I wish to say at the outset how pleased and honored I am to represent the American Society of Plant Physiologists as its president for the coming year. The more I learn of the organization, the more impressed I become. The past leadership has left the Society in excellent shape: the staff in our Rockville office is exemplary; our annual meeting is first-rate; and the journals we publish are second to none. The appointments of the new members to the committees of our Society continue to be exceptional. There is no question that the Society has a bright future.

The start of the new year is an excellent time for discussing future plans. There are several items that top this year’s agenda, some, of course, stemming from the efforts of earlier leadership.

- **Membership.** The membership of the Society remains stable at just over 5,000 members. While this is an admirable number, it has become apparent through meetings of several committees, including the executive committee, that many potential members have for whatever reason not joined ASPP, or any other society. We are especially concerned about young scientists because they obviously represent the future. We should encourage them to recognize the importance of membership: not only its scientific benefits, but also its significance to outreach efforts of the Society, such as the protection of federal funding programs. ASPP has played, and will continue to play, a major role in championing all areas of plant biology in the political arena in Washington. Experience shows that the nurturing of plant biology federal granting programs requires eternal vigilance.

I have attempted to revitalize the membership committee by including as regular members the ASPP sectional representatives to the executive committee. The thinking behind the change is that the leaders from the sections represent the grass roots of the Society and as such should be able to present the benefits of membership to plant physiologists throughout their geographical areas. A special meeting of the membership committee is also being convened at our Rockville headquarters to develop recruitment strategies. The membership committee, however, cannot do it all. We need the help of everyone. I ask, therefore, that all of us as members of ASPP make an effort to attract new members, especially continued on page 2
younger scientists. Membership throughout the plant physiology community is essential as the Society embarks on important new endeavors, such as teaching, outreach, and a broader effort in national politics.

- **ASPP Education Foundation.** The Foundation, initiated under the leadership of past ASPP presidents Russell Jones and Jim Siedow, and approved by last year’s vote of the membership, is off to an excellent start. A major goal of the Foundation is to use the scientific resources of the Society to advance the teaching of the plant sciences in the nation’s public schools. Through public outreach, the Foundation also aims to enhance public understanding of plant biology and the sciences in general. The Foundation will also foster timely new ties between ASPP and industry. Three members have recently been appointed to the board of directors of the Foundation (Mr. Richard Barth of Ciba Geigy, Mr. Hendrik A. Verfaille of Monsanto, and Dr. David S. Weir of DuPont). The remaining three appointments to the board are to be made during the next few months. The first meeting of the board is scheduled to be held at our Rockville headquarters in January. It is anticipated that fund raising efforts will begin shortly. The funds raised by the Foundation will help meet a variety of needs, including support of the new programs being developed by our education committee. The Foundation also provides an avenue for ASPP members to contribute financially to strengthen the Society and build bridges to new areas.

- **International Affairs.** As one travels in Europe and Asia, it soon becomes apparent that the ASPP plays an important role internationally. With more than one-third of our members residing overseas, we are increasingly extending the activities of the Society beyond our national borders. The ongoing joint meeting of the American and Canadian Societies of Plant Physiology, begun 22 years ago, is an obvious success. The next joint meeting, to be held in Vancouver, British Columbia, in 1997, is expected to be scientifically invigorating and of great interest to the membership of both societies. The Vancouver meeting will be further enriched by the participation of the Japanese and Australian Societies of Plant Physiology. Discussions with our Japanese and Australian colleagues indicate strong interest in what promises to be a premier meeting of Pacific Rim plant physiologists. In a related, more imminent development, also unparalleled, plant physiologists from Mexico will join our Society in the 1996 meeting in San Antonio. Plans are in place to integrate our Mexican colleagues in the meeting and include them in the symposia. The San Antonio meeting promises to be a milestone in our relations with Mexico and Latin America.

As the international activities of the Society grow, it becomes timely to ask what our future role should be in other countries. I have reflected on this question for some time, but particularly after I had an opportunity during a recent visit to Nagoya to breakfast with Dr. Bambang Sugiharto, one of four ASPP members in Indonesia—a country whose people total more than the combined population of Germany, France, and the United Kingdom. Indonesia is representative of countries with long-term interest in plant physiology, yet one in which most of the relevant resources are presently applied to problems in soil science and plant breeding. I asked Dr. Sugiharto what he thought the role of the ASPP should be in countries such as his own. He indicated that what his country most needs is to increase the level of understanding of plant physiology.

One of the points I would like to accomplish in the coming year is to gain a better understanding of how our Society can best serve overseas members. As the world develops and countries become interdependent, this is one aspect that cannot be ignored. I plan to discuss the question with individuals from countries with well-established plant physiology programs, as well as those in which this field is not yet developed.

- **ASPP Newsletter.** While our Newsletter continues to carry items of interest, I believe that it could be “livened up.” To this end, I have initiated a new series, “Turning Point,” that will feature contributions by distinguished colleagues in the field. The series is intended to identify key experiments or moments that have changed the course of an experimental protocol and led to new, unexpected findings. We have an outstanding lineup of articles for the year, including the inaugural feature this month by Andy Benson (page 5). I hope that our membership will enjoy and benefit from the series. Other type of articles will also be featured from time to time.

Again, I look forward to an exciting and productive year.

Bob B. Buchanan
1995-1996 ASPP President
University of California, Berkeley
view@nature.berkeley.edu
News and Reviews Editor Chasan Resigns from THE PLANT CELL

Rebecca Chasan, news and reviews editor of THE PLANT CELL since the position was created in 1991, will leave ASPP at the end of November to become editor of BioScience, a publication of the American Institute of Biological Sciences.

As news and reviews editor, Chasan has been fully responsible for the content and style of the front section of THE PLANT CELL. Over the past four years, she has written almost all the In This Issue articles, most of the feature articles, and numerous, exhaustive meeting reports. When she wasn’t writing the section, she was selecting and editing material provided by other authors. Chasan also has served as the editor of all review articles published in THE PLANT CELL during her tenure. She edited and managed both special issues of the journal, the October 1993 issue on plant reproduction and the July 1995 issue on plant biochemistry.

Becky Chasan was completing her doctoral dissertation in molecular biology at the University of California-Berkeley when she was hired in early 1991. Toward the end of her graduate studies, she had decided to pursue a career as a science journalist rather than as a researcher or teacher. It was sheer serendipity that she was looking for her first writing job at the same time that the ASPP executive committee approved Bob Goldberg’s (founding editor of THE PLANT CELL) request to add a science journalist to the staff of the journal. Under Dr. Chasan’s hand and with her special talent for clarifying and synthesizing highly complex subject matter, the news and reviews section of THE PLANT CELL has come to be widely read and respected—many readers turn there first each month when their issue arrives.

An active search is now underway to fill this critical position (see ad on page 33 of this newsletter, in the November 24 issue of Science, and in the November issue of THE PLANT CELL).
OBITUARIES

Walter D. Bonner, Jr.

Walter Daniel Bonner, Jr., died in Shanesville, Pennsylvania, on August 6, 1995, at the age of 76 following an illness of several months. He became a member of ASPP in 1970.

Walter was educated at the University of Utah, where he received a B.S. in chemistry, and then continued to Cal Tech where he earned a Ph.D. in biology in 1946. Following a postdoctoral fellowship with David Keilin at the University of Cambridge (1949-1952), Walter returned to the United States to take up an associate professor position in the Botany Department at Cornell University. In 1959 Walter joined the Johnson Research Foundation at the University of Pennsylvania in Philadelphia, where he began what later became some classic research on the elucidation of the plant respiratory system. Walter remained at the Johnson Foundation until his retirement in 1989 when he was granted emeritus status.

Retirement, however, did not prevent Walter from continuing his interests in plant respiration, since even at his farm in Shanesville he continued his own research and became associated with Albright College, serving as a research mentor for undergraduate biology and biochemistry majors.

