutions for heavy metal contamination.

"It's an important demonstration because it may show that a poor neighborhood with limited resources can tackle environmental problems. It appeals to our students who are very interested in the environment and very interested in doing something to improve the quality of life in Hartford," says Hebe M. Guardiola-Diaz, one of the two professors guiding the student research effort.

The idea for the research garden originated with Guardiola-Diaz and another Trinity professor, David E. Henderson, who were interested in creating summer projects for their students. Last fall, Guardiola-Diaz, an assistant professor of biology and neuroscience, and Henderson, a professor of chemistry, independently approached college administrators to request funding for their proposed projects. Each professor was unaware of the other's request until administrators got them together.

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Trinity College students tend to an experimental garden that they are raising in a vacant, lead-contaminated lot in Hartford. The chemical solution that the two students are spraying is intended to enhance the plants' natural ability to absorb lead. Phytotech, a firm that ASPP member Ilya Raskin helped form, is assisting with the project.

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"It was just great timing," said Guardiola-Diaz. She explained that she got her idea for the project when she and a neighbor who works for the Connecticut Department of Environmental Protection met at a house-warming party and began to talk about ways in which they could collaborate to help the city of Hartford. Henderson, meanwhile, was looking for a project that would allow the Chemistry Department to use a newly acquired piece of equipment known as an inductively coupled plasma emissions spectrometer. The tool is used in trace metal analysis.

"Hebe said, 'Let's do this together.' And I said, 'OK, fine.' I had no idea what this project was going to do to my schedule," said Henderson, who explained that the garden has absorbed almost all his free time this summer.

The college agreed to finance the project, giving the professors $37,000 from its Kellogg Community Innovation Fund to hire students and purchase supplies. The fund was established in May 1998 when the Kellogg Foundation awarded Trinity a $5.1 million grant to support Trinity's strategic commitment to building academic–community connections that emphasize civic responsibility and educational innovation.

The lot selected for the garden project totals 1.2 acres and is adjacent to the House of Bread, a nonprofit organization that operates a soup kitchen and temporary housing for the homeless on Chestnut and Edwards Streets in Hartford. It is across the street from the city's Quirk Middle School and within a short distance of the gold-domed state Capitol. The lot had formerly been the site of a paint store, accounting for the high levels of lead contamination in the soil. When the old paint store building was leveled several years ago, the debris was buried at the site, further contributing to the pollution problem.

The lot is owned by the city of Hartford, which had licensed it to the Hartford-based Knox Foundation for use as a community garden. The foundation intended to plant a community garden as it has done at several locations in Hartford, but it was prohibited from going ahead with its plans once the pollution was discovered. Up until then, neighborhood children also had been allowed to play in the vacant lot.

Working with city and state officials, the two Trinity professors became involved, suggesting the site as the location for their remediation project. Guardiola-Diaz also involved Phytotech, the biotechnology company based in Monmouth Junction, New Jersey, that provided the seeds and expertise for the research project. The company has tried its phytoremediation methods with some success in New Jersey, Ohio, and Massachusetts and near the Chernobyl nuclear reactor in the Ukraine. ASPP member Ilya Raskin of Rutgers University helped form Phytotech. Raskin earlier wrote a white paper on phytoremediation for ASPP that can be found at http://aspp.org/pubaff/phytorem.htm on the ASPP homepage.

"If Phytotech's methods work for us in Hartford, the firm can add us to its list of success stories," Guardiola-Diaz explained. "We also will provide new information on the use of Sudan grass and sunflowers, because there is not much experience with using these plants for remediation efforts in Connecticut, and this is important information."

The garden was planted in June after much difficult labor. Henderson and the students had to use 12-pound sledgehammers to break up old foundations and bricks so that a garden could be planted. The soil was so difficult to work with that the garden was limited in size to 60 feet by 80 feet. But once planted, the garden did well and the first harvest was completed in mid-July.

"We will use an electron microscope to look at the cells of the plants to see what's going on and to test the amount of lead they have absorbed," Henderson said. "We will probably do only two harvests this year, and then we will totally pull up the plants in the fall, sample the soil once again, and then totally replant next year."

The harvested plants include the roots, because the students and professors are not sure which part of the plants best absorbs the lead. Eventually, the plants are burned, and the ash is then disposed of as a hazardous waste. Currently, the students are making preparations for their second planting, toiling daily under the watchful eyes of neighbors. Perhaps not too surprisingly, the students have made many friends among the local residents, who stop by throughout the day to check on the garden and chat about the students' research. To keep neighbors informed, the students also have spoken to gatherings at the House of Bread.

"We're learning as we go along. None of us has ever done this before. I've gardened before, but never in bricks and rocks," Henderson said. "I don't know if we will be able to give the city a squeaky-clean lot, but our hope is to give the neighborhood a cleaner lot."

"This has been a great way to get our students learning and involved in the community," Guardiola-Diaz added. "The students have made presentations, and they talk to neighbors who stop by the garden. It has been a really rich experience of being involved in the community, helping out our neighbors, and learning. To a large extent, that is what we were after."

2000 Membership and Subscription Renewal Forms Will Be In the Mail SOON!

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Lagarias Appointed to Stumpf Professorship in Plant Biochemistry at UC Davis

Professor J. Clark Lagarias, Section of Molecular and Cellular Biology at the University of California, Davis, is the first faculty member appointed to the Paul K. and Ruth R. Stumpf Professorship in Plant Biochemistry (see *ASPP NEWS*, May/June 1999, page 17). The endowed professorship, which began in July and continues through June 2004, will help support Lagarias's teaching and research program in plant biochemistry.

Lagarias is known internationally for his seminal contributions to our understanding of the plant photoreceptor phytochrome. He made his first contribution to the field as a graduate student at the University of California, Berkeley, where he determined the structure of the phytochrome chromophore, phytochromobilin. In 1980, he joined the University of California, Davis faculty as an assistant professor in the Department of Biochemistry and Biophysics. Early in his academic career, Lagarias developed a purification protocol for isolating native, nondegraded phytochrome that facilitated research in many laboratories. He went on to study the conformational forms of phytochrome and the biosynthesis of phytochromobilin. Lagarias's laboratory has been a leader in research on the assembly of phytochrome from its apoprotein and chromophore. Perhaps most significant is his laboratory's recent discovery that phytochrome is a light-regulated enzyme. He and his research colleagues have shown that phosphorylation and dephosphorylation of phytochrome appear to be the initial steps of light signal transduction. This work has been a major breakthrough in understanding light-sensing signal transduction pathways in plants.

Lagarias has also shown that either phycocyanobilin or phycoerythrobilin can substitute for phytochromobilin in the phytochrome molecule. Both of these phycobilins can covalently bind with the phytochrome apoprotein. The adducts are intensely fluorescent, photostable, and chemically stable and can be reconstituted in living cells. Lagarias's laboratory is currently exploring the use of the adducts, named "phytofluors," in vivo as fluorescent probes.

Professor Emeritus Paul Stumpf and his wife, Ruth, established the endowed professorship in recognition of Paul Stumpf's deep ties to the University of California and his five-decade academic career in plant biochemistry. Stumpf was the founding chair of the Department of Biochemistry and Biophysics at University of California, Davis and a pioneer in research on plant lipid biochemistry.

Marvin Edelman Honored for Achievements

Marvin Edelman, Weizmann Institute of Science in Israel, recently received the degree of Doctor of Science, Honoris causa, from the University of Waterloo, Ontario, Canada, in recognition of illustrious achievements in plant research and education.

Dr. Edelman has a long, productive career of pioneering research. He has published more than 130 scientific papers, and his research is widely cited. The two major foci of his research have been plant molecular biology and bioinformatics. He was the first to isolate chloroplast DNA and then was among the first to map the chloroplast genome. He is well known for his contributions to the structure and function of photosystem II. His novel work has provided key insights into regulation of photosynthesis.

A decade ago, when the field of bioinformatics was in its infancy, Edelman became a pioneer and leader in this important discipline. Bioinformatics involves the application of advanced information technology to the international genome sequencing projects.

In service to the scientific community, Edelman has chaired a number of conferences, including the 2nd International Conference for Plant Molecular Biology. Following his early work with bioinformatics, he founded the European Molecular Biology Data Network in Israel. To bring this field to others, especially in Eastern Europe and Asia, he founded and heads the UNESCO International Center for Cooperation in Bioinformatics. He chairs the Advisory Committee of the European Bioinformatics Institute.

Book Collection for Sale

ASPP corresponding member Malcolm B. Wilkins is interested in selling his extensive collection of plant physiology and botanical books. The collection is very strong in plant physiology and includes a number of classical volumes that are no longer available.

Dr. Wilkins is happy to send a list of titles to anyone who is interested. You can reach him at The University of Glasgow, Department of Botany, Glasgow, G12 8QQ, Scotland; telephone +44-141-330-4450, fax +44-141-330-4447, e-mail m.wilkins@bio.gla.ac.uk.

Jaleh Daie Named Director of Science Program at the Packard Foundation

ASPP member Jaleh Daie, an internationally recognized scientist and professor, became the director of the Science Program for the David and Lucile Packard Foundation in July.

In announcing the appointment, Richard T. Schlosberg III, president and CEO of the foundation, stated, "We are delighted to have Jaleh Daie join the foundation to lead our Science Program. David Packard believed that a bright future for this country and the world depended on excellence in scientific research. We are glad that Dr. Daie will use her outstanding skills and experience to help direct resources to support scientific research, as well as to apply the lessons of science to address some of the pressing global problems targeted by the foundation's other programs."

In accepting the position, Dr. Daie said, "There is so much in our lives that rides on scientific and technological advances, and the Packard Foundation is uniquely positioned to be a catalyst for new ideas and innovation. I'm excited to join Packard's efforts to make a difference."

Dr. Daie will direct and manage the $67 million annual grant giving of the Science Program and will lead future planning of the program.

