

ASPP NEWS

The Newsletter of the American Society of Plant Physiologists

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Deadline for the
March/April 1996 issue
of ASPP NEWS
is March 1, 1996.

TURNING POINT

[Editor's note: Following is the second of a series of articles that are intended to describe an experiment (or "moment") that was a turning point in research consequential to the field.]

The Boys of Summer

by Martin Gibbs, Professor Emeritus,
Brandeis University

My first position was at the newly established Brookhaven National Laboratory, formerly Camp Upton, where, designated the departmental botanist, I was assigned the responsibility of synthesizing radiocarbon-labeled simple sugars for the community of mammalian physiologists. Inasmuch as barium carbonate was the only radioactive compound available, photosynthesis in leafy material seemed to be a practical approach. The problem was how to localize the ^{14}C label in the isolated sugar products.

Isotopic carbon distribution patterns in sugars were determined at the time by a procedure introduced in 1945 by the noted microbial biochemist, H. G. Wood. Here, the two lactic acids formed from one glucose or fructose in the *Lactobacillus casei* glycolytic homolactic fermentation are degraded chemically. This method yields tracer not in individual, but in pairs of carbon atoms, since the carboxyl carbon of the lactic acid arises from carbon 3 and 4 of the glucose, the carbonic carbon from 2 and 5, and the methyl carbon from 1 and 6. There was need by the scientific community for a method to isolate the individual carbons to define the ^{14}C labeling of the hexoses formed in photosynthesis.

The solution came when I. C. (Gunny) Gunsalus brought a novel microorganism to Brookhaven in the summer of 1952. The previous year, he,

Radiocarbon research in the 1950's provided both an important ^{14}C localization method and a catchy tune.

R. D. DeMoss, and R. C. Bard had reported that *Leuconostoc mesenteroides* produces one mole each of carbon dioxide, ethanol, and lactic acid per mole of glucose fermented. Furthermore, the bacterium was found to possess growth characteristics indicative of a fermentative reaction sequence differing from glycolysis, then the only known pathway of glucose breakdown.

When Gunsalus, already known for his work on bacterial metabolism, came to Brookhaven, we demonstrated that *Leuconostoc* ferments glucose via a new reaction sequence: carbon dioxide arises from carbon 1; the methyl, and carbinol carbons of ethanol arise from carbons 2 and 3 in that order; and the carboxyl, alpha-, and beta- carbons of lactic acid from carbons 4, 5, and 6. Clearly, to account for the data, the anaerobic dissimilation of glucose by *L. mesenteroides* involved at least a portion of the oxidative pentose phosphate (direct oxidation) pathway. More importantly, for a determination of isotopic carbon patterns in carbohydrates, this degradation of glucose

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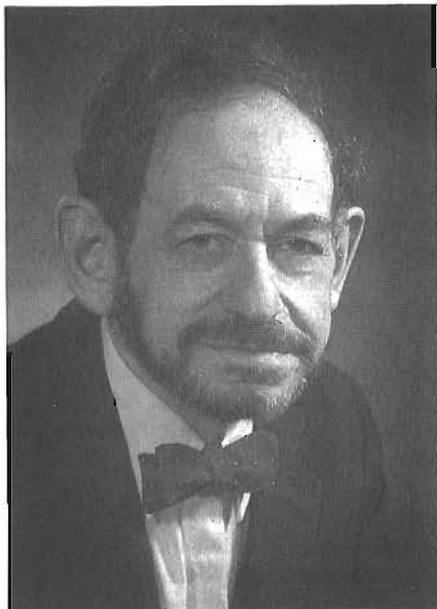
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The ASPP NEWSLETTER is distributed to all ASPP members and is published six times annually, in odd-numbered months. It is edited and prepared by ASPP staff from material provided by ASPP members and other interested parties. Copy deadline is about the fifteenth day of the preceding even-numbered month (e.g., December 15 for January/February publication). Submit copy by e-mail whenever possible; submit all other copy by mail, *not by fax*. Contact: Jody Carlson, Editor, ASPP NEWSLETTER, 15501 Monona Drive, Rockville, MD 20855-2768 USA; e-mail jcarlson@aspp.org; telephone 301-251-0560, ext. 17.

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Martin Gibbs, Abraham S. and Gertrude Berg Professor Emeritus in Life Sciences, Brandeis University, won his doctoral degree in the Department of Botany, University of Illinois under F. L. Wynd and Harry Fuller. On the advice and with the assistance of K. V. Thimann, Gibbs moved directly to the Brookhaven National Laboratory. In addition to those mentioned in the accompanying article, his work with radiocarbon attracted W. A. Wood, Howard Gest, G. Robert Greenberg, Jerome Schiff, Feodor Lynen, and Severo Ochoa. At Cornell University and Brandeis University, he continued his research on photosynthesis, respiration, and hydrogen metabolism while serving for 30 years as chief editor of *Plant Physiology*.

yields each carbon separately—a decided advantage over *L. casei*.

Shortly after the findings of Gunsalus and Gibbs were published, the *Leuconostoc* procedure was used successfully by many investigators. Among the early studies was a collaborative effort carried out at the National Institutes of Health (Horecker) and Brookhaven (Gibbs). This research followed up on earlier studies that provided evidence for the conversion of pentose phosphate to hexose phosphate in extracts of rat liver (B. L. Horecker, P. Z. Smyrniotis, and H. Klenow) and spinach leaves (B.

Axelrod, R. S. Bandurski, C. M. Greiner, and R. Jang). In the collaborative work, the course of the reactions was followed in a rat liver extract with ribose-5-P-1-¹⁴C and -2,3-¹⁴C. The isotopic distribution pattern in the resulting glucose determined with *Leuconostoc* confirmed a transketolase-transaldolase series of reactions involving sedoheptulose-7-P as an intermediate. This work helped Horecker elucidate the cyclic nature of the direct oxidation pathway.

The summer of 1953 brought Horecker to Brookhaven to repeat the labeling experiments with pea leaf and root preparations. It was also our good fortune that Harry Beevers, who later became known for his pioneering work on the glyoxylate cycle in plants, came that summer to study pathways of respiratory metabolism by measuring glucose breakdown in higher plant tissues. We found that, while the pea root preparation showed a labeling pattern essentially the same as that of liver, the leaf extract differed. The difference between the root and leaf data was eventually accounted for by the photosynthetic carbon reduction cycle of M. Calvin, A. A. Benson, and J. A. Bassham.

Harry and I examined the relative respiratory contributions of the classical glycolytic sequence and the direct oxidation pathway. Additionally, we measured the effect of age of tissue on the relative contribution of each pathway. The data were consistent with the concept that as embryonic tissue

differentiates during growth, carbohydrate metabolism undergoes qualitative change. While embryonic tissue splits glucose via classical glycolysis, the direct oxidation pathway makes an increasing contribution as growth and differentiation occur.

So enchanted were they by *Leuconostoc*, the boys of the summer of 1953 (Horecker and Beevers) were inspired to compose a ditty to the tune of "Clementine." (See bottom of page.) The degradation reaction was carried out in a Warburg vessel—a glass container fitted with side arms from which the phosphate buffer and cell suspension could be added (tipped in). The CO₂ produced was trapped in alkali in a small specialized compartment in the center of the vessel.

Additional verses (at least a dozen) were contributed by Mary Stiller, who worked with Harry Beevers. The lights of an ancient binary scaler counting in tens did flash.

Otto Kandler came the following year to apply the *Leuconostoc* fermentation to sugars isolated from algae and higher plants that had photoassimilated radioactive carbon dioxide for brief periods. The isotopic distribution patterns were asymmetrical in contrast to a symmetrical one predicted by the cycle. Termed the Gibbs effect and often quoted as an argument against the cycle, the asymmetrical labeling was later shown to result from a lack of isotopic equilibrium between the two

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Leuconostoc

Solo

Leu - co - no - stoc in the side arm, Glu - cose in the cen - ter

well, Tip it in with phos - phate buf - fer, Car - bon one comes off like

Chorus

hell. To the coun - ter, to the coun - ter, to the coun - ter like a

shot. Turn the switch on, see the lights flash, Is it cold, or is it hot?

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three-carbon intermediates that combine to yield the six-carbon sugar and is not an indicator of modification.

I, too, was a lad of summers having umpired ball games in the departmental BNL league. Of all the bystanders, I remember only one — young Michael, the son of Jean and Harry, who, alone, cheered and approved my every call.

Minority
student and
faculty travel
grants available
for 1996-1997.

See article on
page 16 and
application
forms on pages
17 and 18.

OBITUARIES

Delbert D. Hemphill

ASPP headquarters received word in December 1995 of the death of emeritus member Delbert D. Hemphill. Hemphill, a member of the Department of Horticulture of the University of Missouri-Columbia, joined ASPP in 1948.

Katherine Ellen "Kit" Steinback

Kit Steinback died unexpectedly in Berkeley, California, on December 30, 1995, at the age of 46 following a short illness. She had been a member of ASPP from about 1976 until 1988.

Kit was born in Berkeley on July 10, 1949. She received her B.A. degree in botany from the University of California at Berkeley in 1971 and her M.A. and Ph.D. degrees from the Department of Biological Sciences of Harvard University, where she studied the organization and development of thylakoid membranes in maize in the laboratory of Lawrence Bogorad. She was a postdoctoral research associate with Charles Arntzen at the University of Illinois from 1977 to 1980. There, she continued her work on the structure and function of chloroplast proteins, particularly the light harvesting pigment protein complex, and explored its relation to grana formation. She was an important participant in the discovery that atrazine blocks photosynthesis by binding to a thylakoid protein. The latter work provided the basis for the concept that sensitivity of a plant to an herbicide could be eliminated by altering an herbicide binding site on a protein.

During the academic year of 1980-1981 while a visiting assistant professor of biological sciences at Wellesley College, Kit also worked at Harvard in a joint project (with Lee McIntosh, Arntzen, and Bogorad). Together with the earlier work that showed that triazine arrests photosynthetic electron flow, this research was at the foundation of studies that led to the characterization of the reaction center of photosystem II of photosynthesis. The following year, she was a visiting assistant professor at the MSU DOE Plant Research Laboratory in East Lansing, Michigan. Then, in 1982, she took a position with Advanced Genetic Sciences (later DNAP) in Oakland, California,

where she served as a biochemist and as an administrative officer of grants and contracts. Kit authored or co-authored 38 journal publications. She was a co-organizer of a Cold Spring Harbor Symposium entitled "Molecular Biology of the Photosynthetic Apparatus" and editor of the publication that followed.