Walter’s research career was dominated by an intense curiosity about the plant mitochondrial respiratory chain, which ultimately led to a classic series of papers that identified the presence of a unique terminal oxidase in plants, the alternative oxidase. Although information on the exact nature of this oxidase was not forthcoming for a considerable number of years, Walter’s laboratory became internationally recognized as a center of excellence for studies on the characterization of this enzyme. Along with his postdoctoral associates, which included Joe Wiskich, Roland Douce, Alan Lambowitz, Carmen Manella, and Peter Rich to name but a few, Walter’s laboratory pioneered plant mitochondrial purification procedures and spectrophotometric techniques that proved the alternative oxidase to be truly a bona fide mitochondrial protein and in doing so firmly established plant mitochondria as a major system for study by the bioenergetic community. In addition to providing major insights into the nature and regulation of the alternative oxidase, Walter and his collaborators were the first to characterize the external NADH dehydrogenase in plant mitochondria and to show that enhanced reduction of the b cytochromes was due to reversed electron transport.

Walter’s enthusiasm, creativity, and curiosity about plant biochemistry affected all who worked with him, and his dry sense of humor made his laboratory a fun place to work in. His guidance and training in the “art of plant mitochondriology” was appreciated by numerous graduate and postdoctoral associates and has helped to establish a number of them as forces within the field of plant bioenergetics. He will be sorely missed by all of us who knew and had the opportunity to work with him.

Anthony L. Moore
University of Sussex, United Kingdom

Ward B. Davis, Last Surviving Charter Member of ASPP, Dies

As was mentioned briefly in the September/October Newsletter, The American Society of Plant Physiologists quietly passed a significant milestone on June 17, 1995, when Dr. Ward B. Davis, 101, the last surviving charter member of the society, died in Huntington Beach, California. Davis joined ASPP when it was formed more than 71 years ago in March of 1924. He was at that time a graduate student at the University of Chicago, where Charles Albert Shull, first ASPP president and founding editor of Plant Physiology, was a professor of plant physiology.

Ward Davis was born in Fortville, Indiana, in 1894. He taught in Indiana schools until he was drafted to serve in World War I. Following the war and one semester spent at the University of Toulouse in France, he returned to the United States and entered the University of Chicago. He and his wife, Opal, a plant ecologist, had fellowships at Boyce Thompson Institute, located at that time in Yonkers, New York. Both Ward and Opal received their doctorates from the University of Chicago. In 1925, following graduation, Dr. Davis was hired at the USDA Laboratory of Fruit and Vegetable Chemistry in California, originally in downtown Los Angeles and eventually in Pasadena, where he spent his entire career.

Davis was one of 64 individuals who joined the fledgling American Society of Plant Physiologists in March 1924. The society began as a splinter group of the Physiological Section of the Botanical Society of America. ASPP’s founders wanted to give plant physiologists a more powerful voice in plant science (at the time the designation “plant physiologist” was relatively new) and to provide an outlet, other than the American Journal of Botany, for the publication of plant physiological research.

Ward and Opal Davis attended the 50th anniversary of the founding of ASPP that was held at Cornell University in 1974, when he was already 80 years old. He continued to live a vigorous, physically active life (he was still jogging at age 95), until afflicted by a stroke at the age of 97.

There is now no one living who was present at the founding of the American Society of Plant Physiologists. It seems, somehow, that such a passage marks a kind of maturity for the organization—today nearly 5000 strong, international in scope, and actively involved in promoting the interests of plant science research and education as we approach the 21st century.

Erratum

In the last paragraph of the obituary for Jerome Schiff that appeared in the September/October 1995 issue of the ASPP Newsletter, Schiff was described as a “gourmande.” Arthur Stern, who wrote the piece, had used the word “gourmet,” not gourmande. The word gourmande was inaccurately substituted for gourmet in the editing of the obituary.
Saga of a Great Theory of Photosynthesis

Science is a matter of assembling information that might have a novel relationship, called a "theory" or a "hunch," depending on how sophisticated one feels. The "Experimental Part" comes when we do some experiments designed to demonstrate the validity of those relationships. If they fit logically, the "Entropy" of the array has suddenly decreased, and we have "made a discovery." But, when the parts of the system fail to fit, the great vision becomes another "dropped stitch in the rich tapestry of time." Such is Life. And so, often, such is Science.

The most exciting idea that I and many of my colleagues experienced was Melvin Calvin's "Thioctic Acid Mechanism of Photosynthesis," a superb concatenation of information, ideas, and experimental evidence that appeared to fit with all we knew of photochemical energy conversion in the chloroplast. It developed at the time thioctic acid (lipoic acid) and its function had just been discovered. Thioctic acid is a yellow compound, with absorption at 330 nm capable of accepting energy from an excited chlorophyll molecule.

Melvin Calvin and G. N. Lewis were highly respected in photochemical circles and the absorption of energy by thioctic acid seemed logical. The product, a dihydronic acid [R-S . .S-R], was consistent with the plethora of sulfur radicals detected in photosynthetic tissues with the then-novel paramagnetic resonance spectrometers. John Barltrop, who had come from Oxford University's chemistry department, proceeded to develop experimental support for the theory. He and Calvin collected convincing evidence for the reaction of such radicals with water or alcohols. Thus, photolysis of the strained disulfide ring in water could yield both R-SH and R-SOH, a sulfenic acid, on the same thioctic molecule, one, a reducing agent, and the other, a sulfur analog of an alkyl hydroperoxide capable of yielding oxygen. Thus, the energy of the quantum absorbed by chlorophyll might yield the essentials of photosynthesis.

Finally, Barltrop and Calvin tested the hypothesis in Scenedesmus, treated with added thioctic acid; oxygen production increased 50%. The plausibility of the theory was elegantly developed in over forty pages of ensuing publications documenting the experimental evidence. Had Nature overlooked this opportunity it would have made a mistake. The quality of the research was superb, as one can appreciate from the meticulous publications. For a year the whole effort was exhilarating. It was truly a Nobel idea.

The high point of this saga was Melvin's lecture in a 1954 national AAAS meeting in Berkeley. Beginning with his usual hesitant manner and leading to a magnificent crescendo of convincing evidence for the mechanism of the quantum conversion of photosynthesis, the audience was totally impressed. The great C. B. van Niel jumped from his seat in the front row with tears in his eyes to congratulate Melvin. It must have seemed a consummation of his own decades of thought and effort dedicated to understanding photosynthesis.

Final proof lay in identification of thioctic acid in the chloroplast; but the assay was tedious and required microbiological experience. Clint Fuller, with a new Ph.D. from the Stanford laboratory of Beadle and Tatum, was recruited to assay thioctic acid. I grew some Chlorella in sulfate-S⁹, chromatographed the extract, and prepared the radioautograph of my paper chromatogram. With Melvin and the others standing around the great white table, I laid the film on the paper. There, was a huge black spot, right in the position we expected. Melvin's eyes just about dropped out onto the film. It was a breathtaking moment.

The S⁹ radioactivity had to be proved to be thioctic acid. Try as he would, Clint Fuller and his Streptococcus fecalis bacterial assay could not find a trace of thioctic acid! One by one, the evidence for the several critical steps weakened and the thioctic theory

continued on page 6
quietly evaporated. The massive effort, the elegant chemistry and photochemistry produced impressive publications which no longer attract attention. Yes, the theory was in ashes, but we must see a "take home lesson" in this saga. One can survive a failed effort, even one which had involved man-years of work and excitement.

Postlude: Ten years later, the great "thioctic acid" spot was found to be Nature's most potent surfactant, the sulfolipid of chloroplasts, a sulfonic acid derivative of a glucolipid; its deacylated product, α-sulfoquinovosylglycerol, was hydrolyzed by pure β-galactosidase—both properties defying the rules of classical biochemistry. After a few years of exciting sulfocarbohydrate metabolic studies, we wisely quit. Now, thirty years later, important breakthroughs by Ernst Heinz, Christoph Benning, and Rawle Hollingsworth and Rob Cedergren, even indications discovered at NCI that the sulfolipid inhibits replication of HIV, promise solutions to the puzzle engendered by the great Thioctic Theory of Photosynthesis.

REFERENCES


Friends Say Goodbye to USDA's Schauer

The National Research Initiative Competitive Grants Program (NRI) at USDA honored Anne Holiday "Holly" Schauer at a pot-luck luncheon April 26, 1995. Holly, who recently retired from her position as associate chief scientist, served with the NRI and its predecessor, the Competitive Research Grants Office (aka CRGO) since its inception in 1978.