Most recently a professor at the University of Wisconsin–Madison, Dr. Daie has extensive experience in management, research, education, and policy in a variety of settings, including academia, government, and nonprofit organizations. Prior to joining the University of Wisconsin, Dr. Daie served as professor, department chair, and founding director of the Center for Interdisciplinary Studies in Sciences at Rutgers University. She also served as chair of the board of the Council of Scientific Society Presidents (CSSP), president of the Women in Science and Technology Alliance (WiSTA), and president of the Association for Women in Science. In 1983, Dr. Daie was appointed assistant professor of biology at Utah State University, where she earned her Ph.D. She serves on numerous advisory boards and is a recipient of many honors and awards, including fellow of the American Association for the Advancement of Science, Hall of Fame inductee of the Women in Technology International, and Henry Rutgers research fellow.

The David and Lucile Packard Foundation is a private family foundation created in 1964 by David Packard, cofounder of the Hewlett-Packard Company, and Lucile Salter Packard. The foundation provides grants in seven areas, including science, to nonprofit organizations operating at the national and international level.

Jaleh Daie, Science Program director, David and Lucile Packard Foundation.

Summer 2000 Research Opportunities in Japan, Korea, and Taiwan

The Summer Programs in Japan, Korea, and Taiwan (NSF 99-152), sponsored by the National Science Foundation, the National Institutes of Health/Fogarty International Center, and the U.S. Department of Agriculture/Agricultural Research Service, provide graduate students in science and engineering first-hand experience in Japanese, Korean, and Taiwan research environments; an introduction to the science and science policy infrastructure of the respective countries; and language and cultural training. The primary goals of the programs are to introduce students to Japanese, Korean, and Taiwan science and engineering in the context of a research laboratory and to initiate personal relationships that will better enable them to collaborate with foreign counterparts. The programs will run from mid-June to August.

ELIGIBILITY: Applicants must be U.S. citizens or permanent residents. They must be enrolled at a U.S. institution in a science or an engineering Ph.D. program, be enrolled in an M.D. program and have an interest in biomedical research, or be enrolled in, and have completed at least one full academic year of, a master's degree program at the end of the calendar year of application. Applicants must be pursuing studies in fields of science or engineering that are supported by NSF, NIH, or USDA and also are represented among the potential host institutions.

SUPPORT: International travel costs to and from Japan, Korea, or Taiwan, in-country living costs (accommodations, food, and professional travel), and an allowance of $2,500 for each participant will be provided.

DEADLINE: All application materials (including applicant's and recommenders' forms) must be postmarked by December 1, 1999. Mail to East Asia and Pacific Program, Room 935, Division of International Programs, National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230.

A full description of the Summer Programs is available at the NSF/Tokyo Web site at http://www.twics.com/~nsftokyo/. Direct questions to Dr. Christopher A. Loretz by e-mail (cloretz@nsf.gov) or by telephone (703-306-1701).

ASPP Education Forum

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News from the Educational Funding Front

A new set of programs instituted in the Division of Undergraduate Education (DUE) at the National Science Foundation (NSF) are of interest to plant biology faculty and departments because of the opportunities they offer to substantially improve programs and courses or to conduct outreach to the K–12 community. We have just completed the first cycle of funding in these programs and so can report on recently funded plant-related projects and the general impressions of NSF staff and the reviewers concerning the proposals received. The new programs are Course, Curriculum and Laboratory Improvement (CCLI) and NSF Graduate Teaching Fellows in K–12 Education (GK–12). The CCLI program has three foci: Adapt and Implement, Educational Materials Development, and National Dissemination.

The Adapt and Implement (A&I) focus of CCLI was designed to encourage faculty to benefit from the many good projects currently developed and to adapt them to suit their own situation. It is expected that proposals submitted to this program will cite specific antecedents for the proposed project and indicate why this project is being adapted and how the proposer will change it. Clear objectives and a viable evaluation plan are important. Funds are available for equipment to support new laboratory directions, faculty time and student efforts to develop new courses or curricula, documentation and evaluation of outcomes, and dissemination workshops. Institutions are required to provide half of the funds required for the projects submitted. Of the 121 biology A&I proposals submitted last November, 38 were funded, and of those, six concerned plant biology in some way. The amounts awarded varied from $32,000 to help establish an upper-division laboratory that offers students the ability to contribute to the current worldwide effort to sequence Arabidopsis to $139,000 to establish and maintain a mobile molecular biochemistry laboratory that will circulate to departments, such as botany and ecology, that now use molecular biology extensively but only recently incorporated these methods into the discipline. Undergraduate biochemistry/molecular biology students will help develop modules for these laboratories.

The Educational Materials Development (EMD) focus of CCLI was designed to help faculty develop materials that will be useful nationally and so require a plan for testing, marketing, and, if a Web site is an important component of the project, keeping the site current as new software and hardware platforms develop. Of the 26 biology EMD proposals submitted, 10 were funded, and six of those either focused on or related to plant studies. The amounts awarded varied from $74,000 to $320,000. The next CCLI competition will be June 2000. Check the DUE Web site (http://www.ehr.nsf.gov/EHR/DUE/start.htm) for the new program announcement and exact due dates for proposals.

The GK–12 program is designed to encourage mathematics, science, and engineering graduate students and their departments to establish ongoing programs with the elementary, middle, and high schools in their areas. The objective is to introduce students to the K–12 world; to help universities keep K–12 faculty knowledgeable about new ideas, findings, techniques, and interests in various science, mathematic, and engineering disciplines; and to help school districts keep university faculty and students current on activities at the K–12 schools. Funds are available for student stipends ($18,000 per annum for graduate students, and $10,000 for undergraduates), tuition (up to $10,500), the infrastructure to support the students, and programs to introduce the graduate students to current teaching methods and materials. Of the 152 GK–12 proposals submitted this June, 30 are being funded. None of these is specifically plant related, although many funded projects do include or originate from life science departments. The new program announcement and due dates for GK–12 proposals will be posted on the DUE Web site.

In addition, several projects funded in the past are now completing their activities and are beginning to disseminate their products. For example, the C-fern project has developed a number of products available from Carolina Biologicals as well as multimedia materials. Information about DUE-supported projects can be searched on the Project Information Resource System (PIRS: http://www.ehr.nsf.gov/PIRstart), which contains principal investigator–submitted information. General information concerning NSF projects is available on the NSF Awards Search Web site (http://www.nsf.gov/verity/srchawd.htm).

A list of projects funded and a short description of each is given below. The award numbers are an aid to those who would like to search for these projects on the Web.

Adapt and Implement

9950542 Mobile and Modular Multidisciplinary Biotechnology Laboratory, Peter J. Jankay, California Polytechnic State University, $139,428: A central facility is being established to help faculty in diverse disciplines introduce molecular biology techniques into their student laboratories.

9950557 Development and Implementation of an Investigative Laboratory Component for the Molecular Biology Course, Rachel Myerowitz, St. Mary's College of Maryland, $31,665: In this project, based on the prior work of Monroe and Knight (Council on Undergraduate Research Quarterly 16, 109–114; 1995), students isolate, characterize, and sequence clones from a cDNA library of *Arabidopsis thaliana* and then use GenBank DNA databases to determine the novelty of their clones.

9950624 The Great Salt Lake Project: Inquiry-Based Education for Preservice Teachers Using a Unique Regional Ecosystem, Bonnie Baxter, Westminster College of Salt Lake City, $36,428: Preservice teachers, in collaboration with master teachers and science faculty, are designing experimental modules centered around the unique ecosystem of the Great Salt Lake and creating a Web-based dissemination system that will help them use the materials as they begin teaching.

9950698 Conservation Genetics of Rare or Sensitive Species in Laboratories for Undergraduate and Secondary Students, Shane K. Sarver, Black Hills State University, $59,994: A collaboration between the Math and Science Center of Black Hills State University and Oglala Lakota College adopts a molecular biology approach to the study of rare and endangered local species, adapting a research-based approach first developed by the Black Hills State University Geology Department for use in the undergraduate biology curriculum.

9950930 Portfolio Writing in Introductory Biology Lab, Thomas W. Sasek, Northeast Louisiana University, $42,503: A portfo-

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lio-style laboratory notebook requiring considerable writing assignments and quantitative measurement is the basis for a cross-disciplinary collaboration between the English and Biology Departments that introduces long-term projects considering such topics as fern genetics and aquatic microsomes into an Introductory Biology course.

9972366 Curriculum Development for Ecology, Evolution & Conservation Biology, Donald K. Price, University of Hawaii, Manoa, $100,001: The unique biota of Hawaii is the basis for a field-based course that teaches the basic concepts of ecology and evolution by adapting the research design of an NSF-funded Hawaiian Rain Forest ecosystem study. This program incorporates materials developed and disseminated in an Undergraduate Faculty Enhancement project in Molecular Genetic Analysis Applied in Evolution, Ecology and Systemic Biology.

Educational Materials Development

9950522 C-Fern Educational Materials Development: Sporophystic and Genetic Applications, Les Hickok, University of Tennessee, Knoxville, $310,000: New strains of C-fern will be developed, expanding the usefulness of C-fern incorporation into inquiry-based exercises in undergraduate laboratories. Dissemination includes a Web site, workshops for university and grades 7–12 faculty, and development of a specific C-fern–based course for preservice teachers.

9950689 Biology Student Workbench: Inquiry Tolls for the Use of Molecular Data in Undergraduate Biology, Eric Jackobsson, University of Illinois at Urbana-Champaign, $319,710: A user-friendly interface is being created to the Biology Workbench, a suite of interactive tools currently used by researchers interested in studying sequence bioinformatics, structure, and ion movement across biological membranes. Faculty from a variety of institutions are developing modules illustrating the use of the databases for undergraduate modules investigating such topics as environmental remediation, biodiversity, and agricultural applications.

9950740 BIRDD Digital Library: Enhancing Evolution Education, John Jungk, Beloit College, $193,000: The Beagle Investigations Return with Darwinian Data (BIRDD) digital library will be expanded to include data on a variety of organisms, including plants. The site is also being improved to facilitate export to other systems and construction of interlinkages to promote analysis phylogenetically, spatially, and temporally.

9950928 An On-Line Virtual Reality Laboratory Linking Students to Research at the Coastal Studies Center, Carey R. Phillips, Bowdoin College, $74,260: A virtual reality world is being created as a mirror image of a coastal studies center near marine and forest ecosystems and is linked to research at those ecosystems. The design encourages students to interact and use large amounts of information while making interdisciplinary inquiries about real-world problems.