After Kit left AGS in 1989, she was for a time a senior research associate in forensic science in the Department of Biomedical and Environmental Health Sciences at U.C. Berkeley and also worked in publishing.

To her many friends, she was a thoughtful, considerate, and sensitive person. She was also a fantastic cook. If Kit's early interests had not led her into science, she would have offered serious competition to Julia Child. She will be sorely missed by all who knew her.

A memorial fund in Kit's name has been established to help defray the costs of women students and postdoctoral associates attending this summer's Gordon Conference on "Photosynthesis: Biochemical Aspects." Contributions to the Katherine E. Steinback Memorial Fund can be sent to Ann Hirsch, Department of Biology, University of California, Los Angeles, CA 90024-7009.

Stefan J. Kirchanski, Irvine, California
Ann M. Hirsch, UCLA
Lawrence Bogorad, Harvard University



Back Issues of Science

Dr. Carl McDaniel, Rensselaer Polytechnic Institute, has copies of *Science* from 1968 through 1995 that he will give to any person or organization willing to pay the shipping costs. There are some, but not many, missing issues. Contact Carl McDaniel, Department of Biology—MRC, Rensselaer, Troy, NY 12180 USA; fax 518-276-2162, e-mail mcdanc@rpi.edu.

PRESIDENT'S LETTER

Our Changing Times

As president of the ASPP, I had the privilege to attend the bi-annual meeting of the Council of Scientific Society Presidents (CSSP), held December 2-5, 1995 in Washington, D. C. More than sixty society presidents are members of this group, which works to improve science for all. As was true of the previous meeting I attended, the most impressive part this year was the lecture program. CSSP consistently manages to assemble an impressive list of speakers. For example, the presidents of the National Academy of Science (Bruce Alberts), National Academy of Engineering (Harold Liebowitz) and the National Institute of Medicine (Kenneth Shine) all gave presentations. The comments made by these and other participants at the meeting left little doubt that the world of science is undergoing dramatic change. In response to budgetary restrictions, the scientific enterprise we have known is evolving to a form yet to be defined. Below I briefly describe the changes and suggestions discussed at the meeting. I also present examples of what is being done to adapt to the changes.

The beginning: reduction in federal science funding. The current change commenced at the close of the Cold War. In the absence of an adversarial superpower, support for science has continued to decline. In light of current problems with the national budget, it is almost certain that this trend will continue irrespective of whether the Democrats or Republicans rule the budgetary day in Washington. Medicine is in the best shape because both Congress and the public understand its need. Support for NIH will likely be increased in the long term by a percentage equivalent to the consumer price index plus 1%. Even this level, however, represents a reduction in real terms owing to the high rate of inflation in medical research. To a degree, the extent of the decline rests in our hands. Each of us needs to devote more time to outreach activities that reiterate the importance research has played in improving the daily lives of the citizenry of this country. It is essential that public officials and legislators understand

this importance. This is especially true for the current Congress, which has less understanding of science than did its predecessors. One message repeatedly conveyed at the Washington meeting was that outreach efforts are most effective at the local level—for example, meeting representatives or senators on their home turf.

Industry will not pick up the slack. Unfortunately, we cannot count on industry to bail us out. Of the \$130 billion dollars invested in research and development by the 271 members of a leading organization of corporations, Washington's Industrial Research Institute, for example, only 6% is used for basic (long-term) research. While there is talk of increasing this percentage, there is strong pressure to support only that research likely to remunerate the company in the near-term. Furthermore, history has shown that when federal contributions go down, industrial investments in university research follow suit. In short, while there may well be increased interactions between university scientists and corporations in the future, the bulk of support for long-term research must continue to come from the government.

Need to improve the image of research universities. The public image of research universities has to be improved in the public eye. For example, the message has to get out that almost half of the fundamental scientific research conducted in the nation is university-based. Medicine is a case in point. More than 40% of the important application discoveries were not founded on directed research, but stemmed from long-term projects in which scientists were trying to figure out how the body works. The benefits we enjoy in health, economic leadership, and military superiority are traceable to investments in research made at universities a generation or more ago. Furthermore, while research investment in the United States has been essentially flat during the 1990s, it has been increasing in competitor nations. This trend does not bode well for a future that all agree will be increasingly technology-based.

Budget downsizing dictates need to identify target fields. With a decreasing budget, the scientific community must identify new fields of emphasis. Unlike the past, the United States cannot continue a program that spans the full scientific spectrum. We must decide which fields we want to lead in the future and invest our resources there.

Changes must be made. The budget dictates that the research establishment must reorganize for greater efficiency. For example, multidisciplinary teams directed toward a common goal will become increasingly frequent in the future. We need to decide how many Ph.D.s to train. There was not consensus on this point at the meeting. Some believed that the number should be reduced and let the market determine the final count. Others thought that the nature of the degree should change, the educational component broadened, so that a greater choice of career options is possible. Yet others concluded that scientists, including those below the doctorate level, should be doing jobs that today are done by nonscientists. Business and certain government careers were given as examples. There seemed to be agreement that the master's degree will assume greater importance in the future.

Wrap-up. The overriding view emerging from the CSSP meeting is that we must face the present changes in science head on. Although no one wants to accept it, the days of generous funding and an ever-growing budget base for science are over. There was agreement on general courses of action to be taken as the picture solidifies. First, we as scientists must increase our outreach activities to educate students in the public schools as well as to enlighten their parents and congressional representatives as to the value of university-based research. Only then can we expect the nation to sustain healthy long-term support for science. Furthermore in keeping with the tenor of the 90s, we must learn to do more with less. Toward this end, we will have to

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improve efficiency in every way possible. Transition will not be easy. Long-held ideas and institutions will have to change.

What to do? Participants at the CSSP meeting provided generalities but, unfortunately, few specifics on how to adapt to the changes underway. The best I can offer, therefore, is a summary of what ASPP is doing as a professional society and what I am doing as an individual scientist.

We are fortunate that past ASPP leadership foresaw changes and instituted adaptive measures, which in most cases are being strengthened and extended.

- A public affairs committee and an office with a full-time staff member have been set up to advise Congress and keep the ASPP membership apprised of the funding situation in Washington. As scientists, we should take an active role in making sure that our voices are heard in an effective way.
- The ASPP Education Foundation has been established to educate and enlighten the public on the importance of research in the plant sciences as well as science in general. In this context, ASPP acts in the interest of all scientists, especially those working in plant-related fields.
- ASPP is taking systematic steps to reinforce the understanding and importance of the plant sciences to the public. These include teacher workshops, educational symposia, a program to bring minority students to the national meeting, and a policy which allows the publication of education articles in *Plant Physiology*. On a more personal note, I have made a number of recent adaptations after sensing the inevitability of change. Time will tell if my approach is a wise one.
- I have selected two projects (cereal biochemistry, bioremediation) conducive to potential commercial application and yet dependent on fundamental research.
- My research is increasingly multi-disciplinary and less "single-PI" oriented. While such a change is appropriate for senior faculty, it is not encouraged for junior colleagues. This is one aspect of the academic reward system that may have to change. Organizations such as CSSP, and ASPP, could be instrumental in this connection.
- Our laboratory is now one of several

that collaborate on projects spanning the spectrum from the bench to the factory or field. To my surprise and delight, progress at one end of the spectrum facilitates work at the other.

- We work more closely with companies. Students engaged in this work are, therefore, encouraged to incorporate practical application in their vision.
- Students from historically African-American and Hispanic universities visit our laboratory annually for a semester or longer.
- An increasing portion of my time is devoted to teaching and public outreach.
- One area in which I have fallen short (and need to improve) is volunteering in the schools. All of us should offer our talents and expertise to public education. We can make a difference.

I hope this summary will give an idea of ongoing attempts to adapt to the changes taking place in science. Periods of challenge, such as the one we now experience, can be faced in different ways. I hope that the present changes can be viewed not as a block or a dead-end, but as an opportunity to create new avenues. If so, I am optimistic that, in the end, we may well surprise ourselves with how effective we are in the new scientific enterprise. An anonymous quotation perhaps sums up the situation, "Tempora mutantur, nos et mutamur in illis" (Times change, and we too change with them—from John Owen's *Epigrammata* [1615]).

Bob B. Buchanan
1995-1996 ASPP President
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SECTION NEWS

Southern Section

The annual meeting of the Southern Section of American Society of Plant Physiologists will be held March 30 to April 1, 1996, at the Sheraton Plaza Hotel at the Florida Mall in Orlando, Florida. Randall Cameron (813-293-4133) is in charge of local arrangements. Participation is not limited to members in the

Southern Section. Anyone who is interested in attending the meeting and/or presenting a talk or poster should contact Dawn Luthe, secretary/treasurer (601-325-7733, dsluthe@ra.msstate.edu). The deadline for submitting papers is February 28, 1996.

Mary Musgrave, vice-chair of SS-ASPP, has organized the 1996 annual symposium, Gravity and the Plant Cell, which will be held on the morning of April 1. The speakers and their topics are: Janet Braam, Rice University, "Roles of the TCH Genes in Responses to Gravity and Other Environmental Stimuli"; Randy Wayne, Cornell University, "A Down-to-Earth Model of Gravisensing"; Abraham Krikorian, SUNY at Stony Brook, "Space Stress and Genome Shock in Developing Plant Cells."

Western Section

The Western Section of the American Society of Plant Physiologists, as has been noted in recent issues of the newsletter (see especially the September/October 1995 issue), is undergoing a renaissance, after having been inactive for about 10 years.

Officers for the newly reactivated section have been announced. Serving as chair from January 1, 1996, until December 31, 1997, is Rolf Christoffersen from the University of California at Santa Barbara. Secretary-treasurer for the same period is Frances DuPont of the USDA/ARS's Western Regional Research Center in Albany, California. The new Western Section representative to the ASPP executive committee is Sharmen O'Neill, University of California at Davis, whose term began on October 1, 1995. O'Neill will serve on the executive committee through September 30, 1998. She succeeds Terri Lomax, Oregon State University, who served as the sole officer of the Western Section for several of the years that the section has been inactive.

The September/October 1995 issue of the ASPP Newsletter detailed several actions that have been taken to revive the Western Section. With this announcement of officers, the section now has the nucleus necessary to move forward with a formal election, meetings, and full-fledged member services.