Holly came to the USDA from NSF to begin USDA's first competitive grant program. Together with Joe Key, the first chief scientist of CRGO, they established both the mechanism and, importantly, the ethos to ensure a rigorous review process for competitive funding of the agricultural sciences. Over the years, Holly helped initiate new programs as CRGO expanded and served as program director for almost every plant-related program in the office including Genetic Mechanisms for Crop Improvement, Nitrogen Fixation, Forest Biology, and Environmental Stress.

Holly, however, is perhaps best known for her enthusiasm for science and for scientists, especially those beginning their careers. She mentored a generation of plant physiologists and others, both with regard to their research as presented in their proposals and to their participation in the review process.

Holly's friends joining her at the luncheon included former CRGO/NRI chief scientists Drs. Dave Krogman, Luis Sequeira, Paul Stumpf, and Arthur Kelman; and NSFers Drs. Mary Clutter (with whom Holly had worked at NSF) and Machi Dilworth.

Holly was presented a friendship quilt made by the NRI staff which is inscribed, "To Anne Holiday Schauer, in celebration and appreciation of a career devoted to the advancement of science, from your friends everywhere." Incorporated into the quilt are more than 250 signatures including those of all 10 CRGO/NRI chief scientists (June Kosuge, widow of Tsune Kosuge, signed in his stead) and many panel managers, panel members, grantees, friends, co-workers and colleagues.

Holly, who continues to live in Washington, D.C., can be reached by e-mail at: 73754.3000@compuserve.com.
Research Spending Bills Move through Congress

Clinton Signs USDA Bill

President Clinton signed the Fiscal Year 1996 (FY 96) spending bill for USDA into law on October 21. The House and Senate had approved the agriculture appropriations conference report on October 12.

Appropriations for the Agricultural Research Service for FY 96 are $710 million, slightly more than the President requested. The strong showing by ARS in the final bill erased earlier proposed significant cuts.

The National Research Initiative Competitive Grants Program (NRICGP) plant systems research category received $37 million for FY 96, which is the same amount as in FY 95. Overall, NRICGP received $96.735 million. Funds which had been added recently to NRICGP for three new categories for additional emphasis on Water Quality, Integrated Pest Management and Pesticide Impact Assessment were not included for FY 96, causing some overall reduction for the program. Special designation of targeted funding for these three categories continues outside the NRICGP as it had prior to last year, but at reduced amounts. NRICGP funds were targeted in the appropriations process by interests seeking special grants again this year. Supporters of special grants again demonstrated substantial strength in Congress in the agriculture spending bill. Special grants generally take tens of millions of dollars that the administration intended for the NRICGP, instead.

Many ASPP members and other plant scientists contacted their Congressional offices by phone, letter or in some cases, personal visits, to voice support for the NRICGP and/or ARS funding. These constituent actions gave needed support to vital agricultural research programs as Congress cut sharply in many other programs this first year of a seven-year plan to balance the budget. These constituent contacts were particularly needed this year because of the added pressure caused by overall budget cuts of several billion dollars below last year’s level in the agriculture spending bill.

DOE Spending Bill Enacted

In addition to the recent enactment of the agriculture spending bill into law, President Clinton signed FY 96 spending legislation for the Department of Energy, on November 13. The House and Senate approved the DOE appropriations conference report on October 31. The FY 96 appropriation for the Division of Energy Biosciences is $30.2 million, which is about two percent higher than the President’s request and 4.5 percent higher than last year’s appropriation.

The strong showing of the Division of Energy Biosciences was aided by ASPP constituent efforts led by Ken Keegstra of Michigan State University and Lou Sherman of Purdue University, both members of the ASPP Committee on Public Affairs. Sherman, Keegstra and a number of other ASPP members helped restore a more than $3.2 million proposed cut in the FY 96 authorization. The increase in appropriations funding for the Division of Energy Biosciences of 4.5 percent is one of the higher increases in a year in which many programs experienced significant cuts.

Cuts Unrelated to NSF Might Lead to Veto

FY 96 spending for the National Science Foundation (NSF) as part of the VA, HUD and Independent Agencies appropriations bill has been approved by both the House and Senate but still must go through Conference. The House had passed a decrease of about one percent in research funding for NSF, while the Senate called for an increase in research funding of $14 million, bringing the total to $2.294 billion. Both the House and the Senate approved funding the Education and Human Resources Directorate at $599 million, which is $7 million less than last year. ASPP members and others in the science, mathematics and engineering communities provided grass roots support for NSF.

A number of other programs in the VA, HUD and Independent Agencies spending bill faced huge cuts. There were major funding reductions for HUD and EPA. These cuts and particularly the elimination of funds for the Corporation for National and Community Service, a program highly regarded by the President, raise the prospect of a veto by the President if his concerns aren’t addressed before the bill clears Congress.

Many appropriations bills are lagging behind schedule for enactment this year. Several weeks after USDA appropriations legislation was enacted, 11 of the 13 appropriations bills still had not become law. The spending bill including NIH is currently on the slowest track of the 13 bills.
Congressman Michael Crapo (R-ID) (left) and Calvin Dooley (D-CA) (center) are leading supporters of the Agricultural Competitiveness Initiative (ACI) in the House of Representatives. Sen. Richard Lugar (R-IN) (right) has led the effort for the ACI in the Senate. The Balanced Budget Reconciliation Act of 1995 passed recently by the Senate provides $30 million in funds for Agricultural Competitiveness grants with funds provided by the Commodity Credit Corporation. The grants would go to research ranging from discovery to principles of application, extension and related private-sector activities, and education. Eligible grantees include scientists and institutions in the private and public sectors. Grants would be awarded based on the merit and quality of proposals as determined through a system of peer review. Key supporters of the ACI want it to eventually become a $500-million annual grants program. ASPP members on the Society’s grass-roots network have been urging Senate and House conferees to accept this provision for Agricultural Competitiveness grants.

Sustainable Agriculture Council Meets to Advise USDA

Lemaux Represents ASPP

White House and USDA officials told members of the National Sustainable Agriculture Advisory Council (NSAAC) at its meeting September 25-26 in Washington, DC, that there is a renewed emphasis in support of sustainable agriculture within the Department.

Marion Berry, special assistant to President Clinton and liaison with USDA, said the administration has tried to put people in key positions who would help advance sustainable agriculture. Berry said the nomination (and subsequent confirmation this year) of Karl Stauber as USDA under secretary for Research, Education and Economics is an example of how the administration has tried to support sustainable agriculture. The Agricultural Research Service (ARS) and the Cooperative State Research, Education and Extension Service (CSREES), including the National Research Initiative Competitive Grants Program (NRI CGP) fall within Stauber’s authority.

James Horne, outgoing chairman of NSAAC, agreed with Berry. “We recognize that it’s a new ballgame with Karl afloat. We recognize it as a plus,” Horne said.

John Marcus Safley, assistant director, Soil Conservation Service, and new vice chair of NSAAC, said they couldn’t have made sustainable agriculture reforms happen a few months ago, but they can now with Dr. Stauber as Under Secretary.

Berry pointed out that an interagency USDA Sustainable Agriculture Working Group has been created to increase knowledge and awareness of sustainable agriculture, identify barriers, and develop a plan of action to administratively mitigate the barriers. The working group consists of nearly 50 administrators and staff from Research, Education and Economics; Rural Economic and Community Development; Natural Resources and Environment; Marketing and Regulatory Programs; and Farm and Foreign Agricultural Service.

A rice farmer from Arkansas who has known President Clinton for some 20 years, Berry assured the council that the administration will not put sustainable agriculture on the “back burner.”

Peggy Lemaux of the University of California at Berkeley explained that regulation of plant biotechnology must be done in a reasonable manner based on valid science to contribute to sustainable agriculture. Lemaux was nominated to the council by ASPP. She serves as the only plant science society representative on the council, which is made up of 14 private and 14 public representatives.