9972316 Mathematical and Computational Approaches to Molecular Biology, David C. Miller, William Patterson University, $74,699: Material is being produced for an undergraduate course that supports mathematical and computational approaches (statistics, combinatorics, computational concepts, graph theory, and basic topology) to molecular biology questions (sequence and structural analysis of DNA, RNA, and proteins).

9972486 An Inquiry-Based Simulation Learning Environment for the Ecology of Forest Growth, Thomas J. Murray, Hampshire College, $74,260: Educational tools are being developed to simulate tree and forest growth and the effects of human-created environmental disturbances on forest growth. Preservice students and in-service teachers are involved in testing the materials.

Terry S. Woodin
Program Director
National Science Foundation
Division of Undergraduate Education

The views expressed are those of the author and do not necessarily reflect those of the Division of Undergraduate Education, the Directorate for Education and Human Resources, or the National Science Foundation.

Susan Singer, who was editor of the Education Forum at its inception, contributed the following article on the history of the education efforts of ASPP. Those of us involved in today's education activities want to thank the pioneers in establishing an Education Committee for their efforts and accomplishments.

Celebrating 10 Years of Major ASPP Contributions to Plant Biology Education

This year we celebrate the 75th anniversary of ASPP, but we also have another exciting anniversary to celebrate and use as launch pad into the next millennium. In July 1989, ASPP funded a roundtable discussion in Denver, Colorado, on what ASPP's role in education could be. This meeting was held independently of our national meeting, and I believe it represented the first major financial commitment of the Society to education. Ellen Weaver and Bob Rabson organized this invitational workshop, which from my perspective was the key event that gave us sufficient momentum to begin moving into a major leadership role in plant biology education. I had the privilege of attending this meeting and remember being amazed by the energy and commitment of the participants, including Paul Williams.

I was actively involved as an Education Committee member and then chair through 1995. Since then, I have delighted in being a cheerleader on the sides and smile each time I renew my membership in ASPP as I contribute to the ASPP Education Foundation. My son celebrated his first birthday at the 1989 Denver meeting, and it has been a gift to watch who he has become in the past 10 years. Likewise, we have come such a very long way in educational reform at all levels over the past decade. I chose to write this piece to give some historical context so we can truly celebrate ASPP's major contributions to education. I also want to challenge us to look toward the next millennium with vision and creativity in the educational arena. My goal is to highlight milestones, and in doing so I acknowledge that I will not be able to mention all the contributions so many members have made. Also, I do not mean to imply that ASPP suddenly became educationally aware 10 years ago. Regional meetings have long nurtured students and recognized outstanding work by students. Rather, the anniversary I'm noting reflects the beginning of substantial financial and societal leadership commitment to education at the national level. Our efforts have been extraordinarily successful because so many have cared and generously shared their time, energy, and innovative ideas.

So, where have we been? Ellen Weaver tirelessly launched what was first called the Teaching Corner in the *ASPP Newsletter.* When I picked up this responsibility, we switched the column's title to Education Forum. Many members generously contributed information, including upcoming events, book reviews, educational grant opportunities, outreach activities, and lab ideas. When I rotated off the Education Committee, Bob Wise became editor and carried on the tradition with panache. Carol Reiss is now ensuring the continuity of this effort. With the advances in information technology, the education page of the ASPP Web site provides infinitely more ways for all our members to have access to current educational information.

This is also the fourth anniversary of Plant-Ed, a newsgroup moderated by Jon Monroe and myself (Jon has been the leader

in this endeavor) that has been a model of the best in education communication with now more than 4,000 archived "conversations." This ASPP initiative has pulled in plant biologists from many fields and societies. One of the signs of true leadership is pulling others into the conversation. Last year's "Toward Literacy in Plant Biology" workshop, cosponsored by ASPP and CELS (the Coalition of Educators in the Life Sciences), is a great example of this. A diversity of societies including the American Society of Agronomy, the American Phytopathological Society, the Crop Science Society of America, the Society for Developmental Biology, the Botanical Society of America, and the Association of College and University Biology Educators gathered to discuss plant biology literacy. ASPP's *Principles of Plant Biology* was key in launching the discussion. That then–ASPP president Ken Keegstra took the time to attend this workshop speaks volumes in terms of the commitment of ASPP leadership to education. This conversation continued at the August 1999 International Botanical Congress in St. Louis to develop an agenda for a July 2000 plant education workshop that will be part of a Project Kaleidoscope Undergraduate Science Education Institute in Keystone (hmmm . . . we're back to Colorado). I hope ASPP will play a major role in this and other efforts examining the future of plant biology education.

In addition to continuing and broadening the conversation about plant biology education, Ellen Weaver and Paul Williams started the now regular appearance of the Education Booth at our annual meeting. There have been many years during which we have had hands-on opportunities for members to explore new ideas for lab or classroom activities. Fast Plants helped us get started. Carol Reiss brought demos and a photosynthesis video created by Cornell students. When image analysis was just emerging, we had a demo at our Education Booth. I remember Joe Varner spending hours showing folks how to do tissue printing. Dina Mandoli had a computer-based presentation on how to make a great poster. We shared printed materials including a plant development lab I had edited and a plant physiology lab collection Jim Shinkle had edited. The Education Booth has become a home for members who are primarily engaged in teaching and might feel a bit detached from the Society's strong research emphasis. It also serves members who want to polish their teaching skills or try something new but have extensive time constraints because of their research. They appreciate having easily accessible materials at their research meetings. This has been complemented by many high-quality education poster presentations and, earlier on, oral education presentations. (That was the year my research and teaching talks were in concurrent symposia. I got a lot of exercise!)

Throughout the past decade, education symposia during our annual meetings have met the needs of diverse audiences. Career Options symposia, such as the one Dale Blevins organized, have been very well attended by graduate students and postdocs. We now have a breakfast for faculty who teach at primarily undergraduate institutions, thanks to Mark Brodl and others. This initiative led to the development of a listserv for these faculty to discuss research issues specific to the undergraduate environment (a beautiful example of how interconnected teaching and research really are). Terry Woodin helped out with a Grants Writing Workshop. We had Sheila Tobias speak on "Why Students Leave Science." Ken Bain, director of the Searle Center for Teaching Excellence at Northwestern University, shared his research on "What the Best Teachers Do" and how this relates to what is known in the learning sciences. We led the way among professional societies in having a "prime time" education symposium of general interest to all members. The first such symposium in the mid-1990s featured Sharon Long speaking on "Improving Science Literacy and Science Education at the University Level," Jo Handelsman sharing her experiences with "Biology Brought to Life: A Case for Local Action and Global Thinking," and Hector Flores offering his thoughts on "Seeds of Change: Soul Searching Through Undergraduate and Graduate Teaching." I am particularly grateful to Ralph Quatrano, Bob Buchanan, and Jim Siedow (ASPP presidents while I chaired the Education Committee) for providing the leadership necessary to give education credibility and presence at our national meetings and on the ASPP agenda. I am awed by their commitment and persistence in giving birth to the ASPP Education Foundation, which positions ASPP to actualize education visions as we move into the next century. I reread the vision statement the ASPP Education Committee created in 1994. That vision is well on its way to being fully realized. The continuity of educational commitment within ASPP (and wonderful staff support provided by many, including Brian Hyps) gives me confidence that even clearer and broader visions will continue to emerge and be implemented.

One of the big challenges for plant biology education is to professionalize teaching as a scholarly activity. While we have many informal ways to exchange ideas (for example the Web, Plant-Ed, and the Education Forum), sharing scholarly work in a way that is credible to our institutions and reaches an audience that is inundated with research journals is a challenge. This issue was one I was particularly concerned about, and I worked with Bob Buchanan to obtain a grant from NSF to support a workshop on plant biology education publication in December 1994. Jim Siedow and I were delighted that the outcome was that Maarten Chrispeels, editor-in-chief of *Plant Physiology,* agreed to publish high-quality education articles in the journal. Please consider submitting your scholarly education work to *Plant Physiology.*

For the past decade, ASPP has taken its responsibilities for informal and precollege education seriously and productively. One of the very first outcomes of the Denver meeting was an ASPP Fast Plants Workshop in Madison fully funded by ASPP. Actually, I think my first Education Committee "job" was to organize this workshop with Paul Williams. I was just looking at a rather dated video of the event that John Greenler had coordinated and shown at one of our Education Booths. Wow! How wonderful to see the enthusiasm of the ASPP participants and their desire to go out into the broader community to spread the word about plants. Dina Mandoli created the wonderful "Cube" as an alternative to traditional careers brochures for high school students and organized a high school teachers workshop entitled "From Soup to Nuts" at one of the annual meetings. She also has provided advice for the Magic School Bus on behalf of ASPP. In 1994, we piloted a collaborative effort with the Frederick District in Maryland with Doug Luster's guidance. We learned a great deal about K–12 teachers. Bringing a past National Association of Biology Teachers president and high school teacher, Barb Schulz, and the Frederick superintendent to an Education Committee meeting also helped get us on track. I'm thrilled that ASPP now goes to meetings of the National Science Teachers Association. Of course, the Epcot exhibit funded by the Education Foundation is absolutely off the charts in terms of educational impact!

Where are we going next? As fantastic as this is, it is important to remember that every time one of us enters an introductory biology classroom, we have the opportunity to educate not only future biologists, but also future precollege teachers, policymakers, and citizens. Your course may be the only college-level science class a student takes, and 58 percent of the introductory biology in this country is taught in commu-

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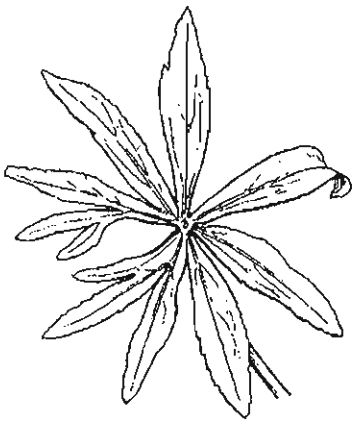
nity colleges. There are so many different ways to contribute to plant biology literacy, and ASPP is working diligently to support members in many different venues.