Public Affairs

ASPP Urges House Agriculture Committee to Support Basic, Competitive Research

In response to questions by the U.S. House of Representatives Committee on Agriculture concerning revision of the research title of the Farm Bill, ASPP recently submitted comments explaining economic growth opportunities offered from basic research and competitively awarded grants. ASPP added that the Research title's provisions on sustainable agriculture need to be fair and reasonable for farmers.

ASPP cited the May 1995 report of the Economic Research Service, *The Value and Role of Public Investment in Agricultural Research*, which found the high return to society from agricultural research, especially basic research. "A summary of estimates of social rates of return for public support for basic agricultural research and development is 57 percent to 110 percent," ASPP noted. ASPP said ERS concluded that, "a high rate of return means that many beneficial projects are not being funded."

ASPP public affairs committee chair Ralph Quatrano said in the comments that a report released late in 1994 by the National Research Council, *Investing in the National Research Initiative, An Update of the Competitive Grants Program in the U.S. Department of Agriculture*, found the need for increased support for competitive research within USDA. The report found that

competitive grants have three major strengths that work toward attainment of the goal of stimulating advancement in fundamental areas of science, thus advancing the frontier that defines the possibilities for technological innovation. The report said these three strengths are:

- Competitive grants are responsive and flexible, permitting participation of leading-edge scientists as applicants and also as proposal reviewers and allowing adjustment in year-to-year funding priorities as scientific opportunity and national need dictate.
- Such grants can attract a broad range of scientists to the agricultural, food, and natural-resource system, drawing talent into new endeavors and into research on unresolved problems.
- This competitive grants program casts a wide net that captures research proposals that will aid in developing new alliances, new initiatives, and new approaches complementary to those traditionally employed.

ASPP's comments noted that some interests in the sustainable agriculture movement have challenged the contribution of basic research to sustainable agriculture. "However, it is important to recognize that sustainable agriculture does not simply mean organic farming as some groups advocate," Quatrano noted. "Ad-

vances in plant biotechnology not only offer advantages in productivity, but also offer more environmentally sustainable practices. Crops engineered using plant biotechnology to more effectively resist disease, require less chemical inputs. Crops which will be engineered to better withstand drought will result in less need to invest in irrigation equipment."

The comments noted that the success of sustainable agriculture depends fundamentally on making plants more efficient in converting sunlight, nutrients, and water into food and fiber products. Conventional plant breeding now boosts yields by roughly one percent annually. Biotechnology can be expected to make breeding even more efficient in the future.

"ASPP agrees with the need to develop economically, socially, and environmentally sustainable agricultural practices. Whole farm societies, along with their social fabric, will almost certainly be eliminated as economically unsustainable in future years if they are denied the contributions that basic research will bring," the comments added.

The House Committee on Agriculture will review comments submitted to its questions in preparation for its development of the research title of the Farm Bill early this year.

DEADLINE FOR ABSTRACTS

FOR PLANT BIOLOGY '96- THE ASPP ANNUAL MEETING

IS FEBRUARY 29, 1996

NASA Center for Advanced Studies in the Space Life Sciences Seeks Plant Biology Topics

The National Aeronautics and Space Administration (NASA)-sponsored Center for Advanced Studies in the Space Life Sciences (CASLS) is seeking suggestions for workshop topics on plant science and other life sciences. CASLS established operations last year through a cooperative agreement between the Marine Biological Laboratory (MBL) in Woods Hole and NASA. The center addresses issues of mutual interest to NASA and the basic science community.

A series of symposia, workshops, and seminars will be held at the MBL to advise NASA on a wide variety of topics in the life sciences, including plant biology, cell biology, developmental biology, molecular biology, neurobiology, and systems biology. Special attention will be directed at examining how gravity and its control impact on biological processes and how

variations in gravity can be utilized as a probe to better understand such processes.

The center will provide a forum for scientists to discuss the role that gravity may play in fundamental cellular and physiologic processes. These meetings at the MBL will also serve to inform the community of research opportunities in the life sciences that are of interest to NASA. The center will use its newsletter to provide synopses of these events and to disseminate information from NASA that is of interest to the life sciences community.

CASLS is organizing a workshop entitled "Planning for Aquatic Research in Space" to be held at the MBL in the spring of 1996 with Dr. George Langford from Dartmouth as chair. Topics for discussion at this meeting will be selected from areas of plant biology, neurobiology, developmental biology, and cell biology.

A second workshop is planned for autumn 1996. Two possible themes have been suggested. These are: "Aquatic Models in Developmental Biology" and "Planning for Insect Research in Space." If you have thoughts or suggestions on these or other potential workshop topics, contact the center. If you do not yet receive a copy of the "Newsletter of the Center for Advanced Studies in the Space Life Sciences" by direct mail, you can also contact the center to add your name to the mailing list.

Center contacts are: Lenny Dawidowicz at 508-548-3705 and ldawidow@mbi.edu and Ann W. Crosby also at 508-548-3705 and acrosby@mbi.edu. World Wide Web location is: <http://www.mbl.edu/html/NASA/WWW.nasa.html>. Mailing address is Marine Biological Laboratory, 7 MBL Street, Woods Hole, MA 02543-1015.

Federal Furloughs Halted by Continuing Resolution

NSF, NASA Funded through March 15

A partial federal shutdown beginning December 16 came to an end one week into the new year as Congress passed a continuing resolution that became effective as President Clinton proposed a seven-year balanced budget using Congressional Budget Office (CBO) numbers.

A continuing resolution funding government operations was in effect until January 26. Potential further disagreement between the Congress and the President on the budget threatened a new round of temporary furloughs for many federal workers.

However, Congress and the President agreed to another continuing resolution that keeps doors open at the National Science Foundation and National Aeronautics and Space Administration through March 15.

ASPP campus contacts sent letters to their members of Congress in support of continued funding for NSF. More legislation needs to be passed to keep NSF and NASA operating past March 15.

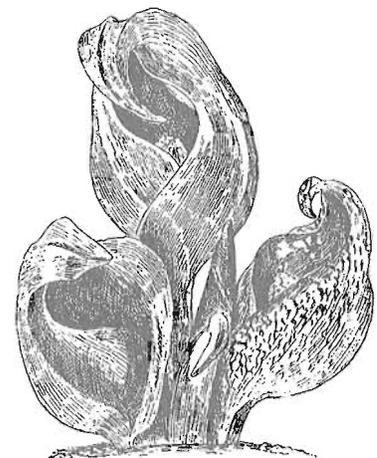
Employees of NSF and NASA had joined several hundred thousand other federal employees who were either furloughed or forced to work without pay during the federal budget impasse.

At NSF, 1,233 employees were on furlough and 24 were working without pay. A total of 19,980 NASA employees were furloughed and 1,290 were working without pay. Overall, the partial shutdown idled 284,621 employees and forced 475,608 to work without pay.

As employees returned back to NSF headquarters in Arlington, Virginia, efforts were made to honor all continuing plant science grants. As she worked late in the office on January 17, Plant Science Initiatives Program Director Machi Dilworth explained that NSF was also attempting to make awards for plant science proposals selected by peer review panels in the fall. The government shutdown and subsequent four federal snow days in Washington the week of January 8 kept many proposals from the January

10 NSF deadline piled up in the mail room, temporarily out of reach of program staff.

Department of Energy and U.S. Department of Agriculture employees were not affected by the furloughs. Appropriations bills for DOE and USDA were passed into law before the recent partial federal closure.



Agricultural Competitiveness Initiative Under Consideration for Farm Bill

Congress did not pass the Agricultural Competitiveness Initiative (ACI) last year despite earlier passage by the Senate. House Agriculture Committee staff said this leaves the ACI for consideration for possible inclusion in the research title of the Farm Bill during committee deliberations expected in February.

The Senate had earlier approved \$30 million for a new ACI program in provisions that were not subsequently accepted in conference. House conferees cited the lower amount proposed for the program of \$30 million in the Senate-passed bill as opposed to an earlier proposal providing as much as \$500 million for the ACI from the Commodity Credit Corporation.

The ACI is proposed as a way to help producers through increased funding of competitive research at a time when Congress is reducing price supports. However, some producers experiencing price support cuts are also sensitive to additional cuts of funds that may be directed to research. There is the prospect that some commodity groups would seek an increased emphasis on applied research by the ACI.

ASPP has been explaining the need for support of fundamental research by the ACI. Many ASPP members who contacted their members of Congress in support of the ACI cited the importance of conducting fundamental research.

If successful, the ACI proposal offers the prospect of a large increase of needed support for plant and other agricultural research. Officials at USDA have been discussing placing administration responsibility for the ACI, if adopted, with the staff of the National Research Initiative Competitive Grants Program (NRICGP). With the NRICGP as the already existing extramural competitive grants program, it would appear to be a logical home at USDA for a second competitive grants program.

When ASPP first reviewed the draft legislation for the ACI earlier last year, it was believed that it had an uphill battle toward enactment. The recent passage in the Senate made prospects of enactment seem somewhat higher. With current efforts to balance the budget expected to reduce discretionary spending, including

discretionary spending for research, by about 30 percent over seven years, passage of the ACI could be a welcome exception to the expected downward trend in federal spending on research.

The current plan to fund the ACI from the Commodity Credit Corporation would not require a reduction in other discretionary agricultural research funds. At the same time, efforts need to be made to assure that other discretionary agricultural research funds are not reduced if the ACI is created.

Interests seeking special grants annually seek funds that the administration proposed, instead, for the NRICGP. Those seeking special grants might try to obtain additional funds if there was a larger infusion of dollars proposed for competitive grants.

ASPP has been one of the most active science societies in support of competitive grant programs such as the NRICGP and ACI. Letters and calls to Congress from members of the ASPP contact network help explain the views of the research community to Congress.

Competitive, Academic Research Favored in National Academy of Sciences Report

A report released November 29 by a joint committee of the National Academies of Sciences and Engineering and the Institute of Medicine called for federal policy-makers to place a priority on funding academic research. The report also called for an emphasis on competitive merit review as the basis for allocating funds.

Although the report did not presume that university-based research is always of higher quality than that conducted elsewhere, the report said university-based research had three distinctive advantages that merit giving it a preference.

First, academic research allows agencies the flexibility to easily shift funding when priorities change. Second, it provides quality control through grant competition and rigorous peer review. Third, by linking

research to education, funding research and development projects at colleges and universities reaps the added benefit of simultaneously supporting the training of the nation's succeeding generations of scientists and engineers.