Lemaux’s nomination was supported by the ASPP committee on public affairs, chaired by Ralph Quatrano, past presidents Russell Jones and Jim Siedow and president Bob Buchanan. Doug Randall of the committee on public affairs and ASPP member Paul Stumpf of the University of California at Davis also actively supported the nomination. Quatrano noted that with her diverse background in research and in extension and liaison with the farming and biotechnology communities, Lemaux brings valuable experience to NNSAAC.

NSAAC was created by Congress to make recommendations to the Secretary of Agriculture concerning sustainable agriculture research and education projects that should receive funding by USDA. Rob Myers coordinates the Council for USDA as director of the Office of Sustainable Agriculture Programs.

Some problems have been created by a segment of the sustainable agriculture community that does not recognize the contribution of fundamental and non-farm-based research to sustainable agriculture. ASPP has been active in supporting sustainable agriculture and has encouraged the Department to recognize the vital contribution of fundamental research to sustainable agriculture.
Basic agricultural research has the highest benefit to society, according to the USDA Economic Research Service (ERS) report titled "The Value and Role of Public Investment in Agricultural Research" published in May of this year.

The rate of return on investment in agricultural research, even when conservative figures are used, is high — at least 35 percent, the ERS report found. "A high rate of return means that many beneficial projects are not being funded," the report said.

When the rate of return for basic agricultural research alone was determined, an exceptionally high "mean estimate of 75 percent," was reported by ERS.

The report said that the private sector lacks the incentive to conduct much of the research necessary to sustain productivity growth. "This is probably clearest for basic, or pre-technology, research. Economic studies have found that basic agricultural research has about twice the benefit to society as more applied agricultural research." In addition to the lack of investment in basic research by private industry, the ERS found that the private sector also lacks the incentive to fund some types of applied research. "If new technology cannot be packaged into a saleable product, the private sector is unlikely to develop it," the ERS report noted.

Public support of agricultural research in the United States has been "losing ground" relative to other nations, according to the report. For example, two major grain producers — Canada and Australia — were spending about twice as much as the U.S. on research relative to the size of their agricultural economies in the early 1980s (the most recent figures available). Japan also spent more on research as a percent of agricultural gross domestic product (GDP) than the United States. Agricultural economist Keith Fuglie, who worked on the ERS team that wrote the report, told ASPP that ERS is in the process of updating these figures used for international comparisons.

In comparison, the U.S. spent a higher percentage of its agricultural GDP on research in the early 1960s than Japan. The comparatively lower public investment by the U.S. in more recent years occurred despite the fact that U.S. spending on research increased from about 1.5 percent to just over 2 percent of agricultural GDP over the twenty-year period.

"The effects of new technology on the environment, on human health, and on resource adjustments are not well understood at the present time. However, the net effect of these factors may not necessarily be negative. For example, new technology that increases yields reduces the need to expand production into environmentally sensitive areas. Labor that exits agriculture may eventually find higher-paying non-farm jobs," ERS said.

The ERS report said one of the major trends in agricultural research in the U.S. has been the growing role of the private sector in providing new technology to farmers. "In real terms, private expenditures for food and agricultural research tripled between 1960 and 1992," the report said.

Private research in the U.S. in 1960 was estimated at $206 million with 3 percent spent on plant breeding. In 1992, private firms in the U.S. were spending $3.416 billion on research with 12 percent of that spent on plant breeding, according to ERS. In 1992, about 60 percent of private research was devoted to developing yield-increasing technology.

The ERS concluded, "These trends suggest that there is more potential for overlap and duplication between public and private agricultural research today than was true in the past. It implies that greater coordination is needed between public and private research so that public research does not 'crowd out' private research, and so that the two systems complement, rather than compete with each other."

In its analysis of public and private plant breeding, the ERS report conjectured, "When there is a strong incentive for the private sector to invest in research, there is less need for direct public funding...." For corn, the private sector is able to appropriate a large share of the gains from plant breeding, and it spends over twice as much as the public sector. The character of public research on corn improvement has also changed with the growth of private investment in breeding.

"Public sector programs have moved to pre-technology research, such as corn genetics and enhancing the germplasm pool used by private breeders, and have left the development of finished varieties to the private sector. For non-hybrid crops such as soybeans and small grains, private incentives are weaker and public breeding is still predominant."

Among the report's findings analyzing agriculture in federal science policy were the following:

- In 1994, the federal government spent $66.5 billion for R&D of which 57 percent was for national defense and 2 percent was for agriculture.
- Compared to the composition of the

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**Non-Defense R&D**

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<th>Category</th>
<th>1994: $28.4 billion</th>
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<tr>
<td>Science &amp; Space</td>
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<tr>
<td>Health</td>
<td>37%</td>
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<tr>
<td>Agriculture</td>
<td>4%</td>
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<tr>
<td>Transportation</td>
<td>5%</td>
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<tr>
<td>Environment</td>
<td>6%</td>
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<td>Energy</td>
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**Personal Consumption**

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<tr>
<th>Category</th>
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<td>Food</td>
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<tr>
<td>Clothing</td>
<td>7%</td>
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<tr>
<td>Medical care</td>
<td>17%</td>
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<tr>
<td>Transportation</td>
<td>11%</td>
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<tr>
<td>Housing</td>
<td>14%</td>
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<tr>
<td>Other</td>
<td>15%</td>
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The pie figure chart at left shows that in 1994, four percent of the federal science budget for non-defense research and development went to agricultural research. Thirty-seven percent of personal consumption in the U.S. economy (chart at right) in 1991 was in sectors dependent upon agricultural food and fiber research. A total of 16 percent went to purchase food; seven percent to clothing and 14 percent to housing.
Shining Light on Photosynthesis

A report on ASPP member Joanne Chory’s genetic and molecular research into light perception by plants was written in the October 1995 issue of *Frontiers in Science and Technology*. The newsletter is produced by the Coalition for National Science Funding (CNSF) and is distributed to members of Congress and their staff. CNSF produces the newsletter to give examples of research to Congress demonstrating the importance of supporting the National Science Foundation (NSF).

Chory, who is at the Salk Institute for Biological Studies Plant Biology Laboratory in San Diego, has received support from the National Science Foundation (NSF) for her research. The article, “Shining Light on Photosynthesis,” noted that plants have the unique ability to convert sunlight into chemical energy in a process called photosynthesis. “Because plants cannot survive without photosynthesis and humans cannot survive without plants, studies of how plants perceive and respond to light help us better understand a process fundamental to all life on Earth,” the article noted.

Chory’s long-term goal is to completely understand the process that allows a plant to perceive and respond to its light environment. The article noted that last year, Chory received the National Academy of Science’s Award for Initiatives in Research for her research accomplishments in this area. The award recognizes innovative young scientists and encourages research that will potentially lead to new capabilities for human benefit.

ASPP joined CNSF and the CNSF steering committee nearly two years ago. The coalition is made up of a broad base of science, mathematics, and engineering societies which have members conducting research supported by NSF. Earlier this year, CNSF held its first Congressional exhibition and reception at which ASPP sponsored two poster exhibits. ASPP helped coordinate the CNSF exhibition, which was well-attended by Congressional staff. A second annual CNSF exhibition featuring leading NSF-supported research is planned again next year.
Uncle ASPP Still Needs You

The 1996 ASPP membership renewal form will contain a checkoff box in which you can indicate your willingness to serve as a question answerer for members of the National Association of Biology Teachers (see September/October newsletter). Eventually, all initial contact will be through the ASPP Web site. For now, headquarters will collect the names of interested volunteers and make them available to the NABT. Please consider volunteering for this educational outreach service being developed by the Society.

New Home Page for Young Gardeners

Teaching children how to garden can help them blossom into more wholesome adults. But before they get dirt on their hands, a few strokes on a computer keyboard might produce some fun and useful hints from horticulturists around the world.

KINDERGARDEN, a new site on the world wide web out of Texas A&M Horticulture Department, has been established to help excite and educate children in the fun of home gardening, and teachers.

Inexpensive, Non-toxic DNA Extraction Described

In response to a question posted by David Starrett (Southeast Missouri State University) regarding plant DNA extraction, Barry Meatyard (University of Warwick, Coventry, UK, <secab@csv.warwick.ac.uk>) posted the following answer to the Plant Education Net.