ASPP recognizes the diversity of contributions members make to plant biology education through the ASPP Teaching Award. This award became a reality because of Ellen Weaver's efforts. Award recipients Paul Williams, Carl Pike, and Carol Reiss epitomize the range of education activities our Society supports—from mentoring graduate students while developing probably the most successful precollege plant education outreach program (Fast Plants), to committing to a career in educating undergraduates, to providing outstanding laboratory instruction in plant physiology while mentoring teaching assistants. All these individuals have also provided significant leadership through the ASPP Education Committee. In honoring them, we celebrate the contributions of all our members who value education. Happy 10th birthday ASPP Education Committee! I can't wait to see where we will go in the next decade!

Susan Singer
Carleton College
Northfield, Minnesota

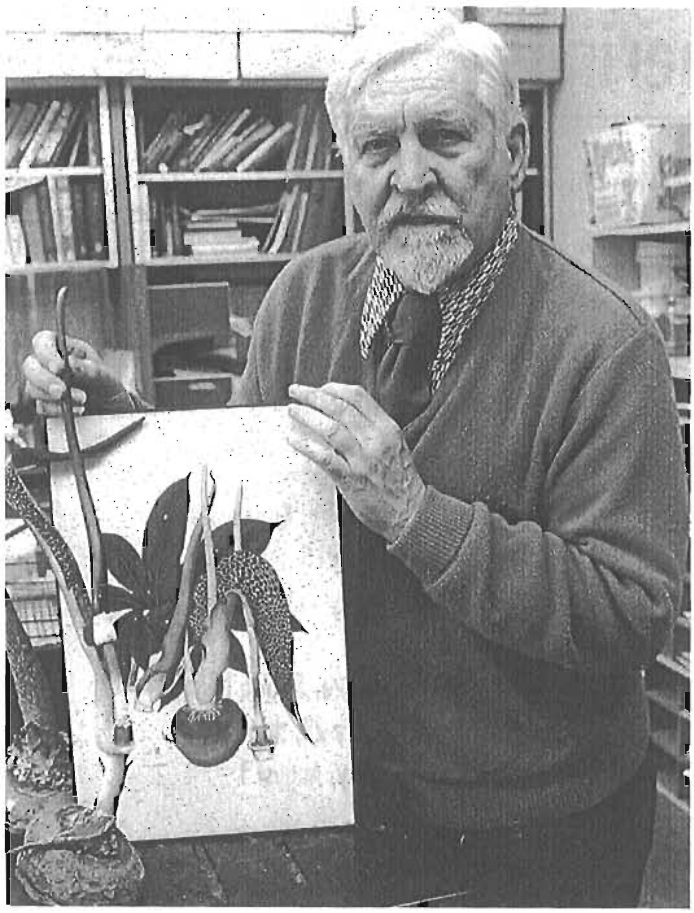


Bastiaan J. D. Meeuse

Professor Emeritus and ASPP member Bastiaan J. D. Meeuse died of pneumonia in Kirkland, Washington, on July 27, 1999, at the age of 83. He was born May 9, 1916, in Sukabumi, Java, where his parents were school teachers; attended high school in the Netherlands; and then studied biology at the University of Leiden, where he received a B.Sc. in 1936. He completed his doctoral studies with Professor C. van Iterson at the University of Delft, where he studied the formation of sucrose from starch in plants at low temperatures, receiving the doctor's diploma cum laude in 1943. During this period he also worked with the noted animal behaviorist Niko Tinbergen to study the courtship behavior of butterflies. He spent some time with the underground forces before being able to return to Delft in May 1945, becoming van Iterson's chief assistant.

From 1947 to 1949, Prof. Meeuse was on a Rockefeller Fellowship working with David Goddard at The University of Pennsylvania on pea seed metabolism. He then returned to Delft, where he was acting head of the Biochemical Laboratory, working with students on a number of metabolic studies.

In 1952, he joined the Botany Department at the University of Washington, Seattle, as an assistant professor, rapidly advancing to full professor by 1960. There he worked for several years in enzymology, especially in definitive studies of the highly heat resistant moss oxalic acid oxidase. He next undertook the endeavor that dominated his attention for several decades: the thermogenic respiration of the spadix of *Sauromatum guttatum*, with its production of odoriferous volatile amines that attract carrion fly and beetle pollinators. His broad interest in insects and pollination led to the writing of the classic book *The Story of Pollination* (1961) and later on *The Sex Life of Flowers* (1984) and to the scientific support for the popular Oxford University film *Sexual Encounters of the Floral Kind*. Bas Meeuse's unique character is illustrated by his work to elucidate the nature of "calorigen," a term van Herk coined in 1937 for the plant substance that promotes a dramatic thermogenic response in the voodoo lily floral spadix. His persistence led in the late 1980s to the discovery that calorigen was actually salicylic acid, a compound now known to play many roles in plant physiology and defense. Remarkably, Meeuse's success in finishing this chapter of his research was achieved not with federal grant support, but rather through collaboration with colleagues who shared his clear vision and appreciation of the importance of studying a remarkable process in an unusual plant.



Bastiaan Meeuse with a flowering voodoo lily, *Sauromatum guttatum*. Courtesy of the University of Washington.

Along with the activities mentioned above, Bas Meeuse was a stimulating teacher, naturalist, and source of wisdom and guidance for students and others around him. In lectures, Bas would often pause and put his right index finger to his lips. His eyes would twinkle, and once again the class would be mesmerized by another yarn, spun by a master . . . not only as biologist but as a genuine raconteur, a man who loved life and who saw infinity in a grain of sand.

Bas was also a popular lecturer to garden and nature-oriented public groups and author of many popular articles on a wide variety of biological subjects. At the same time, he was a devoted husband, father, and grandfather and a warm and valued friend to a host of scientists around the world, all of whom will miss him very much, both in a serious vein and for the hand-written letters angled up the pages and the self-deprecating witticisms as well.

Dick Walker, Steven Bressler, and
Hannah Skubatz
University of Washington

Terrence Delaney
Cornell University

William G. Nolan

ASPP headquarters was recently informed of the death of William G. Nolan. Professor Nolan was a director of UGS at Georgia State University. He had been a member of ASPP since 1967.

Gatherings

The *ASPP NEWS* publishes dates, titles, locations, and contact names and addresses for meetings, courses, seminars, and the like that are of interest to ASPP members. Submit announcements via e-mail to sbraxton@aspp.org or mail to Sylvia Braxton Lee, *ASPP NEWS*, 15501 Monona Drive, Rockville, MD 20855-2768 USA. **Faxed transmissions are not accepted.**

FUTURE ASPP ANNUAL MEETING SITES

2000: San Diego, California
Saturday, July 15, through
Wednesday, July 19

2001: Providence, Rhode Island
Saturday, July 28, through
Wednesday, August 1

1999

OCTOBER

October 6–14
Optical Microscopy and Imaging in the Biomedical Sciences
Short Course
Marine Biological Laboratory
Woods Hole, Massachusetts
For information, contact Carol Hamel, Admissions Coordinator, Marine Biological Laboratory, 7 MBL Street, Woods Hole, MA 02453-7401; telephone 508-289-7401, e-mail admissions@mbl.edu, Web site http://www.mbl.edu.

October 10–13
The 9th Gatlinburg Symposium
University of Tennessee, Knoxville
For information on the scientific program, contact Dr. Barry D. Bruce at 423-974-4082 or bbruce@utk.edu. For conference details and registration information, contact Ms. Susan Davis, 212 Conference Center Bldg., Henley Street, University of Tennessee, Knoxville, TN 37996; telephone 423-974-0280, e-mail susandavis@utk.edu.

October 20–22
Autumn School "Biosynthesis and Differentiation of Plant Storage Organs and Products"
Wageningen, The Netherlands
Organizers: D. Vreugdenhil and R.G.F. Visser. Contact Dick Vreugdenhil: fax +31-317-484740, e-mail dick.vreugdenhil@algem.pf.wau.nl. Scientific program and registration: http://www.spg.wau.nl/pf.

October 30–November 2
3rd México-US Symposium
"Plant Biology at the End of the Second Millennium, a Bilateral Overview"
Mérida, Yucatán, México
For information, contact Teresa Hernández-Sotomayor Ph.D. at ths@cicy.mx or see Web site at http://www.cicy.mx/index.html.
Sciences, University of Hyderabad, Hyderabad - 500 046, India; telephone +91-40-3010265, fax +91-40-3010 120 or 145, e-mail iclsnm@uohyd.ernet.in, Web site http://www.uohyd.ernet.in/curr/slconf.htm.

2000

JANUARY

January 13–14, 2000
Agricultural Microbes Genome I Conference
San Diego, California
Information on the meeting (including online registration forms and abstract instructions) is available at http://www.ag-microbial.org/.

FEBRUARY

February 20–24, 2000
World Congress of Young Farmers Conference
Orlando, Florida
For information check the Web site at http://www.fb.com/world. To contact please e-mail bhmgmt@aol.com or call 630-323-6880.

MARCH

March 5–9, 2000
New Frontiers in Plant Science and Plant Biotechnology
Toulouse-Labège, France
Detailed information and preliminary registration form can be found at http://ambre.toulouse.inra.fr/ifr/NewFrontiers/welcome.html. Or contact Christine Guidice, BP17 Auzeville, F 31326 Castanet Tolosan, France; telephone +33-5-62-19-35-31, fax +33-5-62-19-35-02, e-mail newfront@cict.fr.

March 26–29, 2000
The 5th International Conference on "Plasma Membrane Redox Systems and Their Role in Biological Stress and Disease"
Hamburg, Germany
Detailed information about the conference and a form to receive the first circular can be found at http://www.rrz.uni-hamburg.de/biologie/ialb/redox2000/redox.htm. You can also contact the organizers by sending e-mail to REDOX2000@botanik.uni-hamburg.de or contact M. Böttger, O. Döring, and S. Lüthje, Institut für Allgemeine Botanik, Ohnhorststr. 18, D-22609 Hamburg, Germany; telephone +49-40-82282-345 /348, fax +49-40-82282-254.