The report said that competitive merit review should be the basis for allocating funds, except when the purpose or nature of the work makes even-handed competition infeasible. Competitive merit review has been largely responsible for the remarkable quality, productivity and originality of U.S. science and technology, the report said.

Other key principles for making budget decisions recommended in the report include:

- Giving preference to funding projects

and people rather than institutions, thereby promoting the quality and flexibility of research.

- Research and development capacity should remain associated with the agencies whose missions require it. The resulting pluralism of agencies and research institutions fosters creativity, cross-fertilization and flexibility. (This recommendation responded coolly to a proposal for creation of a Department of Science. Instead, the report called for a more coherent federal budgeting process along with a more competitive distribution of funds.)
- Federal government should encourage, but not directly fund, private-sector tech-

continued from page 9

nology development with two exceptions: in pursuit of the government's own missions—such as weapons development or space flight—or where government participation is essential for the development of new enabling, or broadly applicable technologies.

- Existing federal laboratories should undergo renewed scrutiny, with the possibility of redirecting or eliminating resources when mission requirements have diminished or if external reviewers deem them less effective than other alternatives. At the same time, the report noted that federal laboratories, which now account for nearly 40 percent of the federal science and technology budget, have played a vital role in the nation's science and technology enterprise.

The report said that current estimates of federal research and development expenditures exceeding \$70 billion annually are misleading. Almost half of this amount is spent on activities such as establishing production lines and developing operational systems for new aircraft and weapons systems that do not involve the creation of new knowledge or technologies. Therefore, a more accurate estimate of federal support for research and development would range from \$35 to \$40 billion annually, the report said.

"By any measure, the federal government's investments in science and technology since World War II have been a spectacular success, producing enormous benefits for the nation," said Frank Press, committee chair and former president of the National Academy of Sciences. Press is currently senior fellow at the Carnegie Institution of Washington.

"If the government adopts the committee's recommendations, it will be possible to reduce or eliminate some programs, boost support of others and restrain federal spending, all while maintaining our nation's excellence in science and technology," Press added.

The report called for development of the federal budget to take the following steps:

- An annual comprehensive research and development budget, including areas of increased and reduced emphasis would be made by the President.
- Research fund allocation decisions would be made by departments and agencies based on clearly articulated

criteria congruent with those used by the President and the Congress. Congress would create a process that examines the entire research budget before the total federal budget is divided into allocations to appropriations committees and subcommittees.

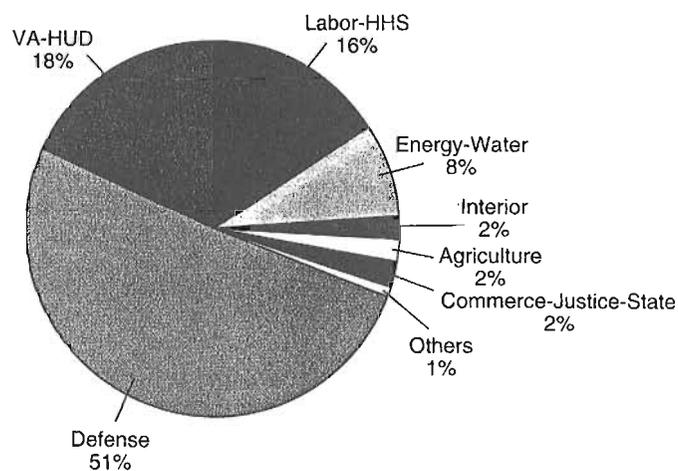
- The President and Congress would ensure that the research budget is sufficient to allow the nation to achieve pre-eminence in a select number of fields and to perform at a world-class level in other major fields.
- The U.S. would pursue international cooperation to share costs to tap into the world's best science and technology and to meet national goals.

The report used plant science research examples of federal science and technology that "enable continuing U.S. innovation." Among the eight examples of "ba-

sic research" listed in a table in the report was the following: "Exploring the chemistry of photosynthesis—at many universities and federal laboratories (USDA, NSF)." There were also examples of basic research in the physical and social sciences among the eight examples.

Among the dozen examples of "fundamental technology development" listed in the table of research that "enable continuing U.S. innovation" was the following: "Breeding drought-resistant or saline-tolerant crop plants—at USDA centers and universities (USDA, USAID)."

The report was requested by the Senate Appropriations Committee. The report is available at no charge on the World Wide Web at <http://www.nas.edu/nap/online/>.



This pie chart shows the proportion of federal research approved by seven of the thirteen appropriations subcommittees in Congress. The VA-HUD subcommittee appropriates for NSF, NASA, EPA, and the Office of Science and Technology Policy. The Energy and Water subcommittee approves spending for most DOE research programs including the Division of Energy Biosciences. The Agriculture subcommittee appropriates most agricultural research funds. The Labor-HHS subcommittee approves spending for NIH, Centers for Disease Control, and Department of Education R&D programs. Fourteen percent of the federal government's discretionary funds went for R&D last year. (Reprinted with permission from *Allocating Federal Funds for Science And Technology*, copyright 1995 by the National Academy of Sciences. Courtesy of the National Academy Press, Washington, D.C.)

ASPP Education Forum

Edited by Robert Wise, Department of Biology, University of Wisconsin Oshkosh, Oshkosh, WI 54901, e-mail wise@vaxa.cis.uwosh.edu.

Plant Physiology to Publish Education Articles

Maarten Chrispeels, editor of *Plant Physiology*, has announced that the Society's flagship journal will be accepting up to six peer-reviewed, high quality, scholarly articles per year relating to issues in plant biology education. An editorial structure and instructions to authors are being developed. Susan Singer (Carleton College, MN) has worked closely with the Society's publications committee and journal editors to help bring about this opportunity for the ASPP to join other leading scientific societies in demonstrating a commitment to science education by publishing such articles. Please see companion articles on this topic.

Impact of Publishing Plant Education Articles Noted

Dr. David R. Hershey (Prince George's Community College, Largo, MD), who has been very active in publishing education articles that focus on plants as experimental systems, recently posted a complete, updated list of outlets for such articles on the Plant Education Newsgroup. Dr. Hershey points out that despite the lack of a journal devoted specifically to issues involving plant education, botanical scientists and educators have several other outlets for education articles. He also notes that before publishing, it is worthwhile to search the ERIC database for articles on the manuscript's topic that have appeared in the science education literature. Although far from complete, ERIC does include most of the journals that publish plant teaching articles. However, it began in 1966, thus the earlier literature, much of which is still useful, is missed. Hershey notes that plant biologists who do not publish plant education articles can still provide strength to the

literature by introducing it to their students, particularly to graduate students who intend to pursue teaching careers. Introductory botany courses could provide students with information on plant biology teaching, which would include resources and techniques for precollege teachers and parents. Topics could include sources and types of plant biology science fair projects, plant biology curricula (e.g. Wisconsin fast plants, GrowLab, Lifelab, etc.), and plant projects that parents can do with their children (e.g. making a terrarium, growing plants from supermarket produce, hydroponics, forcing spring bulbs, growing novelty plants, using plants as toys, etc.). A useful book on the latter topic is *Honeysuckle Sipping: The Plant Lore of Childhood*, Jeanne R. Chesnow, 1987 (Down East Books, Camden, ME).

Hershey also notes that most of the rewards for publishing in science education journals seem to be of the personal satisfaction kind. Although usually not recognized as such by administrators, an innovative science education article is a scholarly achievement that will probably have a wider readership and greater impact than most research articles. Sharing tried-and-true plant teaching techniques is a service to educator colleagues and plant biology education in general. It may also enable zoologically focused science teachers to add some plant content to their general biology courses. Hershey uses several of his teaching articles as handouts in his undergraduate classes. Students are impressed that they can actually understand the articles—something not possible with most research articles. As a final caution, Dr. Hershey notes that tenure-track faculty should be wary about publishing teaching articles. At some institutions, they are considered a negative, rather than a positive, part of the tenure package.

David Hershey has published over two dozen plant education articles in a variety of refereed science education journals.

Update on Outlets for Plant Education Publications

The March/April 1994 ASPP Newsletter contained an article by Susan Singer and David Hershey on publication outlets for plant education articles. That list has been updated and expanded in the following condensation of Hershey's recent posting to the Plant Education Newsgroup.

The American Biology Teacher, published by the National Association of Biology Teachers (NABT), is probably the single biggest source of plant biology teaching articles. It has a circulation of about 11,000, and its readers are about 75% high school biology teachers, yet most articles are written by college faculty. Surveys indicate the most appreciated articles are of the how-to-do-it type, which give directions for hands-on labs or teaching techniques. Other articles include reviews of particular biology topics or teaching techniques.

BioScience has three departments, Education, the Biologist Toolbox, and Viewpoint, all of which are good venues for plant teaching articles.

The British quarterly *Journal of Biological Education* publishes a great many plant articles and is one of the few that gives free reprints to authors.

The National Science Teachers Association (NSTA) publishes four general science teaching journals: *Science & Children* for elementary teachers, *Science Scope* for middle school teachers, *The Science Teacher* for high school teachers, and *Journal of College Science Teaching*. All often contain plant articles. An advantage of NSTA journals is that they have artists who can take an author's rough sketches and make professional drawings. *The Journal of College Science Teaching* is aimed primarily at faculty who teach introductory courses and has a Favorite Demonstration section that is ideal for 1 to 2 page articles.

+*Carolina Tips* is a newsletter distributed free to science teachers by Caro-

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lina Biological Supply Company. It is unique because the articles often contain color illustrations. Articles are refereed by Carolina's staff of Ph.D. biologists, and authors are provided with free reprints.

Science Activities is a quarterly general science education journal focusing on hands-on activities and often publishes plant articles.

The *Journal of Chemical Education* sometimes publishes articles that deal with plant and soil chemistry.

The American Society of Agronomy publishes the *Journal of Natural Resources And Life Sciences Education*, formerly the *Journal of Agronomic Education*. It has the rare distinction, for a science education journal, of having one of its articles cited in a major textbook (*Plant Physiology* by Salisbury & Ross). Unlike the above journals, it has page charges.

BioScene - Journal of College Biology Teaching, is published by the Association of Midwest College Biology Teachers. It contains many plant articles. All its 21 volumes are being archived on-line, which will make it one of the most easily accessible journals.