The Science and Plants for Schools Programme (based at Homerton College, Cambridge, Royal Botanic Gardens in Edinburgh, and Institute of Education at the University of Warwick) has developed techniques for safe and low-cost extraction of DNA from plants and subsequent restriction and gel electrophoresis. The protocols are designed for use by school students (ages 16-18) but are also becoming more widely used in undergraduate programs as well. We provide training courses for teachers who wish to use these techniques.

Fifty grams of Sinapis alba cotyledons are ground in 5 mL SDS buffer (100 mL buffer contains 73 mL water, 10 mL 1M Tris-HCl pH 8.0, 14 mL 5M NaCl, 2 mL 0.5M EDTA, 1 mL 10% SDS) preheated to 65°C. A little sand is added to facilitate cell disruption. Transfer grindate to a small conical flask and wash another 5 mL buffer and add to flask. Cover with Parafilm and incubate for 30-60 min, agitating occasionally.

Remove debris by centrifuging at 2,500 rpm in bench centrifuge; filtering would probably also work. Put filtrate or supernatant into screw-top plastic tube. Precipitate DNA by adding equal volumes of cold, 95% ethanol. Gentle rocking of the tube causes DNA to precipitate over 5 min period. This can be centrifuged and collected as a pellet or spooled out with a stainless steel wire bent to form a hook.

The DNA can then be dried prior to redissolving in Tris/EDTA buffer (as above) and cleaved by EcoRI, HindIII or BamHI (or any other available restriction enzyme).

Electrophoresis is on agarose gels poured in a low-cost mini-gel tank, and these are run overnight at 9V. Staining is by either azure blue or methylene blue. We usually run plant DNA alongside lambda cut/uncut as standards.

Results are excellent!

The materials and methods have been developed so that the technology is accessible to schools on three counts: low cost (very important in UK schools), safe, simple. See: Miller MB, Practical DNA technology in school. Journal of Biological Education 28(3) pp 203-211 for a full reference.

Kits are marketed in the UK via National Centre for Biotechnology Education, University of Reading, Whiteknights, Reading, RG6 2AJ, telephone 011-44-1734 873743, fax 011-44-1734 750140.

Plant Physiology Teaching Articles Available in Science Activities

Plant Science Activities was the theme of the summer 1995 issue of Science Activities (vol. 32, no. 2). Articles included "Don't Just Pet Your Chia" by ASPP member David Hershey (Prince George's Community College, Maryland), "Tightening the Corn Belt" by Carmen Trisler, and "Seeds in a Sock" by Judy Kuechle.

Science Activities, which is aimed at the secondary education level, is indexed by ERIC and numerous other bibliographic services and published by Heldref Publications, part of the nonprofit Helen Dwight Reid Educational Foundation.
Phytochemicals and Health

Edited by
David L. Gustine
Hector E. Flores

Proceedings
Tenth Annual Penn State Symposium in Plant Physiology
May 18-20, 1995

Current Topics in Plant Physiology: An American Society of Plant Physiologists Series, Volume 15

The World of Phytochemicals, E. E. Conn
Metabolism and Regulation of Phenolics: Gaps in our Knowledge, H. A. Stafford
Biochemical Diversity and Diverse Phytochemicals, H. G. Cutler
Photo-Mediated Activities of Antibacterial and Antiviral Compounds from Plants, R. S. L. Taylor, J. B. Hudson, G. M. N. Towers
Enhancement of Plant Disease Resistance through Expression of Foreign Phytoalexins, D. L. Gustine
Plant Defense Compounds and Human Health, J. Kuc
Dietary Inhibitors of Cancer: Phenyethylisothiocyanate as an Example, G. D. Stoner
The Role of Crucifers in Cancer Chemoprotection, J. W. Fahey, P. Talalay
Taxol Biosynthesis: Cyclization and Early Hydroxylation Steps of the Pathway, R. Croteau, J. Hefner, M. Hezari, N. G. Lewis
Historical Role of Herbs in Contraception, J. M. Riddle
Cyanogenic Glycosides: Physiology and Regulation of Synthesis, J. M. McMahon, R. T. Sayre
Aliphatic Nitrocompounds in Plants and Their Biological Activity, W. Majak
Regulation of Tobacco Alkaloid Biosynthesis, T. Hashimoto, Y. Yamada
Alkaloid Toxicants and Teratogens of Plant Origin, K. E. Panter, L. F. James
Metabolism and Toxicity of Pyrrolizidine Alkaloids, P. R. Cheeke, J. Huan
Zoopharmacognosy: A "Biorational" Strategy for Phytochemical Prospecting, J. P. Berry, M. A. McFeren, E. Rodriguez
Physiological Role(s) of Lectins in Plants and the Effects of Their Inclusion in the Diet on the Gut and Metabolism of Mammals, A. Pusztai, S. Bardocz
Evaluation of Food for Potential Toxicants, H. N. Nigg, R. C. Beier
Amatoxin Mushroom Poisoning: Still Searching for Antidotes, K. R. Burkhart, M.D.
Biochemistry and Regulation of Trichothece Toxin Biosynthesis in Fusarium, A. E. Desjardins, T. M. Hohn, S. P. McCormick, R. H. Proctor
Insane Roots and Forked Radishes: Underground Metabolism, Biotechnology, and Biodiversity, H. E. Flores
New Pharmaceuticals and Non-nutritive Sweeteners from Plants, A. D. Kinghorn, E. J. Kennelly, L. Luyengi
Extinction and the Loss of Phytochemical Diversity and Pharmacological Potential, R. J. Huxtable

Plus 28 mini-papers
Dr. Jimmy Henderson (left), luncheon speaker, and Dr. William Gordon (right), committee chair, at the luncheon of the minority affairs committee.

Final Annual Meeting Memories
(see also pages 24 and 34.)

Minority travel grant awardees and their mentors.
Sucrese Metabolism, Biochemistry, Physiology and Molecular Biology

Edited by
H. G. Pontis, G. L. Salerno, E. J. Echeverria

Proceedings
International Symposium on Sucrese Metabolism
Mar del Plata, Argentina
May 8-13, 1995

Current Topics in Plant Physiology: An American Society of Plant Physiologists Series, Volume 14

The Early Days of the Instituto de Investigaciones Bioquimicas, Fundacion Campomar, A. C. Poladini
Carlos Cardini: A Whole Life Devoted to Research and Teaching, J. S. Tandecarz

Regulation of Sucrose-Phosphate Synthase by Reversible Protein Phosphorylation: Manipulation of Activation and Inactivation in Vivo, S. C. Huber, M. Bachmann, R. W. McMichael, Jr., J. L. Huber

The Regulation of Sucrose Synthesis in Leaves and Tuber of Potato Plants, P. Geigenberger, K.-P. Krause, L. M. Hill, R. Reimholtz, E. MacRae, P. Quick, U. Sonnewald, M. Stitt

The Structure of Sucrose-Phosphate Synthase, M. E. Salvucci, F. J. van de Loo, R. R. Klein

Biosynthesis of Sucrose in Lower Organisms, G. L. Salerno, A. C. Porchia, N. Sanchez

Metabolic Roles of Sucrose Synthase: Example of Rice Isozymes Encoded by Three Isogenes, J.-C. Su

Can Sucrose Cleavage Enzymes Serve as Markers for Sink Strength and Is Sucrose a Signal Molecule during Plant Sink Development?, C. C. Black, T. Loboda, J.-Q. Chen, S.-J. S. Sung

The Plant Invertases, A. R. Sampietro

3-Phosphoglyceric Acid Activation of Maize Endosperm ADP-Glc Pyrophosphorylase following Proteolytic Cleavage of the SH2 or BT2 Subunits, L. C. Hannah, J. Baier, J. Carren, M. Giroux

On the Role of Sucrose Synthase in Cellulose and Callose Biosynthesis in Plants, P. S. Choarey, M. E. Miller


Transgenic Plants as a Tool to Analyze Carbohydrate Metabolism, J. Kossmann, B.-M. Rober, J. Liese, W.-B. Frohmer, U. Sonnewald, L. Willmitzer