March 27–29, 2000
Cellular Compartmentation of Plant Metabolism
Society for Experimental Biology Annual Conference
Exeter University, United Kingdom
Organizers: C. G. Bowsher, S. A. Hill, A. K. Tobin, R. Walker. For information contact Dr A. K. Tobin, School of Biology, Sir Harold Mitchell Building, University of St. Andrews, St. Andrews, Fife, KY16 9TH, U.K.; fax +44-1334-363366, e-mail at6@st-andrews.ac.uk, Web site http://www.demon.co.uk/SEB/meetings/2000/ExeterSessions.html. Entry form deadline is October 18, 1999.

APRIL

April 1–5, 2000
The XVI International Congress on Sexual Plant Reproduction
Banff, Alberta, Canada
Coorganizers: Dr. D. D. Cass, University of Alberta (d.cass@ualberta.ca) and Dr. V. K. Sawhney, University of Saskatchewan (sawhney@admin.usask.ca). For information, check our Web site at http://www.usask.ca/biology/spr/.

April 11-13, 2000
MICRO 2000
International Microscopy Conference & Exhibition
Hammersmith, London
For registration forms and information, contact Royal Microscopial Society, 37/38 St. Clements, Oxford OX4 1AJ, United Kingdom; telephone +44-1865-248768, fax +44-1865-791237, e-mail for conference information rebecca@rms.org.uk, e-mail for exhibition information allison@rms.org.uk, Web site http://www.rms.org.uk.

MAY

May 13–18, 2000
Auxin 2000
Ajaccio, Corsica
Organizers: Alan Jones, Catherine Perrot-Rechenmann, and Mark Estelle. For information on the speakers, venue, application for participation, and estimated costs, visit the Web site at http://www.isv.cnrs-gif.fr/CR/aux2000 or contact alan_jones@unc.edu.

May 14–18, 2000
World Congress for Soilless Culture on Agriculture in the Coming Millennium
Kibbutz Ma'ale Ha'chamisha, Israel
For information, contact the Congress Secretariat, Ortra Ltd., 1 Nirim Street, PO Box 9352, Tel Aviv 61092, Israel; telephone +972-3-6384444, fax +972-3-6384455, e-mail soil@ortra.co.il.

May 14-19, 2000
10th International Symposium on Iron Nutrition and Interactions in Plants
Houston, Texas
Organizing Committee Chairman: Michael A. Grusak. For information, contact Stancia Pemberton, USDA/ARS Children's Nutrition Research Center, 1100 Bates Street, Houston, TX 77030; telephone 713-798-7020, fax 713-798-7078, e-mail stanciap@bcm.tmc.edu.

JUNE

June 11–16, 2000
International Symposium on Grapevine Physiology & Biotechnology Heraklion
Crete, Greece
For information, contact Professor K. A. Roubelakis-Angelakis, Department of Biology, University of Crete, PO Box 2208, 71409 Heraklion, Greece; telephone/fax +30-81-394459, e-mail poproube@biology.uch.gr. Also, visit the symposium Web site at http://www.biology.uch.gr/meetings.

OCTOBER

October 3–6, 2000
Workshop: The Role of Invertases in Plant Carbohydrate Partitioning and Beyond
University of Regensburg, Germany
For information and registration, contact Thomas Roitsch, Lehrstuhl fuer Zellbiologie und Pflanzenphysiologie, Universitaet Regensburg, 93040 Regensburg, Germany; telephone +49-941-943-3021, fax +49-941-943-3352, e-mail thomas.roitsch@biologie.uni-regensburg.de, Web site: http://www.biologie.uni-regensburg.de/invertase/.

ASPP Placement Service

This form may be used only by members of the American Society of Plant Physiologists.
Please print or type your placement information on this form (curriculum vitae will not be accepted) and send it to
Donna Gordon, ASPP Headquarters, 15501 Monona Drive, Rockville, MD 20855-2768

LAST NAME _____ TITLE _____ FIRST NAME _____ INITIAL _____

STREET ADDRESS _____

CITY _____ STATE _____ ZIP _____ COUNTRY _____

TELEPHONE _____ FAX _____ E-MAIL _____

I am seeking the following position (check all that apply):

[ ] Permanent [ ] Temporary [ ] Postdoctoral [ ] Industrial
[ ] Academic [ ] Government [ ] USA only [ ] Outside USA

US citizen? [ ] Yes [ ] No **Date available:** _____

Fields of interest, specialties, and publications titles: _____

Thesis, dissertation topics, professor: _____

Professional societies and honors: _____

Degree/year	Major	Minor	College/university and its location

Postdoctoral study (specialty and with whom, where, when): _____

Employer and location	From	To	Position, Title, Duties

References (names, addresses, telephone numbers):

ASPP Job Placement Service

I. Registering with the ASPP Placement Service and Obtaining Placement Files

ASPP headquarters in Rockville, Maryland, operates a placement service in which are kept active two files of resumes of individuals who are seeking employment. Employers are urged to survey the resume files for those seeking permanent positions and those seeking postdoctoral or similar positions. The files cost $25 each and may be ordered from Donna Gordon, ASPP Placement Service, 15501 Monona Drive, Rockville, MD 20855-2768 USA. Those seeking employment should complete the Placement Service Form on the facing page to be included in the service.

II. Placing a Position Ad in *ASPP NEWS* and on the ASPP World Wide Web Homepage

Submit all ads by e-mail to Sylvia Braxton Lee at sbraxton@aspp.org (or by mail to Sylvia Braxton Lee, 15501 Monona Drive, Rockville, MD 20855-2768; **FAXED ADS ARE NOT ACCEPTED**). A fee of $150 for print, Web, or both is charged for all academic/government/industry permanent positions and for all positions, regardless of rank, posted by private companies (private nonprofit companies are not charged a fee). If a fee is charged for your ad, please include billing information at the time the ad is submitted.

- **Academic/Government/Industry Permanent Positions (Ph.D.)**: Limited to 200 words; ad will run 12 weeks on the Web and appear in one issue of *ASPP NEWS*. (If the ad runs only on the Web, the word limit is waived.)
- **Postdoctoral Positions** and **Research/Technical Positions (non-Ph.D.)**: At universities and government installations, limited to 100 words; at private companies, limited to 200 words. Ad will run 12 weeks on the Web and appear in one issue of *ASPP NEWS*. (If the ad runs only on the Web, the word limits are waived.)
- **Assistantships, Fellowships, Internships, etc.**: Announcements of programs and fellowships or internships for students seeking advanced degrees run at no charge and without a word limit. They will run two times in *ASPP NEWS:* the first time, they will run at full length; the second time, they will include location, contact name, and address, with a reference to the original posting. These announcements will run on the ASPP World Wide Web homepage for 12 weeks from the date of posting.

ACADEMIC/GOVERNMENT/INDUSTRY PERMANENT POSITIONS (Ph.D.)

Assistant Specialist
University of California, Davis
(Received 07/06)

An assistant specialist position is available in Cooperative Extension (100%). Candidates will be expected to evaluate and extend research-based information that incorporates principles of sustainable production into Integrated Crop Management Systems for perennial fruit and nut crops in California, and function as the lead specialist for cooperative extension programs associated with almond and walnut production. Candidates must have a Ph.D. degree in ecology, horticulture, agronomy, soil science, plant nutrition, water science, or closely related discipline; demonstrated ability or potential to conduct independent research in agricultural systems; commitment to effective outreach; excellence in written and oral communication; a record of scholarly and academic achievement; computer literacy; the ability to work effectively with extension colleagues, faculty, staff, and numerous clientele groups. Send curriculum vitae; transcripts if less than five years since graduation; copies of published and in-press articles; description of current and projected extension and research interests relative to this position; summary of teaching interests and experience; and names and addresses of at least three references to Prof. Steven A. Weinbaum, Department of Pomology, One Shields Avenue, University of California, Davis, CA 95616-8683. Closing date: October 15, 1999. For additional information about the department visit our web site at http://pom.ucdavis.edu. The University of California is an affirmative action/equal opportunity employer.

Scientist
J. Blaustein Institute for Desert Research
Ben-Gurion University
Sede-Boker Campus, Israel
(Received 07/13)

A tenure-track position is available at the Albert Katz Department of Dryland Biotechnologies (DDB). The DDB is offering a tenure-track position for a scientist with a strong background in plant physiology and/or plant molecular biology. The candidate will be expected to work with other members in the department studying adaptation mechanisms of plants to arid environments. Specific research goals relate to plants' response to desert environment and/or the special growth conditions existing in controlled environment greenhouses. Another aspect of the mission is study of carbon dioxide enrichment, temperature extremes, and other related growth physiology problems that plants encounter under these circumstances. Interested persons are requested to send their curriculum vitae, including list of publications and the names and addresses of at least three references, as well as a tentative work plan (one to two pages) describing suggested approaches to these research topics to Prof. Sammy Boussiba, Head, The Albert Katz Department of Dryland Biotechnologies, Ben-Gurion University of the Negev, The Jacob Blaustein Institute for Desert Research, Sede-Boker Campus 84990, Israel; telephone +972-7-6596795, fax +972-7-6596802, e-mail sammy@bgumail.bgu.ac.il.

Faculty Position
University of Missouri—Columbia
(Received 07/14)

The successful candidate is expected to conduct a vigorous, extramurally funded research program applying genomics to understanding how gene sequences, combinations, and expression patterns relate to development, variation, and phenotypes in maize. Excellence in teaching at the graduate and undergraduate levels is required. The successful candidate will participate in the vibrant Maize Biology Research Group, which is part of the rapidly expanding plant genomic initiative at the University of Missouri. The position is provided with a generous start-up package and will be located in a newly renovated laboratory designed specifically for genome analysis. Appointment at assistant (tenure-track) / associate/full professor levels will be considered. College/departmental affiliation will be based on the program and preferences of the successful candidate. Target date is October 15, 1999.

THE DEADLINE FOR ADS FOR THE NOVEMBER/DECEMBER ISSUE OF *ASPP NEWS* IS OCTOBER 30, 1999.
Check ASPP's World Wide Web site (http://aspp.org/JOBS/) every Friday for new job listings.
Jobs with early application deadlines are listed on the Web site, but might not appear in *ASPP NEWS*.