Research journals sometimes publish teaching articles as well. The *International Journal of Plant Science* (formerly *Botanical Gazette*) recently published an article on teaching use of the fern *Ceratopteris*. The *American Journal of Botany* publishes occasional special articles that could be considered educational. The *Plant Science Bulletin* publishes education articles, and the ASPP Newsletter has an Education Forum for short items. Most states have science teacher and biology teacher organizations, some with periodicals.

Lichen Growth Rates Used To Determine Building Age

Andy Dyson (Sutton Coldfield College, Birmingham, UK) describes a practical ("laboratory exercise" for those of us "across the pond") based on the growth rate of lichens found on surfaces of a known age. Gravestones are particularly useful as their date of installation is engraved on the surface.

Two good lichens to study are *Xanthoria parietina* (a yellow-orange

variety) and *Parmelia sulcata* (blue-gray), both of which grow in a circular pattern and therefore are useful for this exercise. Both lichens are common in the U.K. but other species may need to be substituted for other locations. Dyson recommends that educators check with a lichenologist familiar with your local species.

X. parietina is fairly resistant to pollution. It can grow at rates of about 2.5 mm (radial growth) per year depending on the local microclimate. *P. sulcata* is equally tolerant but grows only about 1.2 to 2.2 mm per year. The exercise is based on the assumption that the largest specimen on the rock/gravestone colonized soon after exposure. Armed with a hand lens and suitable measuring devices, the students set about recording the diameters of lichens on gravestones of known age. They then construct a calibration curve (diameter vs. age) and from that a growth rate can be calculated.

There are many factors which can affect the growth rate (rock type, exposure to wind and sun, local moisture conditions) and therefore, students are encouraged to comment on the possible errors within their calculations. Growth rates from different sites can be compared to demonstrate the effect of local conditions on lichen growth.

A competition can then be set up whereby the students have to date a building or monument based solely on lichen growth rate and their own calibration curve. The exact date of construction of the building can usually be obtained from local records.

Arabidopsis Lab Manual on the Web

Jonathan Monroe (James Madison University) has put together a WWW manual for an Arabidopsis lab project used in his plant physiology course. Briefly, students isolate mutants, grow them for seed, then conduct experiments to characterize the mutation(s). The project takes the entire semester, but traditional experiments are pursued while the putative mutants are growing.

The manual is divided into two parts. One is for instructors and contains a poster presentation from a recent ASPP meeting, and the other part is a manual for students that

contains links to the extensive Arabidopsis databases on the Web. The URL is: <<http://www.jmu.edu/biology/pplab/ppjm1.html>>.

Jon welcomes anyone to have a look at his manual and asks to be informed of any errors or bugs.

Resources Available From the NABT

The National Association of Biology Teachers (NABT) has made available to their members over 20 publications dealing with issues and practices in biology education at the elementary, middle and high school levels. These publications are also available to non-members and costs range from \$10 to \$60 depending on the monograph. The contents ranges from cookbook laboratory exercises (many of which can be adapted to college-level introductory courses) to international high school biology exams. A one-page flyer containing book descriptions, cost, and ordering information can be obtained from NABT Headquarters at 800-406-0775.

Titles are:

- A Sourcebook of Biotechnology Activities
- Basic Biological Concepts: What Should the World's Children Know
- Biology Labs That Work: The Best of the How-To-Do-Its
- Biology on a Shoestring
- Biotechnology, Genetic Engineering & Society
- Bitten by the Biology Bug
- Favorite Labs from Outstanding Teachers, Vols. 1 & 2
- Investigating Evolutionary Biology in the Laboratory
- Learning Biology With Plant Pathology
- Oceanography for Landlocked Classrooms
- Order & Diversity in the Living World: Teaching Taxonomy and Systematics in Schools
- Teaching Critical Thinking Skills in Biology
- Using Fast Plants & Bottle Biology in the Classroom
- What College-Bound Students Abroad Are Expected to Know about Biology
- Working With DNA & Bacteria in Precollege Science Classrooms

ASPP Scientist Outreach Assists Frederick County Science Students, Teachers

As the Frederick County (Maryland) Board of Education learned details November 20 of its award of state funds for construction of a new science lab, schools Superintendent Dan Gadra credited ASPP member Doug Luster and ASPP for their assistance of the schools' science program.

The ASPP partnership with Frederick County schools was used as supporting information by the schools in their winning request to the state for construction funds for a new science lab. Awards of this type by the state were rare last year.

Gadra also informed the board that several Frederick County high school students served internships at a USDA-ARS laboratory at Fort Detrick in Frederick after ASPP and Frederick County schools agreed informally to form a partnership in October 1994.

Gadra and Board of Education Member (then chair) Earl Robbins met with the ASPP Education Committee,

past president Jim Siedow, Doug Luster, and ARS scientist J. Michael Robinson at ASPP headquarters in October 1994. ASPP member Maxine Highsmith initiated the proposal for ASPP to form a partnership earlier with a letter to Russell Jones, former ASPP President.

In February 1995, Luster met with the Frederick County Middle School and high school science department chairs. Ideas for the partnership were discussed at the meeting. Luster offered use of ARS labs to teachers and briefed them on student internship programs. Luster also met with the Linganore High School science department chair to discuss useful formats for workshops and lesson plans in plant science.

In the summer of 1995, three students from Frederick County high schools interned in the labs of Luster and fellow ARS scientists Paul Tooley and Norm Schaad. Equipment and supplies that were no longer of use to the ARS lab at Fort Detrick and would have been discarded last summer were enthusiastically selected by Frederick County middle and high school teachers for use

at the schools. Funds for purchase of lab equipment at school systems are often limited.

Luster said future plans this year include conducting a Fast Plants workshop. Selected exercises from the ASPP high school teachers workshop held earlier at the annual meeting may be presented at an "in service" teacher career development day this year.

The partnership with Frederick County schools is primarily with its Middletown High School. The partnership agreement document notes that it does not constitute a legally binding agreement, but represents a mutually stated desire to work toward a common goal. The signing of the partnership between ASPP and the Frederick County schools was shown on the Frederick County cable access television channel.

The ASPP Education Committee is supporting and reviewing outreach efforts conducted with the Frederick County schools for possible future use in other school districts.



Agricultural Research Service scientist Doug Luster (left) represented the American Society of Plant Physiologists (ASPP) at the signing ceremony of a partnership agreement between ASPP and Frederick County schools. Frederick County Board of Education member Earl Robbins (center) and schools Superintendent Daniel Gadra also signed the document at a Board of Education meeting.

FIRST ASPP-SPONSORED INTERNATIONAL CONFERENCE A RESOUNDING SUCCESS

Joint US-Mexico Symposium Attracts 250 Plant Biologists from Mexico and the United States

The first joint U.S.-Mexico meeting in plant biology, co-sponsored by the ASPP and the Mexican Society of Biochemistry, was held in Cocoyoc, Mor, Mexico, November 5-9, 1995. A binational organizing committee (Miguel Lara-Flores and Alejandra Covarrubia-Robes from Mexico, who did the actual work of organizing the meeting, and Virginia Walbot and Maarten Chrispeels from the United States) was constituted in response to an invitation to the ASPP from Federico Sanchez, the president of the Mexican Society of Biochemistry.

The purpose of the meeting was to foster closer ties between Mexican and U.S. plant biologists by providing an exciting meeting at which scientists from both countries could present their latest findings. The program emphasized basic research in plant biology directed at major Mexican crops (maize, sorghum, tomatoes, beans, peppers, wheat). An interdisciplinary approach included speakers who utilize biotechnology, molecular biology, biochemistry, physiology, agrobiology and genetics to better understand these important crops. The enthusiasm of the 250 participants (about 210 from Mexico and 40 from the United States) provided ample evidence that these two ambitious goals were reached. A major benefit of this conference was that the Mexican graduate students, who generally do not have access to funds to attend meetings in other countries, were able to learn first-hand of research breakthroughs in many U.S. laboratories.

The Conference

The conference was organized as a series of five major symposia, (N_2 -fixation; cereal development; plants under stress; biotechnology; signal transduction), divided equally between U.S. and Mexican presentations; six minisymposia, about one-third U.S. and two-thirds Mexican presentations; and three poster sessions, with 110 of 130 posters from Mexico. From the Mexican side, the three major centers of plant molecular biology (UNAM-Mexico City, UNAM-IBT-Cuernavaca, Cinvestav-Irapuato) were heavily represented. Speakers for the symposia and mini-symposia also came from

other institutes in Mexico including CICY (Merida), INIFAP (Chapingo), CIMMYT, the Center for Nitrogen Fixation (Cuernavaca), and the Colegio de Postgraduados de Chapingo (Montecillo).

Sources of Financial Support

Participation of scientists and students from Mexico was supported by UNAM (Faculty of Chemistry, Institute for Biotechnology), CONACYT (the Mexican equivalent of our NSF), and the Mexican Society of Biochemistry. Participation of senior scientists, postdocs, and students from the United States was supported by a major grant from the National Science Foundation (International Programs), a grant from the Samuel Roberts Noble Foundation, and contributions from nine U.S. biotechnology companies: Agracetus, DeKalb, DuPont, Monsanto, Northrup King, Petoseed, Pioneer Hi-Bred International, Sandoz Agro, and U.S. Tobacco Company. ASPP, a sponsor of the meeting, administered the grants and donations and sent its outgoing president, Jim Siedow, as the ASPP representative. The National Science Foundation was represented by Tom Brady.

The Future

At the business meeting of the Mexican organizing committee, a consensus emerged that a similar conference should

be held in two years time to consolidate the gains made at the Cocoyoc conference. Luis Herrera-Estrella and Alfredo Herrera-Estrella, both from Cinvestav-Irapuato, agreed to spearhead the effort at a site close to the colonial city of Guanajuato, which is about 200 miles northwest of Mexico City. Also, Mexican plant biologists were encouraged to attend the Plant Biology '96, the annual meeting of ASPP in San Antonio, Texas, and the 1997 Pacific Rim meeting involving the ASPP, the Canadian Society of Plant Physiologists, and the Japanese and Australian societies.

Two U.S. scientists who will lead the U.S. delegation for the 1998 meeting will be identified at a later time. At a meeting organized by the U.S. delegation to discuss sources of support for collaborative research, Tom Brady explained how the NSF International Grants Program works, and successful applicants (Ann Hirsch and Champa Sengupta-Gopalan) added their comments. Subsequent discussions centered on how we might interest a major philanthropic foundation in a postdoc exchange program and what role the ASPP Education Foundation could play in administering such a program. The organizers of the 1995 U.S. delegation, Virginia Walbot and Maarten Chrispeels, plan to look further into this question.