Can We Assign Specific Roles for the Starch Biosynthetic Enzymes with Respect to Starch Biosynthesis?, J. Press, H.-P. Guan, Y. Fu, M. A. Ballicora, M. N. Siook

Where Do Sucrose Make ADP-Glc?, T. ap Rees

Role of the Vacuole in Raffinose Oligosaccharide Storage, F. Keller

Sucrese and the Regulation of Fructan Metabolism in Leaves of Temperate Graminainae, C. J. Pollock, A. L. Winters, J. Gallagher, A. J. Cairns

Fructan—an Extension of Sucrose by Sucrose, A. Wiemken, N. Sprenger, T. Boller

A Discussion on the Present Model of Fructan Biosynthesis, H. G. Pontis

Sucrese Transporters in Assimilate Partitioning and Plant Growth, D. R. Bush, T.-J. Chiou

Phloem Unloading in Developing Wheat Grains, D. B. Fisher

Symbiotic Phloem Loading by Polymer Trapping, E. Haritatos, R. Turgeon

A Preliminary Turnover Rate for Sucrose/H+-Antiport on the Tonoplast of Red Beet Storage Tissue, H. P. Getz, M. Klein

In Vitro Sucrose Mobilization from the Vacuole, E. Echeverria


A Cell Biochemical Study on Sugar-Controlled α-Amylase Secretion in Rice, T. Mitsui, K. Yotsushima, Y. Nabekura


What Next?, T. ap Rees

Sucrese Metabolism, Biochemistry, Physiology and Molecular Biology

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PLANT BIOLOGY '96
1996 Annual Meeting of the American Society of Plant Physiologists (Joined by the Plant Physiology Section of the Mexican Biochemical Society)

Saturday, July 27 - Wednesday, July 31
San Antonio, Texas

SYMPOSIA

News from the Frontiers of the Plant Cytoskeleton
Organizers: Susan Wick, University of Minnesota, and Federico Sanchez, Instituto de Biotechnologia UNAM

Molecular Biology, Biochemistry, and Physiology of Plant P-450s
Organizer: Mary Schuler, University of Illinois

President’s Symposium
Current Topics in Chloroplast Biology
Organizer: Bob Buchanan, University of California-Berkeley

Journal Editors’ Symposium
Plant Microbe Interactions
Organizer: Brian Larkins, University of Arizona

Gibbs Medal Symposium
Plant Developmental Genetics
Organizer: Elliot Meyerowitz, California Institute of Technology
ANNUAL MEETINGS PAST AND FUTURE
Program Committee Reviews 1995 and Looks Forward to 1996 and 1997

ASPP's program committee met in St. Louis, Missouri, on October 14-15 to review the 1995 meeting; to start putting the final touches on the 1996 San Antonio meeting, which promises to be stimulating and exciting; and to begin early planning for 1997, the quadrennial joint meeting with the Canadian Society of Plant Physiologists, to be held in Vancouver, British Columbia.

The program committee was given a recap of the 1995 annual meeting in Charlotte, North Carolina. Approximately 1125 persons attended the Charlotte meeting. The poster and exhibit area attracted visitors right up to the 9:00 closing time each night, hallways bustled as people hurried from one oral session to another, evening workshops were well attended, and the yearly dinner dance drew a large, toe-tapping crowd. In short, the Charlotte meeting was a success by any measure.

Plant physiologists from Mexico have accepted ASPP's invitation to participate in the 1996 meeting. Hector Perez, a representative of the Plant Physiology section of the Mexican Biochemical Society, attended the St. Louis meeting to assist with planning the San Antonio meeting. Plans are to represent Mexican plant physiologists in major symposia and minisymposia and to encourage Mexican participation in oral and poster presentations.

Following are some of the features and changes planned for the 1996 annual meeting:

- Minisymposia, which have been very successful at the past two meetings in Portland and Charlotte, will be expanded from six to eight, two each day, Sunday through Wednesday. As was the practice in Portland in 1994 and Charlotte this past summer, half of the minisymposia to be offered in San Antonio will be invited and the other half will be "hot" topics selected from among the abstracts submitted in February.
- Major symposia are all set, one each for the five days of the meeting. They include: News from the Frontiers of the Plant Cytoskeleton, organized by Susan Wick and Federico Sanchez; Molecular Biology, Biochemistry and Physiology of Plant P-450s, organized by Mary Schuler; Current Topics in Chloroplast Biology (President's Symposium), organized by Bob Buchanan; Plant Microbe Interactions (Journal Editors' Symposium), organized by Brian Larkins; and Plant Developmental Genetics (Gibbs Medal Symposium), organized by Elliot Meyerowitz, 1995 winner of the Martin Gibbs Medal.
- Topics in which abstracts may be submitted have been renamed, reorganized, and consolidated to acknowledge changes in the field. Posters will be accepted in 27 areas of interest in 1996, oral presentations in 13 of the 27.
- Also in attendance at the program committee meeting was Iain Taylor, representative of the Canadian Society of Plant Physiologists, which will host the 1997 joint meeting of ASPP and CSPP in Vancouver. The 1997 meeting is shaping up as a Pacific Rim meeting, with the Japanese and Australian plant physiology societies being invited to participate along with the American and Canadian societies (see President's Letter, page 1).
- Thus, ASPP is looking forward to two successive international meetings. Every sign says that the first of them next summer will be excellent. Make your plans now to attend the 1996 ASPP annual meeting and vacation in beautiful San Antonio and its environs.

Leader Sought for South Africa Venture

The Citizen Ambassador Program of People to People International seeks a plant physiologist who would be interested in leading a team of plant physiologists and other plant scientists to the Republic of South Africa in 1996. The intention of the program is to be a "useful exchange of professional information and a vehicle to build professional linkages between U.S. and R.S.A. professionals." For information, contact John H. Luppert, Director, Science and Technology Programs, Citizen Ambassador Program, Dwight D. Eisenhower Bldg., Spokane, WA 99202; telephone 509-534-0430, fax 509-534-0245.

Do You Have an Idea for a Minisymposium for Plant Biology '96?

The Program Committee Wants to Hear from You!

See page 25 of this newsletter.
Gatherings

All announcements are subject to editing. Wherever possible, submit announcements via e-mail to jcarlson@aspp.org. Alternatively, mail submissions to Jody Carlson, ASP Newsletter, 15501 Monona Drive, Rockville, MD 20855-2768 USA. Because announcements are scanned into the computer, faxed transmissions will not be accepted.

FUTURE ASPP ANNUAL MEETING SITES

1996: San Antonio, Texas
Saturday, July 27, through Wednesday, July 31

1997: Vancouver, British Columbia, Canada
Saturday, August 2, through Wednesday, August 6

JANUARY

January 18-20, 1996
18th Annual Symposium in Plant Physiology
How Plants Use the Light Environment to Regulate Growth and Development
University of California, Riverside
Organized by Winslow Briggs, Carnegie Institution of Washington; Elaine Tobin, University of California, Los Angeles; and Robert L. Heath, University of California, Riverside. Sessions include properties of the developmentally important photoreceptors (W. Briggs, P-S. Song, A. Cashmore, P. Quail); light regulation of gene expression (E. Tobin, E. Schaefer, R. Last, W. Thompson); signal transduction (G. Neuhas, R. Crain, A. Batschauer, W. Boss); use of mutants to understand light-regulated growth and development (R. Hangarter, X. W. Deng, J. Chory, E. Liscum, III); and whole plant responses to the light environment (A. Teramura, G. Whitelam, S. Kay). The symposium is limited to 175 persons. A poster session will be held on Thursday evening, January 18. A registration fee of $65 (non-students) and $25 (students) will cover registration and a luncheon on Saturday, January 20. For further information and an application form, contact: Cindi McKernan, Department of Botany and Plant Sciences-072, University of California, Riverside, CA 92521-0124, telephone 909-787-3423, fax 909-787-4437.

January 25-27, 1996
Third DBMS Workshop
Plant Cell Metabolism and Its Regulation
Villard de Lans, France
For information, contact: Dr. Jacques Joyard, DBMS/PCV, Grenoble, France, telephone 33-76-88-41-84, fax 33-76-88-50-91. See July/August 1995 ASPP Newsletter for details.