Interested candidates should send a letter including both research and teaching philosophy, curriculum vitae, and contact information of three references to Dr. Joe Polacco, Chair of Maize Functional Genomics Search, 117 Schweitzer Hall, University of Missouri, Columbia, MO 65211. MU is an equal opportunity/affirmative action/ ADA institution.

Assistant Professor
University Of California, Riverside
(Received 07/26)
The Department of Biochemistry invites applications for a tenure-track position of assistant professor of biochemistry. Qualifications for the position include a strong potential for imaginative research in plant molecular biology. Individuals whose scholarship is broadly in the areas of the biochemistry and molecular genetics of signal transduction, gene expression, cell differentiation, or environmental stress response are strongly encouraged to apply. A strong commitment to teaching excellence at both undergraduate and graduate (M.S. and Ph.D.) instruction is required. The position also includes appointment in the Agricultural Experiment Station. Applicants must hold a Ph.D. or equivalent degree and have postdoctoral experience. Salary will be commensurate with education and experience. Submit a curriculum vitae, bibliography (including three reprints), and a brief (limit of 500 words) description of proposed research interests. Send three to five original letters of reference to be sent separately to Chair of Search Committee, Department of Biochemistry, University of California, Riverside, CA 92521-0129. Applications may also be sent by fax to 909-787-4774, followed by a hard copy sent by mail. Evaluation of applications will begin October 1, 1999, but the position will be open until filled. The University of California is an equal opportunity/affirmative action employer.

Professor
University of Berne, Switzerland
(Received 08/16)
The Institute of Plant Sciences of the University of Berne, Switzerland, invites applications for the position of professor of molecular plant physiology starting September 1, 2000. The successful applicant will establish an independent research program, participate in the teaching at the institute at all levels, and perform administrative duties. Applications with a curriculum vitae and list of publications, together with a short outline of research intentions, are to be submitted before November 1, 1999, to Professor A. Pfiffner, Dean of the Faculty of Science, Sidlerstrasse 5, CH-3012, Berne, Switzerland. The University of Berne especially encourages qualified women to apply for this position. Further information can be retrieved from the Web site at http://www.botany.unibe.ch/piub.

Research Leader
USDA National Arboretum, Beltsville, Maryland
(Recevied 08/16)
The USDA National Arboretum is accepting applications for a highly qualified individual with an established research record who will serve as research leader of the Floral and Nursery Plants Research Unit. Responsibilities include identifying high-priority research programs and obtaining support from the government and industry in the diverse areas of genetics, physiology, pathology, entomology, systematics, and germplasm development. As research leader, the incumbent supervises a staff of approximately 47 employees that includes about 14 Ph.D. scientists in four locations. Applicants must have demonstrated their ability to guide and provide leadership to diverse research programs. The research leader is responsible for conducting a personal research program related to nursery and floral plants and coordinating research among the scientists. Applicants require a degree in a field of science that is related to horticulture/botany such as genetics, plant pathology, systematics, or physiology. Salary is commensurate with experience and ranges from $68,570 to $104,851 per year. This is a full-time permanent position, and applicants must be U.S. citizens. For application procedures and qualification requirements, applicants must request a complete copy of the government vacancy announcement (announcement number ARS-X9E-9405) by contacting 301-504-1351 or by downloading the full test announcement from the ARS Web site at http://www.ars.usda.gov. Applications must be postmarked by November 22, 1999. The USDA is an equal opportunity employer.

Faculty Positions
University of Pennsylvania, Philadelphia
(Received 08/27)
The Department of Biology expects to make two tenure-track appointments, one in ecology and one in plant biology. **Ecology:** we are seeking a broadly trained ecologist whose research has implications for understanding large-scale processes and patterns in ecology. The ideal candidate will complement and interact with existing faculty whose strengths lie in population and community ecology and evolutionary biology. **Plant Biology:** individuals using molecular, genetic, biochemical, and/or biophysical approaches to study the mechanism(s) of basic plant processes are encouraged to apply. The successful candidate will also become an active member of the Plant Science Institute. Candidates will be expected to teach at the undergraduate and graduate levels, in addition to maintaining a vigorous, independent research program. We expect that the two appointments will be at the assistant professor level; however, outstanding senior applicants will also be given serious consideration. Applicants should send a curriculum vitae, at least three letters of recommendation, and up to three reprints or manuscripts to Chair, Ecology or Plant Biology Search Committee, Department of Biology, University of Pennsylvania, Philadelphia, PA 19104-6018. Review of applications will begin on October 1, 1999. Further information on the Department of Biology can be found at http://www.sas.upenn.edu/biology The University of Pennsylvania is an affirmative action/equal opportunity employer. Women and minorities are encouraged to apply.

POSTDOCTORAL POSITIONS

Postdoctoral Position
Stockholm University, Sweden
(Received 07/01)
A two-year postdoctoral position is open in the Department for Biochemistry, Arrhenius Laboratories, at Stockholm University, on a project concerning the development and biogenesis of the chloroplast. Using a proteomics approach, involving two-dimensional electrophoresis and mass spectrometry (MALDI-TOF and ESI-MS/MS), we are currently identifying all proteins in the thylakoid membrane as well as the up-and-down regulation of thylakoid proteins under environmental stress. The function of the newly identified proteins will be identified by PCR-based screening of Arabidopsis mutant collections and by biochemical characterization and reconstitution. Currently, we are particularly focusing on the targeting, insertion, and assembly of the chloroplast-encoded thylakoid membrane proteins. We are also reconstituting these processes using a homologous chloroplast translation system (Nilsson, Brunner, Hoffman, and van Wijk, EMBO J. 18, 733–786; 1999). Applicants with a strong background in biochemistry/molecular biology should send their curriculum vitae and the names of three references by e-mail to Klaas Jan van Wijk, e-mail klaas@biokemi.su.se.

Postdoctoral Position
University of Edinburgh, United Kingdom
(Received 07/02)
A three-year postdoctoral position is available to join a BBSRC-funded research program employing structural and functional genomics approaches to investigate the molecular basis of disease resistance in Arabidopsis. The successful candidate will join a well-equipped institute possessing an excellent research environment in which plant disease resistance is a major theme. The institute received the top grade at the last UK research assessment exercise. Edinburgh is a beautiful and dynamic city in which to live and offers easy access to the Scottish Highlands and Islands. Applicants should be highly motivated, with experience in molecular biology essential and expertise in genetics or plant pathology advantageous. Salary will be on the RA1A scale (stlg15,735–stlg23,651/$25,176–$37,842 per annum) depending on age and experience. Informal inquiries should be made to Gary Loake, telephone 0131-650-5332, fax 0131-650-5392, e-mail gloake@srv0.bio.ed.ac.uk. Applicants should send a CV and the names and addresses of two academic referees to Dr. Gary Loake, University of Edinburgh, Daniel Rutherford Building, Institute of Cell and Molecular Biology, King's Buildings, Mayfield Road, Edinburgh EH9 3JH, UK.

Postdoctoral Fellowship
Cornell University, Ithaca, New York
(Received 07/02)
A position is available to investigate the molecular processes controlling fruit development using tomato and Arabidopsis as model systems. The successful candidate should have demonstrated experience in molecular biology and an interest in

development. Background: fruit-bearing domesticated plants are taxonomically diverse, yet they all share a common feature—the edible portion of the plant (ovaries) has undergone a tremendous increase in size and shape variability (up to 1,000x) compared with their wild progenitors. For example, the wild ancestors of cultivated tomato bear fruit weighing only a few grams. In contrast, a single fruit from a modern tomato variety may contain many ovaries and weigh up to 1,000 grams. Until recently, it was difficult, if not impossible, to identify the genes controlling fruit growth, because this is a polygenic trait. Using a QTL approach, we have mapped most of the loci controlling both fruit size and shape in tomato (PNAS **93**,15503; Grandillo et al., in press). We have begun to clone them (two have been isolated thus far: Frary et al., in preparation; Ku et al., in preparation) and to study their regulatory/developmental/interactive properties and to investigate the role of homologous genes in other plants, including Arabidopsis The successful candidate will join a team of approximately 10 graduate students and postdocs working on related projects and will have access to a large infrastructure of genomic and computational tools available at Cornell University (http://www.genomics.cornell.edu/). There will also be opportunities to become familiar with microarray technology for transcript analysis, bioinformatics, and various genetic approaches (including QTL analysis) for gene isolation and functional analyses. Applicants should send or e-mail curriculum vitae and names and e-mail addresses of at least three references to Dr. Steven Tanksley (sdt4@cornell.edu), 252 Emerson Hall, Cornell University, Ithaca, NY 14853.

Postdoctoral Position
University of Arizona, Tucson
(Received 07/14)
A postdoctoral position is available to study calcium channel activity and regulation during moss development (Schumaker and Dietrich, Plant Cell **9**, 1099; 1997 and ARPP, PMB **49**, 501; 1998). The successful candidate must have a Ph.D. in biophysics or related discipline and extensive training and a proven record (publications) in using patch–clamp technology to study plant membrane transport. The work will complement biochemical studies that have identified a moss plasma membrane calcium transport activity that is potentially regulated by voltage, hormones, modulators of animal cell "L"-type calcium channels, and heterotrimeric GTP-binding proteins (Schumaker and Gizinski, PNAS **90**, 10937; 1993. JBC **270**, 23461; 1995. JBC **271**, 21292; 1996). Qualified applicants should send a curriculum vitae, brief description of interest and previous research experience, and names of three references (including e-mail and telephone numbers) to Dr. Karen Schumaker, Department of Plant Sciences, University of Arizona, Tucson, AZ 85721; telephone 520-621-9635, e-mail schumake@ag.arizona.edu. The University of Arizona is an equal opportunity/affirmative action employer.