The two organizers from Mexico of the joint U.S.-Mexico symposium, Miguel Lara on the left and Alejandra Covarrubias on the right, are shown with Ted Hsiao from U.C. Davis.

Mutual Recognition of Plant Science Societies

First of a series by officers from plant physiology and related societies from other countries

According to the latest ASPP membership directory, 154 German plant physiologists hold membership in ASPP. On the other side, the number of colleagues from the United States who support the German Botanical Society through membership is comparatively small (17). This numerical imbalance approximately reflects the respective predilections of junior scientists of the two countries to do, e.g., postdoctoral work in an institute on the opposing side of the Atlantic. Especially since the end of World War II, the dreams of rising generations of German botanists have focused on the scientific scene of the United States as representing a world of unlimited opportunity. Fortunately, special exchange programs from the German side—e.g., that of the

Humboldt Foundation—attract predominantly senior scientists from the United States to spend time as guest researchers in German laboratories.

Admittedly, when working in a host laboratory, we are fascinated above all by the science and do not think about scientific societies. However, these societies form an important part of our scientific life, in setting the scene for our research by publishing journals and organizing meetings, electing editors and awarding prizes.

Being conscious of the international character of science, the German Botanical Society will, in addition to its other obligations, be happy to help guest plant science researchers when visiting Germany. The Society can assist in establishing contacts, arranging invitations, providing the services of its library and—last, but not least—offering its international journal, *Botanica Acta*, for the publication of high quality research findings

in any area of the plant sciences. *Botanica Acta* is indexed in Current Contents and five other bibliographic databases.

The best possible support of colleagues from abroad would be facilitated by membership in our 118 year-old German Botanical Society (Deutsche Botanische Gesellschaft), which today has about 1000 members grouped into several sections, including plant physiology and phycology. The membership fees are in the same range as those for the ASPP and include a subscription to the journal of the society (*Botanica Acta*). With the aim of enhancing scientific relations, the Deutsche Botanische Gesellschaft will be happy to discuss ways to increase interactions, such as improved benefits of mutual membership with the ASPP.

Erwin Beck
University of Bayreuth
President of the
German Botanical Society

PEOPLE

- **Dr. Hans Kende**, Michigan State University, was awarded an honorary doctorate by the Faculty of Sciences of the University of Fribourg, Switzerland, at the traditional Dies Academicus ceremony on November 15, 1995, in Fribourg. Kende and his wife attended the ceremony, during which he was honored for "his eminent research in the field of plant physiology," for "his ongoing support of young researchers of all nations at the Plant Research Laboratory, Michigan State University, East Lansing," and for "all he has accomplished with exemplary commitment and dignity in the service of plant biology."

- **Barbara J. Baker**, of the USDA/ARS, Plant Gene Expression Center, Albany, California, won a 1995 Environmental Protection Award from USDA. Baker, a plant molecular geneticist, who also is an adjunct professor at the University of California, Berkeley, was honored for isolating and cloning the viral resistance gene, *N*. Her work holds promise for

enabling plants to withstand the tobacco mosaic virus, known to attack more than 150 varieties of plants worldwide. The Plant Gene Expression Center is operated by ARS and UC-Berkeley.

- Two appointments have been made recently at the National Science Foundation's Division of Integrative Biology and Neuroscience: **Machi F. Dilworth** has been named acting deputy director of the division and **Hans Bohnert**, University of Arizona, is serving as program director of the division's Integrative Plant Biology Program.



Barbara J. Baker, Plant Gene Expression Center, Albany, California.



Hans Bohnert, program director, NSF's Integrative Plant Biology Program.

Call for Nominations for Officers and Awards Has Been Mailed

The annual call for nominations for officers and awards was mailed to all ASPP members on February 3. Nominations for officers are due at headquarters by March 15, 1996; those for awards are due at headquarters April 8.

ASPP members will be nominating for the offices of president-elect (succeeding Donald R. Ort) and elected member of the ASPP executive committee (succeeding Kenneth Keegstra). The president-elect will serve under that title in 1996-1997, as president in 1997-1998, and as immediate past present in 1998-1999. The elected member will serve on the ASPP executive committee for three years, 1996-1999. Nominations for officers are due at headquarters by March 15, 1996.

Awards to be presented in 1996 include: The Stephen Hales Prize, the Charles Reid Barnes Life Membership Award, the Charles F. Kettering Award, and Corresponding Membership. The nominating ballot explains the qualifications for each of the awards and the procedure to be followed to submit a nomination. Nominations for awards are due at headquarters by April 8, 1996. Awardees will then be selected from among nominees by the appropriate awards committees. Awards will be presented at a ceremony during Plant Biology '96, ASPP's annual meeting in San Antonio, Texas.

Members are urged to participate in the nominating process. If you do not receive your ballot, please contact Sharon Kelly at ASPP headquarters (telephone 301-251-0560, ext. 17, fax 301-279-2996, or e-mail skelly@aspp.org).

NSF Travel Grant Funds Available Again to Minority Students and Faculty

Applications Due June 1

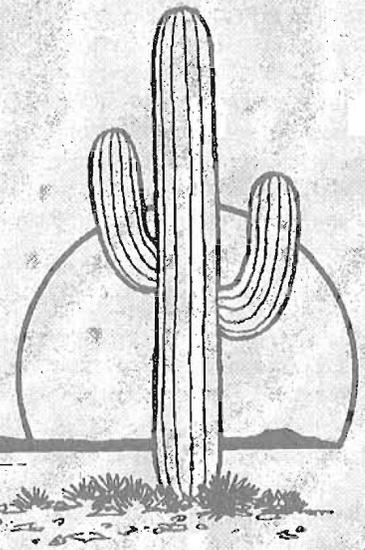
Money is still available from a National Science Foundation-funded grant, approved in 1995, that was designed to encourage greater participation by minority students and minority faculty at scholarly gatherings of plant scientists.

A unique and critical aspect of the effort that differentiates ASPP's proposal from other, similar programs is that ASPP hopes to pair each travel awardee with a mentor who has similar research interests. Mentors, who will not be eligible for travel grants, will counsel the awardee at the meeting and will help to provide networking opportunities. The committee hopes that relationships thus formed will endure and that mentors will continue over a long period to participate actively in helping awardees as they pursue careers in plant science.

The grant provides support for approximately six minority students or beginning faculty to attend meetings, conferences, and workshops within the continental United States during the period July 1, 1996, through May 31, 1997. Applicants for travel awards must be U.S. citizens. Awards will be based upon the merit of the applications.

Application forms for both travel grant applicants and persons volunteering to serve as mentors are included in the center of this newsletter and are due at ASPP headquarters by June 1, 1996. Applicants will be notified of the decision of the committee by the end of June. Questions about the travel grant and mentoring program can be directed to Deborah Weiner, ASPP-MAC liaison, telephone 301-251-0560, ext. 18, e-mail dweiner@aspp.org, or to Ken Beam, ASPP executive director, 301-251-0560, ext. 15 e-mail kenbeam@aspp.org.

We are looking forward
to seeing you in
San Antonio!



On Doing a Postdoctoral Tenure Abroad: Strategies for Potential Transplants

By Claire S. Ting, NSF/NATO Postdoctoral Research Fellow (1994-95), Institut de Biologie Physico-Chimique, Service de Photosynthèse, 75005 Paris, France, and Nicholas J. Mantis, Fulbright Scholar, (1994-95) Institut Pasteur, Unité de Pathogénie Microbienne Moléculaire, Inserm U-389, 75724 Paris, France.

One reason that American science students do not traditionally pursue an apprenticeship in an overseas laboratory may involve the quality and diversity of science training available in the United States. However, it has been observed that science involves skills both at the bench and at the level of human interaction and that developing an understanding of other cultures is fundamental for a well-rounded education and for the well-being of the world. This recognition may perhaps inspire some scientists to voyage overseas.

The postdoctoral years are a particularly good time to go abroad. Postdoctoral positions are, by definition, impermanent, and you possess a mobility that is seldom available at other times of your career. Going overseas not only guarantees exposure to dissimilar scientific approaches, questions, and goals but also enables you to interact with people from widely different cultures and develop your ability to confront the challenges of new environments.

Potential Projects and Laboratories

If you decide to go abroad, it is critical to prepare early. Although information transfer overseas now takes only seconds, human transfers still require longer time scales.

A first step is to research a few potential projects and advisors. There are generally two classes of postdoctoral projects. One involves continuing various aspects of your thesis work and may enable you to investigate questions you did not pursue while under pressure to finish your degree. With this type of project, you may have the advantage of being able to select an advisor with whom you have already interacted. The

second class involves conducting a project in an area different from that of your previous specialization. In this case, it is common not to have had prior interaction with your potential advisor and initial contact may be conducted through a formal letter. If you are able to arrange a meeting, try to establish how receptive he/she is to your ideas and goals. Adopt a critical approach toward suggested research topics since visiting (temporary) scientists are often offered risky projects.

Speak with as many women and men as you can who have spent different lengths of time in the laboratory you are interested in. In addition, it is important to visit the institution and examine the actual facilities and availability of information centers. Inquire about the ease of ordering scientific reagents: in some countries, this process may take a significant amount of time relative to the length of your tenure.

Foreknowledge

Each country has different legal requirements for non-citizens who wish to work there for an extended period of time. Advance knowledge of these requirements will allow you both to assess the ease of working in that country and to assemble all the necessary documents. Professors who have spent sabbatic time abroad and people within language departments are invaluable sources of practical information, as well as of insights about differences in cultural expectations and interactions.

Developing some proficiency in the language of your host country will make your life inside and outside of the laboratory more enjoyable. Although English is often the designated language of scientific conferences, it is not the designated language of scientific laboratories. Most importantly, taking the time to gain knowledge of a country's language demonstrates a sincere interest in its culture. Some postdoctoral researchers wait until they arrive before enrolling

in an intensive language program offered by a university, private tutor, or as in Paris, by the mayor's office. This approach may be successful, but will require a significant time commitment.