MARCH

March 10-16, 1996
Seventh International Symposium on Flower Bulbs
Herzliya, Israel
Convenor of the meeting is A. H. Halevy. For more information, contact Orta Ltd., PO.B. 50432, Tel Aviv, 61500, Israel; fax 972-3-5174433. See January/February 1995 ASPP Newsletter for details.

March 10-16, 1996
Third International Workshop on Basic and Applied Research in Plasmodesmal Biology
Zichron Yakov, Israel
For further information contact one of the following: Bernard Epel, Division of Plant Biology MRC7, The Scripps Research Institute, 10666 North Torrey Pines, La Jolla, Ca 92037; fax 619-554-6330; e-mail bepel@scripps.edu; Shmuel Wolf, Department of Vegetable Crops, The Faculty of Agriculture, Hebrew University, Rehovot, Israel 76100; fax 972-8-468-265, e-mail swolf@agri.huji.ac.il; William Lucas, Section of Plant Biology, University of California, Davis, California 95616; fax 916-752-5410, e-mail wjlucas@ucdavis.edu. See March/April 1995 ASPP Newsletter for details.

March 15-21, 1996
Keystone Symposium
The Extracellular Matrix of Plants: Molecular, Cellular and Developmental Biology
Tamarack, Colorado
Organizers: Andrew Staehelin, Michael Hahn, Norman Lewis, Andrew Mort, Keith Roberts. Keynote address: Structure and Function of Goycosyltransferases, J. Lowe; Banquet address: Cell Wall Research-Past and Future, P. Albersheim. Topics/speakers: Structure and biochemistry of cell wall polysaccharides and glycoproteins/ A. Darvill, A. Mort, M. Kieliszewski, TBA; Biochemistry, molecular biology and biosynthesis of lignin/N. Lewis, J. Dean, A. Boudet; Biosynthesis I. Secretory pathway and synthesis of glycoproteins/A. Staehelin, S. W. Tschermid, TBA; Biosynthesis II: Matrix polysaccharides, callose, and cellulose/N. Carptia, B. Wasserman, D. Delmer; Role of the extracellular matrix in plant growth development (I and II)/K. Roberts, A. Clarke, R. Quatrano, D. Cosgrove, C. Brownlee; TBA; Role of cell walls in symbiosis and pathogenesis (I, II and III)/M. Hahn, H. Spank, N. Shibuya, G. De Lorenzo, C. Lamb, B. Fritig, two TBA; Cell walls in food, feed and industry (I and II)/J. Reid, A. Voragen, D. Della Penna, A. Bennett, TBA. Application and abstract deadline is October 18, 1995. Anyone who has ever applied to a Keystone Symposia conference will automatically be sent application information. Otherwise, contact Keystone Symposia, Drawer 1630, Silverthorne, CO 80498; telephone 303-262-1230, fax 303-262-1525.
April

April 9-13, 1996
Third International Workshop:
Sulfur Metabolism in Higher Plants
Newcastle upon Tyne, United Kingdom
The workshop will provide an overview on
the present understanding of sulfur uptake
and allocation, assimilation, and metabolism
with special emphasis on molecular,
agricultural, and environmental aspects. The
workshop is jointly organized by the
University of Newcastle upon Tyne, the
University of Bern, the University of
Freiburg, and the University of Groningen.
For further information and contributions to
the workshop please contact: Prof. John
Cram, Department of Plant Biology, Ridley
Building, University of Newcastle upon
Tyne, Newcastle upon Tyne NE1 7RU, UK.

April 11-13, 1996
New Biological Approaches to Understand
and Improve Winter Survival of Plants
Århus, Denmark
Contact: Bjørn L. Gudleifsson, RALA
Modravej, 601 Akureyri, Iceland; telephone:
+354-6-24477, fax +354-6-27144. See
January/February 1995 ASPP Newsletter for
details.

April 12-19, 1996
9th International Congress on
Soilless Culture
St. Helier, Jersey, Channel Islands
Write to Secretariat of ISOSC, P.O. Box 72,
6700 AB Wageningen, The Netherlands. See
January/February 1995 ASPP Newsletter for
details.

April 15-17, 1996
Starch: Structure and Function
Cambridge, UK
Contact: Mrs. M. A. Staff, Cavendish
Laboratory, Madingley Road, Cambridge,
CB3 0HE, United Kingdom; telephone 44-
1223-3370007, fax 44-1223-337000. See
March/April 1995 ASPP Newsletter for
details.

April 17-20, 1996
13th Annual Missouri Symposium
Phytohormones in Plants
Columbia, Missouri
Submit abstracts or write for registration
material to Missouri Symposium, 117
Schweitzer Hall, University of Missouri,
Columbia, Missouri
May

May 5-10, 1996
Model Program in Environmental and
Agricultural Ethics
Michigan State University, East Lansing
(Ster State University Life Sciences Bioethics
Institute teaches basic methods and
principles in ethics to life science faculty
members, focusing on those who deal with
the environment, food, nutrition, animals,
and agriculture. The institute equips faculty
to introduce discussions of ethical issues
into existing science courses. Three philoso­
phers, Professors Fred Gifford and Tom
Tomlinson (Michigan State) and Gary
Comstock (Iowa State), will be joined by
internationally recognized experts in ethics
to lecture on moral theory and to lead
discussion sessions of pedagogy. The
institute provides case studies, classroom
exercises, bibliographies, and other practical
strategies used successfully by life scientists
to introduce ethics into their classes. Possible
issues to be covered: intellectual property
rights; honesty and integrity in scientific
research; environmental ethics and intrinsic
value of ecosystems; labeling of genetically
engineered foods; animal welfare and rights;
justice between developed and developing
economies risk

May 12-17, 1996
VIII Congress
International Society of Citriculture
Sun City Resort, South Africa
For information, contact: Congress Secre­
tariat, Institute for Tropical and Subtropical
Crops, Private Bag X 11208, Nelspruit 1200,
South Africa; telephone 27-1311-52071, fax
27-1311-23854, e-mail
supervisornst@itsg.arc.agric.za. See May/June
1995 ASPP Newsletter for details.

May 27-June 1, 1996
Seventh International Conference on the
Cell and Molecular Biology of
Chlamydomonas
Regensburg, Germany
This conference is being organized by Drs.
Rudiger Schmitt and Peter Hegemann,
Universitat Regensburg, and Elizabeth
Harris, Duke University, and is sponsored
by the Deutsche Forschungsgemeinschaft,
Bavarian State Government, and Genetics
Society of America. Platform sessions will
include cell cycle and differentiation;
innovations in genetic and molecular
biology; organelles (genetics, organization
and function); cell wall and membrane;
mating, evolution, and taxonomy; aigae and
lower eukaryotes for the study of new
phenomena; and molecular toolkit (work­
shop). Investigators interested in participat­
ing are invited to submit abstracts by
January 31, 1996. Send request for registra­
tion and abstract materials to Dr. Rudiger
Schmitt, Institut fur Biochemie, Genetik und
 Mikrobiologie, 93040 Regensburg, Germany;
telephone 00 49 943-941-3162, fax 00 49 943-
941-3163; or send e-mail to
chlamy@acpub.duke.edu.

May 28-June 1, 1996
Arc et Senans Plant Workshop: Roots
Arc et Senans, France
This is the first in a new series of work­
shops sponsored by Zeneca Plant Science
and Rhone Poulenc and organized in
collaboration with The Plant Journal. The
workshop will provide: a new interdiscipli­
ary forum to explore the subject of "Roots" from
the perspective of different disciplines.
Recent advances will be reviewed, the
present status of research addressed and
future opportunities defined. A main feature
of this workshop will be the opportunity for
young researchers and established leaders in
the field of study to meet together to
discuss their interests. There will be sessions
on: origin, growth and development of the
primary root; cell division and root growth;
lateral roots and root architecture; root
physiology and function; roots and other
organisms; roots and agriculture. Opportuni­
ties for poster presentations, short talks, and round table discussions are scheduled. For further information, contact: Dr. Louise Dewhurst, IFAB Communications, Department of Biology, University of York, PO Box 373, York YO1 5YW, United Kingdom; fax 44 1904 433029, e-mail biocomms@york.ac.uk.