Postdoctoral Position
University of Arizona, Tucson
(Received 07/14)
A postdoctoral position is available to study the function of phloem proteins and the expression of altered phloem proteins in transgenic plants. The successful candidate should have demonstrated experience in molecular biology, including techniques for protein and mRNA localization or plant transformation, and have a strong interest in vascular development. Applicants must have a Ph.D. in plant biology or related field and be eligible to work in the United States upon employment. Applicants should send a curriculum, statement of research accomplishments, and names and e-mail addresses of three references to Dr. Gary Thompson, 303 Forbes, Department of Plant Sciences, University of Arizona, Tucson, AZ 85721; e-mail garyT@u.arizona.edu. The University of Arizona is an EEO/AA employer-M/W/D/V.

Postdoctoral Position
University of Georgia, Athens
(Received 07/15)
A USDA-NRI supported postdoctoral position (or possibly two) is available for the study of *Ustilago maydis* morphogenesis and pathogenicity. Genetic and/or molecular biological approaches are being employed to identify genes involved in these processes. *U. maydis* is a highly tractable system, and its host, maize, is one of the best studied genetic systems in plants. The laboratory is located in Athens, Georgia, in the Department of Plant Pathology at the University of Georgia. The University of Georgia has an exceptionally strong set of programs related to fungal genetics and mycological research that will aid interested researchers. Motivated, team-oriented researchers are encouraged to apply. The position is available for a minimum of two years. For relevant publications see http://mars.cropsoil.uga.edu/ppath/gold.htm and for additional details please contact Scott Gold at sgold@arches.uga.edu. If interested in applying, please send a curriculum vitae to the e-mail address listed above.

Postdoctoral Research Position
Institute of Plants Genetics and Crop Plant Research (IPK)
Gatersleben, Germany
(Received 07/20)
A three-year postdoctoral position is available immediately to identify regulatory genes involved in metabolic pathways of pigment and vitamin synthesis. The studies will employ mutated transgenic Arabidopsis plants with reporter–promoter constructs and the yeast one- and two-hybrid systems. The applicant must have the requisite skills for Arabidopsis genetics and advanced molecular techniques of mutagenesis, construct synthesis, and GUS and GFP quantitation. Please forward an application including statement of interests and curriculum vitae to Dr. Bernhard Grimm, IPK Gatersleben, Corrensstr. 3, 06466 Gatersleben, Germany; telephone +49 39482 5364, fax +49 39482 5139, e-mail grimm@ipk-gatersleben.de.

Postdoctoral Position
CEA, Grenoble, France
(Received 07/21)
There is a postdoctoral position available in the laboratory of "Physiologie Cellulaire Végétale" directed by J. Joyard. The position is to work on folate (vitamin B9) metabolism. The work will consist of determining whether it is possible to increase the folate content of a plant by modifying the expression of some target enzymes of the biosynthetic pathway. The position is for one year with a net salary of $1,795 a month. The position is only open to non-Europeans. The applicant should be under age 35. A specific background on folate metabolism is not required. Contact Pr. F. Rebeille; e-mail fabrice.rebeille@cea.fr.

Postdoctoral Position
Kansas State University, Manhattan
(Received 07/21)
An NSF-funded postdoctoral position is available immediately to study phospholipase-mediated signaling processes in Arabidopsis. The areas of research include regulation and activation mechanisms of phospholipases, downstream targets of lipid messengers, and generation and functional analysis of plants with altered phospholipase expression. Experience in protein modification/interaction and gene expression/manipulation is preferred. The position is for two years, with extension possible. Please send curriculum vitae and names and e-mail addresses of three references to Dr. Xuemin Wang, Department of Biochemistry, Kansas State University, Manhattan, KS 66506; fax 785-532-7278, e-mail wangs@ksu.edu.

Postdoctoral Position
University of California, Berkeley
(Received 07/26)
A postdoctoral position is available to elucidate the mechanism of xanthophyll hyperaccumulation in green algae under conditions of photo-oxidative stress and to isolate protein components of a xanthophyll-protein complex and clone and functionally characterize genes involved in the formation/accumulation of this complex. Applicants should have a strong background in molecular biology/genetics. Experience with the green alga *Chlamydomonas reinhardtii* is desirable but not essential. Beginning salary is $30,000/year plus benefits. Send inquiries to Dr. Tasios Melis or Dr. Kris Niyogi, Department of Plant and Microbial Biology, University of California, Berkeley, CA 94720-3102; e-mail melis@nature.berkeley.edu or niyogi@nature.berkeley.edu.

Postdoctoral Position
University of California, Davis
(Received 08/03)
A postdoctoral position is available immediately in a plant cell biology lab. Our lab examines the machineries, mechanisms, and energetics of protein transport to and within chloroplasts. Please refer to the lab Web site for relevant publications at http://www-plb.ucdavis.edu/labs/theg. Candidates should have a strong back-

ground in molecular and cell biology, biochemistry, or biophysics. Experience with protein targeting and plant or bacterial systems is a plus but not a strict requirement. Interested individuals should send a curriculum vitae, statement of research interests, and the names of three references, including their e-mail addresses and phone numbers, to Dr. Steven Theg, University of California Davis, One Shields Avenue, Davis, CA 95616; telephone 530-752-0624, fax 530-752-5410, e-mail smtheg@ucdavis.edu.

Postdoctoral Position
Purdue University, West Lafayette
(Received 08/05)
A postdoctoral position is available immediately to study the regulation of floral scent production in plants. The work will include isolation and characterization of genes involved in floral scent production in snapdragon. Familiarity with basic techniques of molecular biology and biochemistry, as well as plant transformation, is required. Send letter outlining research experience and interests, curriculum vitae, publications, and three letters of reference to Dr. Natalia Dudareva, Purdue University, Department of Horticulture and Landscape Architecture, West Lafayette, IN 47907; telephone 765-494-1325, fax 765-494-0391, e-mail dudareva@hort.purdue.edu.

Postdoctoral Position
University of California, Berkeley
(Received 08/13)
A postdoctoral position is available to study molecular aspects of the quiescent center (QC), a population of slowly dividing cells embedded in angiosperm root meristems. Using various techniques, including RT-PCR, differential display, in situ hybridization, and immunolocalization, we will investigate cell cycle controls leading to initiation and maintenance of the QC. High manual dexterity preferred. (Background: Development 121, 2825–2833; 1995). Salary is $28,000–$30,000 per year. Candidates should send a curriculum vitae and three references to L. Feldman at feldman@nature.berkeley.edu. The starting date is January 31, 2000. The application deadline is January 10, 2000. UC is an EOE/AA employer.

Postdoctoral Position
USDA/ARS, Fargo, North Dakota (RA-99-49L)
(Received 08/19)
A two-year postdoctoral position is available to conduct research on potato tuber phellogen (cork cambium) cell wall stiffening initiated during phellogen inactivation and tuber periderm maturation. The research will include determining the changes in phellogen cell walls and related enzymes/proteins that cause stiffening and identifying markers and signals associated with the initiation of phellogen cell wall stiffening in maturing wound and native periderm. The goal of the research project is to determine the biochemical changes responsible for the development of resistance to tuber periderm injury. Candidates must have a strong background in plant biochemistry/physiology. Experience with cell wall and protein/enzyme isolation, characterization, and blotting techniques is desirable. Knowledge and skills in the use of molecular biology techniques are helpful. Certain citizenship restrictions apply. Starting salary is $39,960 per annum plus benefits. Please send curriculum vitae, a statement of research experience, and three letters of reference to Dr. E. C. Lulai, USDA-ARS-NCSL, PO Box 5677, Fargo, ND 58105-5677; telephone 701-239-1352, fax 701-239-1349, e-mail lulaie@fargo.ars.usda.gov. The USDA/ARS is an equal opportunity employer. Women and minorities are encouraged to apply. More information is available at http://www.ars.usda.gov.

Postdoctoral Research Associate
Pacific Northwest National Laboratory
Richland, Washington
(Received 08/19)
Applications are being accepted for an anticipated postdoctoral research associate position at the Pacific Northwest National Laboratory. The successful applicant must hold a Ph.D. in plant physiology, plant molecular biology, botany, or a related field. In addition, the successful applicant must have direct experience with monocot transformation systems, including the *Agrobacterium* transformation system. In addition, applicants should have at least some exposure to the discovery of genes and associated regulatory elements. Preference will be given to applicants skilled in microarray-based screening of plant genetic material. Applicants should also be highly familiar with biochemical characterization of enzymes and other proteins. A current curriculum vitae should be sent to Dr. Brian Hooker, Staff Engineer, Bioprocessing Group, Pacific Northwest National Laboratory, MSIN K2-10, 902 Battelle Blvd., Richland, WA 99352; e-mail brian.hooker@pnl.gov. Electronic applications may be e-mailed.

Postdoctoral Position
Washington State University, Pullman
(Received 08/19)
A postdoctoral position is available immediately for isolation of novel postharvest-related genes and their promoters from maize for targeting gene traits and products to non-crop portions. Research will involve cDNA library construction, restriction fragment differential display (RFDD-PCR) screening, and characterization of gene expression. Applicants must have a strong background in molecular biology. The position will start October 1, 1999. Send a letter of application, curriculum vitae, and three letters of reference to Dr. Maurice Ku, Botany Department, Washington State University, Pullman, WA 99164-4238; telephone 509-335-0197, fax 509-335-3517, e-mail mku@wsunix.wsu.edu.

Postdoctoral and Technical Research Positions
Oilseed Engineering Collaboration
(Received 08/20)
Plant metabolic engineering is an emerging discipline that offers the promise of designing crop plants to accumulate novel storage compounds. A collaboration of five researchers in cooperation with a major U.S. corporation has been established to perform research in the area of oilseed engineering. Approximately 20 positions are available with funding for up to five years. Academic participants are **John Browse**, Washington State University, jab@mail.wsu.edu; **Jan Jaworski**, Miami University of Ohio, jaworsjg@miavx1.muohio.edu; **John Ohlrogge**, Michigan State University, ohlrogge@pilot.msu.edu; **Mike Pollard**, Michigan State University, pollard9@pilot.msu.edu; and **John Shanklin**, Brookhaven National Laboratory, shanklin@bnl.gov. The collaboration will address a combination of basic and applied research goals and will integrate this knowledge to optimize the yield of novel lipids in transgenic crops. Postdoctoral candidates with strong backgrounds in biochemistry, genetics, physiology, enzyme engineering, genomics, metabolic engineering, or cell biology are encouraged to apply. Additional information about the laboratories can be found at http://www.msu.edu/user/oilseeds/. Several technical and graduate student positions are also available in the areas outlined above. Candidates should have a B.Sc. or M.Sc. in relevant disciplines and demonstrated technical competence. Candidates interested in applying for these positions should send a letter by e-mail to oilseeds@pilot.msu.edu or to one of the individuals listed above. The letter should outline your interests within the program and include a curriculum vitae. The above institutions are all equal opportunity/affirmative action employers.