Ideas On Funding

There are two main approaches for funding your postdoctoral time abroad: apply for support from the host country with the assistance of your overseas advisor or obtain funds in the United States and bring your own support. These two approaches can be combined, particularly in the case of an extended stay. Several foreign institutions offer in-house awards or national fellowships for visiting scientists. (For a listing of some funding agencies, see page 20.) However, if you are able to bring your own funding, you may have a wider selection of potential laboratories. The office of sponsored programs at a university is an excellent starting point for information about privately sponsored and government-associated fellowship and grant opportunities. Be aware that some awards may be designed primarily for U.S. projects, but include a stipulation encouraging a short-term tenure overseas. Start early with the application process: turnover periods are often more than six months, and in the event of a negative response, there will be time to reapply.

On Your Way

Before you are actually on your way, it is wise to plan ahead for your return. If you would like to conduct another postdoctoral tenure in the United States after your time abroad, it is helpful to visit a few potential laboratories before you leave. Meetings and interviews may be inconvenient to arrange while you are overseas.

A postdoctoral experience abroad will inevitably involve new difficulties. However, facing the challenges will give rise to new understanding and insights, and because of what you will learn about other cultures and science

continued from page 19

and about your self, the overall experience will undoubtedly be worthwhile.

Some of the many agencies, that in the past have supported U.S. postdoctoral scientists abroad:

National Science Foundation/NATO,
Postdoctoral Fellowship in Science and Engineering, Division of Graduate Education and Research Development / National Science Foundation / 4201 Wilson Boulevard / Rm. 907 D.C. Arlington, Virginia 22230
(Research in NATO countries)

Fulbright Scholar Program
Lecture and Research Awards Council for the International Exchange of Scholars / 3007 Tilden St., N.W. / Suite 5M Box UPD / Washington 20008-3009
Tel: (202) 686-4000
(Projects world-wide)

German Academic Exchange Service
Postdoctoral Grants 950 Third Avenue / 19th Floor N.Y., N.Y. 10022 Tel: (212) 758-3223 daadny@acf2.nyu.edu
(Research in Germany)

Chateaubriand Scholarship Department of Science and Technology / Embassy of France, 4101 Reservoir Road, N.W., Washington, D.C. 20007-2176, Tel: (202) 944-6241, chateaubriand@amb-wash.fr
(Research in France)

Swedish Natural Science Research Council
Postdoctoral Fellowships Box 6711 / Wenner-Gren Center S-133 85 Stockholm, Sweden
(Research in Sweden)

Australian Research Council,
Postdoctoral Fellowships, Secretary / Grants Committee, Department of Employment, Education, and Training, GPO Box 9880 / Canberra Act, 2601 / Australia
(Projects in Australia)

Have you remembered to renew your
membership in ASPP?

Have you renewed your subscriptions to
Plant Physiology and THE PLANT CELL?

To guarantee your listing in the
1996 ASPP Membership Directory
RENEW TODAY!!

If you did not receive renewal forms,
contact Sharon Kelly at

ASPP headquarters:
telephone 301-251-0560, ext. 29,

fax 301-279-2996,

e-mail skelly@aspp.org

**MARK YOUR CALENDARS TODAY
WITH THE FOLLOWING IMPORTANT
ASPP DATES TO REMEMBER!**

Thursday, February 29, 1996
Deadline for abstracts for Plant Biology '96

Friday, March 15, 1996
Nominations due for ASPP officers

Monday, April 8, 1996
Nominations due for ASPP awards

Saturday, July 27 - Wednesday, July 31
Plant Biology '96
The annual meeting of the
American Society of Plant Physiologists

Gatherings

The newsletter 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 J. Braxton. *ASPP Newsletter*, 15501 Monona Drive, Rockville, MD 20855-2768 USA. **Faxed transmissions are not 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

FEBRUARY

February 23

Washington Area Section of American Society of Plant Physiologists
Winter Meeting
College Park, Maryland
Contact: Robert D. Slocum, WAS-ASPP Secretary-Treasurer, Department of Biological Sciences, Goucher College, Baltimore, Maryland 21204-2794; telephone 410-337-6303, fax 410-337-6508, e-mail bslocum@goucher.edu.

MARCH

March 10-16

Seventh International Symposium on Flower Bulbs
Herzliya, Israel
Contact Ortra Ltd., P.O.B. 50432, Tel Aviv, 61500, Israel; fax 972-3-5174433.

March 10-16

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; Shmulik Wolf, Depart-

ment 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 wjucas@ucdavis.edu.

March 14-17

Maize Genetics Meeting
Pheasant Run Conference Center
St. Charles, Illinois
Contact: Paul Chomet, Chair, Maize Genetics Steering Committee, telephone 860-572-5224, fax 860-572-5240, e-mail pchomet@dekalb.com.

March 15-21

Keystone Symposium
The Extracellular Matrix of Plants:
Molecular, Cellular and
Developmental Biology
Tamarron, Colorado
Contact: Keystone Symposia, Drawer 1630, Silverthorne, CO 80498; telephone 303-262-1230, fax 303-262-1525.

March 30 -April 1

Southern Section of American Society of Plant Physiologists
Annual Meeting
Orlando, Florida
Contact: Dawn Luthe, Secretary/Treasurer, Department of Biochemistry, Box 9650, Mississippi State, Mississippi 39762;

telephone 601-325-7733, fax 601-325-8664, e-mail dsluthe@ra.msstate.edu. The deadline for submitting papers is February 28, 1996.

APRIL

April 9-13

Third International Workshop: Sulfur Metabolism in Higher Plants
Newcastle upon Tyne, United Kingdom
Contact: Prof. John Cram, Department of Plant Biology, Ridley Building, University of Newcastle upon Tyne, Newcastle upon Tyne NE1 1RU, UK.

April 11-13

New Biological Approaches to Understand and Improve Winter Survival of Plants
Århus, Denmark
Contact: Bjarni L. Gudleifsson, RALA Modruvellir, 601 Akureyri, Iceland; telephone: + 354-6-24477, fax + 354-6-27144.

April 12-14

Photosynthesis at the Frontiers of Biology
University of Illinois, Urbana-Champaign
Contact: Daniel Bush, 190 ERML, University of Illinois, Urbana, Il. 61801; telephone 217-333-6109, e-mail d-bush1@uiuc.edu.

April 12-19

9th International Congress on Soilless Culture
St. Helier, Jersey, Channel Islands
Write to Secretariat of ISOSC, P.O. Box 52, 6700 AB Wageningen, The Netherlands.

April 15-17

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.

April 17-20

15th Annual Missouri Symposium
Protein Phosphorylation in Plants
Columbia, Missouri
Submit abstracts or write for registration material to Missouri Symposium, 117 Schweitzer Hall, University of Missouri, Columbia, MO 65211; fax 314-882-5635.

April 30

Frontiers in Plant Biology: How Plants Communicate

Plenary Symposium

National Academy of Sciences

Annual Meeting

Washington, DC

Washington area plant scientists are invited to attend. For more information contact:

Hans Kende, MSU DOE Plant Research Laboratory, Michigan State University, East Lansing, MI 48824-1312; telephone 517-353-7865, fax 517-353-9168, e-mail hkende@msu.edu.

MAY

May 3-4

Northeast Section of American Society of Plant Physiologists

Annual Meeting

Plattsburgh, New York

Contact: Peter Conrad or Janice Marchut, telephone 518-564-5271, e-mail conradpl@splava.cc.plattsburgh.edu.

May 5-10

Model Program in Environmental and Agricultural Ethics

Michigan State University, East Lansing

The deadline for applications is March 1, 1996. Contact: Professor Fred Gifford, Philosophy Department, 503 S. Kedzie Hall, Michigan State University, East Lansing, MI 48824; telephone 517-355-4490, e-mail gifford@pilot.msu.edu.

May 9-19

Eighth NATO Advanced Study Institute

Course: Signals and

Pathways in Plants

Maratea, Italy,

Pending NATO approval. Organizers: Natasha Raikhel, Michigan State University, East Lansing, Michigan, USA; Rob Last Boyce, Thompson, Ithaca, New York, USA; Fiorella Lo Schiavo, University of Padova, Padova, Italy; and Giorgio Morelli, National Institute of Nutrition, Rome, Italy. More information available at a later date.

May 12-17

VIII Congress

International Society of Citriculture

Sun City Resort, South Africa

Contact: Congress Secretariat, Institute for Tropical and Subtropical Crops, Private Bag X 11208, Nelspruit 1200, South Africa; telephone 27-1311-52071, fax 27-1311-23854, e-mail supervisor@itsg.arc.agric.sa.

May 21-28

Microinjection Techniques in Cell Biology

Woods Hole, Massachusetts

Short Course. For more information contact:

Carol Hamel, Admissions Coordinator, Marine Biological Laboratory, 7 MBL Street, Woods Hole, MA 02543-1015; telephone 508-289-7401, World Wide Web <http://www.mbl.edu>.

May 27-June 1

Seventh International Conference on the Cell and Molecular Biology of Chlamydomonas

Regensburg, Germany

Send request for registration and abstract materials to Dr. Rüdiger Schmitt, Institut für 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

Arc et Senans Plant Workshop: Roots

Arc et Senans, France

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 1-5

Noble Foundation Symposium

Biochemical and Metabolic Aspects of 3-Ketoacyl Synthases

Humacao, Puerto Rico

For information and applications, contact Jan Jaworski, e-mail jaworsj@muohio.edu or fax 415-325-6857 or Dusty Post-Beittenmiller, e-mail dpost@noble.org or fax 405-221-7380.

June 2-5

The Monroe Wall Symposium on

Natural Products:

Harnessing Biodiversity for Therapeutic Drugs and Foods

New Brunswick, New Jersey

Contact: Keith Wilson, Office of Continuing Professional Education, Rutgers University, Cook College, P.O. Box 231, New Brunswick, NJ 08903-0231; telephone 908-932-9271, fax 908-932-1187.

June 2-7

5th International Symposium on

Grapevine Physiology

Hebrew University of Jerusalem, Jerusalem, Israel

Contact: Ben Ami Bravdo, Rehovot, POB12, Israel 76100, e-mail bravdo@agri.huji.ac.il.

June 9-13

NATO Advanced Research Workshop

Biology and Biotechnology of the Plant

Hormone Ethylene

Chania, Crete, Greece

To be added to the symposium mailing list, send your name and address to: Dr. Angelos K. Kanellis, National Agricultural Research Foundation, Institute of Viticulture and Vegetable Crops, PO Box 1841, 711 10 Heraklion, Crete, Greece; telephone 30 81 245851 or 245873, fax 30 81 245873 or 245858, e-mail kanellis@nefeli.imbb.forth.gr.

June 16-21

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 6500, Israel.