JUNE

June 2-5, 1996
The Monroe Wall Symposium on Biology and Biotechnology of the Plant
symposium mailing list, send your name, complete address, and, if available, your e-mail, fax, and telephone numbers. See July/August 1995 ASPP Newsletter for details.

June 2-13, 1996
Third International Symposium on In Vitro Culture and Horticultural Breeding
Jerusalem, Israel
For more information, or to receive a call for papers, contact Third International Symposium on In Vitro Culture and Horticultural Breeding, P.O. Box 50006, Tel-Aviv 61360, Israel. See May/June 1995 ASPP Newsletter for details.

June 22-26, 1996
1996 World Congress on In Vitro Biology
Biotechnology: From Fundamental Concepts to Reality
San Francisco, California

June 23-26, 1996
Second International Symposium on the Biology of Root Formation and Development
Jerusalem, Israel
For more information, or to receive a call for papers, contact Second International Symposium of the Biology of Root Formation and Development, P.O. Box 50006, Tel-Aviv 61360, Israel. See May/June 1995 ASPP Newsletter for details.

June 23-28, 1996
Seventh International Conference on Arabidopsis Research
University of East Anglia, Norwich, United Kingdom
Registration details will be posted to the international and United Kingdom Arabidopsis bulletin boards by September when finalized. The opening lecture is to be given by Jonathan Hodgkin of the MRC, Cambridge, United Kingdom. The seven lecture sessions will cover the following topics: floral development, vegetative development, floral transition and embryogenesis, plant pathogen interactions, hormones, metabolism, photoperception. There will also be workshops and a permanent poster display area during the week. 1996 Meeting Organizing Committee members are: Mike Bevan, George Coupland, Carol Godwin, Dick Flavell, Nick Harberd, Mary Rayward-Smith. Queries may be addressed to: arabidopsis@bbsrc.ac.uk.

JULY

July 7-12, 1996
12th International Symposium on Plant Lipids
Tuatara, Canada
Contact John P. Williams, Department of Botany, University of Toronto, 25 Willcocks St., Toronto, Ontario, Canada M5S 3I2; telephone 416-978-3540, fax 416-978-5878, e-mail lipids96@botany.utoronto.ca. See July/August 1995 ASPP Newsletter for details.

July 14-17, 1996
4th IUBMB Conference
The Life and Death of the Cell
Edinburgh, Scotland
Contact: The Meetings Office, The Biochemical Society, 59 Portland Place, London W1N 3AJ, United Kingdom; telephone 44-171-580-5530, fax 44-171-637-7626, e-mail meetings@biochemsoc.org.uk. See July/August 1995 ASPP Newsletter for details.

July 14-18, 1996
5th Symposium of the International Society of Root Research:
Root Demographics and Their Efficiencies in Sustainable Agriculture, Grasslands, and Forestry
Clemson, South Carolina
For additional information please contact Dr. James E. Box, Jr., USDA-ARS, P.O. Box 555, Watkinsville, GA 30677, U.S.A., or by e-mail rootconf@uga.cc.uga.edu, fax 706-769-8962, telephone 706-769-3631. Please supply your name, complete address, and, if available, your e-mail, fax, and telephone numbers. See July/August 1995 ASPP Newsletter for details.

July 14-19, 1996
8th International Symposium on Molecular Plant-Microbe Interactions and 7th Annual Gatlinburg Symposium on Molecular Plant Biology
Knoxville, Tennessee
For further information, contact: Dr. Gary Stacey, Director, Center for Legume Research M409 Walters Life Science Bldg. The University of Tennessee, Knoxville, TN 37996-0845 USA; fax 615-974-4007, e-mail: gsstacey@utkcc.utk.edu. See July/August 1995 ASPP Newsletter for details.

July 21-24, 1996
Third International Fructan Symposium
Logan, Utah
Contact: N. Jerry Chatterson, USDA/ARS, Forage and Range Research, Utah State University, Logan, Utah 84322-6300, USA; telephone 801-797-2249, fax 801-797-3075, e-mail njchatt@cc.usu.edu.

July 21-25, 1996
Society for Experimental Biology Symposium
Control of Plant Development:
Genes and Signals
University College, Dublin, Ireland
Organized by Andy Greenland, Elliot Meyerowitz, and Martin Steer. Sessions: positional information, cell to cell interactions, hormones, environmental cues,

AUGUST

August 4-9 1996
Postharvest 96
Fourth Yearly International Conference on Postharvest Science
Taupo, New Zealand
For more information and registration materials contact: Dr. Ian Ferguson, HortResearch, Private Bag 92 169, Auckland, NZ; telephone 00 64 9 849 3660, fax 00 64 9 815 4202, e-mail iferguson@hort.cri.nz. See July/August 1995 ASPP Newsletter for details.

August 5-8, 1996
5th International Plant Cold Hardiness Seminar
Oregon State University, Corvallis
Contact: Tony Chen, Department of Horticulture, Oregon State University, Corvallis, Oregon 97331; telephone 503-737-5444, fax 503-737-3479, e-mail chent@bcc.orst.edu; or contact Paul Li, Department of Horticultural Science, University of Minnesota, St. Paul, MN 55108, telephone 612-624-1757, fax 612-624-4941, e-mail lixx008@maroon.tc.umn.edu.

SEPTEMBER

September 22-28, 1996
NATO Advanced Research Workshop
Regulation of Enzymatic Systems Detoxifying Xenobiotics in Plants
Kallithea, Chalkidiki, Greece
This workshop provides a forum to scientists from academia, industry, and government for discussing and critically assessing recent research advances in the field of xenobiotic metabolism in plants and for identifying new directions for future research. Specific topics will include: (1) plant cytochrome P450s mediating xenobiotic metabolism (structure, function, diversity, regulation, and molecular characterization), (2) glutathione-mediated xenobiotic metabolism in plants (glutathione-ascorbate cycle, glutathione biosynthesis, molecular characterization of glutathione transferases, catalases, and superoxide dismutases), (3) plant glucosyltransferases and hydrolytic enzymes in xenobiotic metabolism, (4) chemical regulation of plant enzymes detoxifying xenobiotics (herbicide safeners, synergists, and other modifiers), (5) xenobiotic resistance in transgenic plants expressing foreign detoxification genes, and (6) evolution of weed resistance to herbicides based on detoxicative enzymes. The workshop will consist of six sessions of five to six invited key speakers each along with discussion sessions and evening poster presentations. The participation of scientists from Eastern European countries is strongly encouraged. A limited number of fellowships covering partial expenses of qualified applicants from these countries is available. Application deadline: May 1, 1996. For registration materials, poster abstract application, and additional information please contact the workshop director: Prof. Kriton K. Hatzios, Department of Plant Pathology, Physiology and Weed Science, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061-0330; telephone 540-231-5808, fax 540-231-5755, e-mail hatzios@vt.edu.

September 27-29, 1996
Robertson Symposium:
C4 Photosynthesis 30 years On
Australian National University, Canberra
Research School of Biological Sciences, Australian National University, Canberra, Australia. Symposium to precede the Australian Society of Plant Physiologists 36th Annual Meeting. For preliminary circular, contact: Bob Furbank, CSIRO Division of Plant Industry, GPO Box 1600 Canberra, ACT 2601 Australia, e-mail furbank@pican.pi.csiro.au; Susanne von Caemmerer, RSBS, ANU, GPO Box 475, Canberra, ACT 2601 Australia, e-mail susanne@rsbs-central.anu.edu.au.
From left: Aron Silverstone, M. Ribas-Carbo, Larry Giles, Tai-ling Sun, Adrian Lennon, D.M. Saravitz at the opening night mixer.

Young and younger enjoying themselves at the dinner dance.
**Statement of Ownership, Management, and Circulation**

(Required by 39 U.S.C. 3685)

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- ASPP Newsletter

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- 15501 Monona Drive, Rockville, Montgomery County, Maryland 20855-2768

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