Postdoctoral Position
Northern Arizona University, Flagstaff
(Received 08/24)
A postdoctoral position is available immediately, initially for one year, to investigate the molecular basis of selenium hyperaccumulation in *Astragalus bisulcatus*. The researcher will be responsible for cloning and characterizing genes involved in selenium uptake and biotransformation in *Astragalus*. This information will be used to generate food plants with an enhanced ability to biotransform selenium into potent anticancer compounds. Extensive experience with techniques in plant molecular biology is essential. Send curriculum vitae and three letters of reference to David E. Salt, Department of Chemistry, Northern Arizona University, Flagstaff, AZ 86011; fax 520-523-8111, e-mail david.salt@nau.edu.

Postdoctoral Position
Oklahoma State University, Stillwater
(Received 08/27)
A postdoctoral position is available starting October 1, 1999, to study intercellular and phloem trafficking of proteins, RNAs, and viruses using cellular, molecular, and genetic approaches. There are excellent opportunities to collaborate with the other lab personnel as well as conduct independent research. A Ph.D. degree in plant cell biology, molecular biology, genetics, or virology is required. To apply, send a letter of application, curriculum vitae, and names and addresses of three references to Dr. Biao Ding, Department of Botany, Oklahoma State University, Stillwater, OK 74078; telephone 405-744-9508, fax 405-744-7074, e-mail bxding@osuunx.ucc.okstate.edu. More information about research in this lab is

available at http://www.okstate.edu/artsci/botany/ding.htm.

Postdoctoral Positions
National Renewable Energy Laboratory (NREL)
Golden, Colorado
(Received 08/31)
Three postdoctoral positions are currently available in the Basic Sciences Center (Biological Sciences Team) at NREL. The first position involves the use of molecular biological techniques to identify putative oxygen-sensing proteins in the green alga *Chlamydomonas reinhardtii* that may be responsible for regulating the hydrogenase associated with photosynthetic H_2 production (Ghirardi et al., Appl. Biochem. Biotechnol. **63-65**, 141–151; 1997 and Seibert et al., *Biohydrogen* [O. R. Zaborski, ed.], Plenum Publ. Co. NY, 227–230; 1998). Applicants should have a background in plant molecular genetics and experience working with biological regulatory systems. The second position involves physiological studies to examine a novel two-stage system (patent pending) for algal H_2 production in which algal cultures cycle between oxygenic photosynthesis and anaerobic H_2 photoproduction modes, depending upon externally imposed conditions. Applicants should have a background in analytical biochemistry or plant physiology with experience working with algal photosynthetic systems. The third position involves biochemical/biophysical investigations of structure/function aspects of the photosystem II reaction center (Greenfield et al., J. Phys. Chem. **10**, 2251–2255; 1997) in plants and *C. reinhardtii*. Applicants should have some spectroscopic background, experience isolating integral membrane proteins, and an interest in the biochemistry and biophysics of photosynthesis. Starting salary and benefits are highly competitive. Please send your curriculum vitae, list of publications and reprints, and the names of three references to Dr. Michael Seibert (mike_seibert@nrel.gov) or Dr. Maria Ghirardi (maria_ghirardi@nrel.gov) at NREL, 1617 Cole Blvd., Golden, CO 80401. NREL is an equal opportunity employer.

SISTANTSHIPS, FELLOWSHIPS, INTERNSHIPS, ETC.

Graduate Research Assistantship
West Virginia University, Morgantown
(Received 07/06)
e Division of Plant and Soil Sciences at West ginia University is seeking qualified individuals interested in obtaining an M.S. or a Ph.D. degree. The position is available September 1999 or anytime thereafter until a suitable candidate is found. The assistantship provides a monthly stipend and tuition waiver. Stipends for M.S. and Ph.D. students are $9,396 and $11,040, respectively. The successful candidate will conduct research on the postharvest physiology of horticultural crops. The research involves the use of recombinant DNA techniques and plant transformation as well as physiological/biochemical measurements to study senescence in horticultural crops. Students with backgrounds in horticulture, botany, or biology are encouraged to apply. Applicants with some experience in molecular biology and/or tissue culture may be given preference. Please submit a letter of application, a resume, college transcripts, GRE scores, TOEFL scores (foreign students), and three letters of reference. For additional information, interested individuals can contact the division office at 304-293-4817 or Dr. Sven Verlinden at the Division of Plant and Soil Sciences, PO Box 6108, Morgantown, WV 26506; telephone 304-293-6023, e-mail sverlind@wvu.edu.

Graduate Assistantship
University of Florida, Gainesville
(Received 07/01)
A graduate assistantship at the Ph.D. level is available for a motivated student in a research project on metabolic engineering of plants to improve their stress tolerance. The student will have opportunities to learn biochemical, physiological, and genetic techniques including genetic transformation. Stipend pays a minimum of $15,000 per year and includes tuition waivers. To learn more about the project and the opportunity, please contact Dr. Bala Rathinasabapathi, Assistant Professor, Horticultural Sciences Department, IFAS, PO Box 110690, University of Florida, Gainesville, FL 32611-0690; telephone 352-392-3991, fax 352-392-5653, e-mail brath@gnv.ifas.ufl.edu.

Graduate Research Assistantship
Colorado State University, Fort Collins
(Received 07/20)
A research assistantship is available in the Department of Horticulture and Landscape Architecture for a student pursuing an M.S. or a Ph.D. degree. Research will be in the area of postharvest physiology and molecular biology of flower senescence. The assistantship is available immediately. Qualifications: B.S. or M.S. in horticulture, biology, plant physiology, or related fields. To apply, send resume, transcripts, three letters of recommendation, and a one-page letter of intent describing research interests and goals to Dr. Michelle L. Jones, Department of Horticulture and Landscape Architecture, 111 Shepardson, Colorado State University, Fort Collins, CO 80523; telephone 970-491-7216, fax 970-491-7745, e-mail mljones@lamar.colostate.edu.

Graduate Research Assistant
Oklahoma State University, Stillwater
(Repeat)
Contact Dr. Biao Ding, Department of Botany, Oklahoma State University, Stillwater, OK 74078; telephone 405-744-9508, fax 405-744-7074, e-mail bxding@osuunx.ucc.okstate.edu. More information about research in this lab is available at http://www.okstate.edu/artsci/botany/ding.htm. (Details July/August 1999 *ASPP NEWS)*

Graduate Research Assistantship
Oklahoma State University, Stillwater
(Repeat)
Contact Dr. Yinghua Huang, Department of Forestry, Oklahoma State University, 112B Noble Research Center, Stillwater, OK 74078; telephone 405-744-6431, fax 405-744-7373, e-mail huangyx@okstate.edu. Oklahoma State University is an equal opportunity employer. (Details July/August 1999 *ASPP NEWS)*

General Research Grants
American Philosophical Society
Philadelphia, Pennsylvania
(Repeat)
Contact the Committee on Research, American Philosophical Society, 104 S. 5th Street, Philadelphia, PA 19106-3387. Questions concerning the eligibility of a project or applicant are accepted at 215-440-3429 or via e-mail to eroach@amphilsoc.org. American Philosophical Society information, directions, and forms can be downloaded from the APS Web site at http://www.amphilsoc.org (click on "research grants" on the homepage). (Details July/August 1999 *ASPP NEWS)*

Graduate Assistant—Crop Physiology
University of Arkansas, Fayetteville
(Repeat)
Contact Dr. Derrick M. Oosterhuis, Altheimer Laboratory, 276 Altheimer Drive, University of Arkansas, Fayetteville, AR 72704; telephone 501-575-3979, fax 501-575-3975, e-mail oosterhu@comp.uark.edu. (Details July/August 1999 *ASPP NEWS)*

Graduate Research Assistantship
North Carolina State University, Raleigh
(Repeat)
Contact Dr. Stewart Warren, Graduate Program Coordinator, Department of Horticultural Sciences, North Carolina State University, Raleigh, NC 27695-7609. For additional information, contact Dr. Mason Pharr at 919-515-1217, e-mail mason_pharr@ncsu.edu, or Dr. John Williamson at 919-515-5366, e-mail john_williamson@ncsu.edu. Graduate school admission application deadlines are: U.S. citizens—fall semester, June 25 spring, November 25. International applicants—spring semester, August 15. (Details July/August 1999 *ASPP NEWS)*

Katherine Esau Postdoctoral Fellowships
University of California, Davis
(Repeat)
Contact Professor Judy Jernstedt, Chair, Faculty Advisory Committee, Esau Fellowships Program, Department of Agronomy and Range Science, University of California, Davis, One Shields Avenue, Davis, CA 95616; fax 530-752-4361. Inquiries may be made by e-mail to the chair at jjernstedt@ucdavis.edu. Fellowships will be awarded on an annual basis. The next deadline for this program will be November 1, 1999. The University of California is an equal opportunity employer. (Details July/August 1999 *ASPP NEWS)*

ASPP Headquarters Telephone Extensions and E-Mail Directory

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

Our office telephone number is 301-251-0560

	John Lisack, Jr., / ext. 115 jlisack@aspp.org	Nancy Winchester / ext. 117 nancyw@aspp.org	Susan Chambers / ext. 111 chambers@aspp.org	Kelley Knoone / ext. 142 knoone@aspp.org	Sandra Giancoli / ext. 140 giancoli@aspp.org	Crispin B. Taylor / ext. 121 ctaylor@aspp.org	Brian Hyps / ext. 114 bhyps@aspp.org	Annette Kessler / ext. 120 akessler@aspp.org	Kelley Noone / ext. 142 knoone@aspp.org	Melissa Juniar / ext. 118 mjuniar@aspp.org
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