June 22-26

1996 World Congress on in Vitro Biology

Biotechnology: From Fundamental

Concepts to Reality

San Francisco, California

Contact: Tiffany McMillan, telephone 410-992-0946, fax 410-992-0949.

June 23-26

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 61500, Israel.

June 23-28

Seventh International Conference on

Arabidopsis Research

University of East Anglia, Norwich, United Kingdom

Queries may be addressed to:

arabidopsis@bbsrc.ac.uk.

June 25-28 June

The Second International Weed Control Congress

Copenhagen, Denmark

Contact: International Conference Services, P.O. Box 41, Strandvejen 171, DK-2900

Hellerup, Denmark, telephone 45 39 61 21

95, fax 45 39 61 20 68; or Jens C. Streibig,

Department of Agricultural Sciences, Weed

Science, The Royal Veterinary and Agricul-

tural University, Thorvaldsensvej 40, DK-

1871 Frederiksberg C, Denmark, telephone

45 35 28 34 57, fax 45 35 28 34 68, e-mail

jens.c.streibig@agsci.kvl.dk.

June 30 - July 3

International Conference on Isozymes and Molecular Markers in Plants: Basic and Applied Aspects

Villa Olmo, Como, Italy

Contact: Prof. Mirella Sari Gorla, Dr. Carla Frova Department of Genetics and Microbiology, University of Milano Via Celoria 26, 20133 Milano, Italy; telephone 39 2 26605201/204, fax 39 2 2664551, e-mail sari@imiucca.csi.unimi.it.

JULY

July 7-12

12th International Symposium on Plant Lipids

Toronto, Canada

Contact: John P. Williams, Department of Botany, University of Toronto, 25 Willcocks St., Toronto, Ontario, Canada M5S 3B2; telephone 416-978-3540, fax 416-978-5878, e-mail lipids96@botany.utoronto.ca.

July 7 - August 3

Summer Course:

Mechanisms of Microbial Adaptation

Ohio State University, Columbus

Sponsored by NSF and DOE

Contact: Dr. Charles J. Daniels, Department of Microbiology, The Ohio State University, 484 West 12 Ave., Columbus, OH 43210; telephone 614-292-2301, fax 614-292-8120, e-mail daniels.7@osu.edu. Application Deadline: March 1, 1996

July 12 - 14

Emerging Model Legume Systems: Tools and Recent Advances

Knoxville, Tennessee

To indicate interest and receive registration information, please contact D. Cook (drcl1653@acs.tamu.edu, or Department of Plant Pathology and Microbiology, Texas A&M University, College Station, TX 77843-2132) or K. VandenBosch (kate@bio.tamu.edu, or Department of Biology, Texas A&M University, College Station, TX 77843-3258).

July 12 - 25

Gordon Conference

Plant Biological Regulatory Mechanisms

New Hampton School, New Hampton,

New Hampshire

Contact: Dr. Athanasios Theologis, Plant Gene Expression Center, 800 Buchanan Street, Albany, CA 94710; telephone 510-559-5911, fax 510-559-5678, e-mail theo@mendel.berkeley.edu.

July 14-17

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.

July 14-18

5th Symposium of the International Society of Root Research:

Root Demographics and Their Efficiencies in Sustainable Agriculture, Grasslands, and Forestry
Clemson, South Carolina

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 706-769-5631. Please supply your name, complete address, and, if available, your e-mail, fax, and telephone numbers.

July 14-18

5th Symposium of the International Society of Root Research

Clemson University, South Carolina

For a copy of the final announcement and call for papers please contact: Dr. James E. Box, Jr., USDA-ARS, P.O. Box 555, Watkinsville, GA 30677, U.S.A.; e-mail rootconf@uga.cc.uga.edu, telephone 706-769-5631, fax 706-769-8962.

July 14-19

8th International Symposium on Molecular Plant-Microbe Interactions and 7th Annual Gatlinburg Symposium

University of Tennessee, Knoxville

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: gstacey@utkvmx.utk.edu.

July 21-24

Third International Fructan Symposium
Logan, Utah

Contact: N. Jerry Chatterton, 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

Society for Experimental Biology Symposium

Control of Plant Development: Genes and Signals

University College, Dublin, Ireland

To receive the Second Announcement and Call for Abstracts, write to: The Society for Experimental Biology, Burlington House, London W1V 0LQ, U.K.

July 27-31

Plant Biology '96 Annual Meeting
American Society of Plant Physiologists
San Antonio, Texas

Contact: Sharon Kelly; e-mail skelly@aspp.org .

AUGUST

August 4-9

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.

August 5-8

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 lixxx008@maroon.tc.umn.edu.

August 11-16

Gordon Research Conference

Cellular Basis of Adaptation to Salt and Water Stress in Plants

Tilton School, Tilton, New Hampshire

Contact: Andrew D. Hanson, Horticultural Sciences Department, University of Florida, Gainesville, FL 32611-0690; telephone 352 392-1928, ext 334; fax 352 392-6479; e-mail adha@gnv.ifas.ufl.edu.

August 18-23

Gordon Research Conference

CO₂ Fixation and Metabolism in Green Plants

Tilton School, Tilton, New Hampshire

Contact: Steven C. Huber, USDA/ARS Plant Science Research, North Carolina State University, Raleigh, North Carolina 27695-7631 USA; fax 919-856-4598; e-mail shuber@croppserv1.croppsci.ncsu.edu.

SEPTEMBER

September 22-28, 1996

NATO Advanced Research Workshop
Regulation of Enzymatic Systems Detoxifying Xenobiotics in Plants

Kallithea, Chalkidiki, Greece

Contact the workshop director: Prof. Kri...

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

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.

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

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: Phenethyl Isothiocyanate 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. McFerren, 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. Burkhardt, M.D.*

Biochemistry and Regulation of Trichothecene 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

Phytochemicals and Health

I enclose a check for U.S. currency, drawn on a U.S. bank, and made out to ASPP.

I authorize this charge to my account:

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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:
Estella Coley, 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):

- | | | | |
|------------------------------------|-------------------------------------|---------------------------------------|--------------------------------------|
| <input type="checkbox"/> Permanent | <input type="checkbox"/> Temporary | <input type="checkbox"/> Postdoctoral | <input type="checkbox"/> Industrial |
| <input type="checkbox"/> Academic | <input type="checkbox"/> Government | <input type="checkbox"/> USA only | <input type="checkbox"/> Outside USA |

US citizen? Yes No Date available: _____

Fields of interest, specialities, 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, MD, operates a placement service in which are kept active two files of résumés of individuals who are seeking employment. Employers are urged to survey the résumé files for those seeking permanent positions and those seeking postdoctoral or similar positions. The files cost \$25 each and may be ordered from Ms. Estella Coley, ASPP Placement Service, 15501 Monona Drive, Rockville, MD 20855-2768. 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 the ASPP Newsletter

- **POSTDOCTORAL, GRADUATE ASSISTANTSHIP, AND TECHNICIAN POSITIONS** (academic and government installations): Limited to 100 words. Ads run two times: the first time entire; the second time, only location, contact name and address, and reference to original posting.
- **TENURE-TRACK POSITIONS** (academic and government installations): Limited to 200 words; \$150 to run one time, \$250 to run two times.
- **ALL PRIVATE COMPANY POSITIONS**: Limited to 200 words; \$150 to run one time; \$250 to run two times.
- **GRADUATE FELLOWSHIP ANNOUNCEMENTS**: Announcements of programs and fellowships or traineeships for students seeking advanced degrees will be grouped at the end of the job placement section at no charge. They will run one time full length with no restrictions on length; the second time, they will include location, contact name and address, and reference to original posting.

Submit ads by e-mail to sbraxton@aspp.org. Alternatively, mail your copy to Sylvia J. Braxton, ASPP Newsletter, 15501 Monona Drive, Rockville, MD 20855-2768 USA. **FAXED ADS ARE NOT ACCEPTED.** If you submit a chargeable ad by e-mail, be certain to include complete billing information. If you mail a chargeable ad, include a purchase order or a credit card number, expiration date, and signature.

Center Director and Full Professor University of Florida, Lake Alfred (New)

A Ph.D. in an agricultural or related science with administrative experience and demonstrated leadership in directing major research or extension programs required. The CREC Director provides leadership for a faculty and staff of 253 people, including 38 UF/IFAS faculty, and coordinates multidisciplinary research and extension activities on citrus statewide. The CREC is located near Winter Haven, 45 miles southwest of Orlando and 50 miles east of Tampa. Contact: Dr. J.W. Noling, IFAS, CREC, 700 Experiment Station Rd, Lake Alfred, FL 33850; telephone 941-956-1151, fax 941-956-4631, e-mail wn@gnv.ifas.ufl.edu. Closing date: March 15, 1996. Women and minorities are encouraged to apply. The University of Florida is an equal opportunity-affirmative action employer.

Plant Physiologist College of Charleston Charleston, South Carolina (New)

The College of Charleston, Department of Biology, invites applications for a tenure track position at the Assistant Professor level. Candidates must possess a Ph.D. degree, a strong commitment to teaching, and an active, ongoing research program, which has the potential for undergraduate

involvement. Teaching responsibilities include Plant Physiology, General Botany and General Biology. The College of Charleston is a liberal arts institution whose primary aim is teaching excellence. In addition to its undergraduate programs, the department offers graduate degrees in Marine Biology and Environmental Studies. Applicants should submit curriculum vitae, a statement of teaching philosophy and research interests, reprints of recent publications and three letters of reference by January 20, 1996 to: Chair, Department of Biology, Plant Physiology Search Committee, College of Charleston, Charleston, South Carolina 29424. The College of Charleston is an Equal Opportunity/Affirmative Action Employer.

Postdoctoral Position The Samuel Roberts Noble Foundation Ardmore, Oklahoma (New)

A postdoctoral position is available to investigate secondary metabolite engineering in alfalfa (*Medicago sativa*). Studies will include the transformation of alfalfa with genes encoding phytoalexin-modifying enzymes, followed by analysis of the plants for altered metabolite accumulation and increased pathogen resistance. Foreign genes will be expressed using various promoters, including a phytoalexin-specific alfalfa promoter. Experience in molecular biology is

essential. Knowledge of binary vector construction, plant transformation, and/or biochemistry preferred. Send a cover letter, describing research experience and interests, and curriculum vitae, listing the names and addresses of three references, to: Dr. Nancy L. Paiva, Plant Biology Division, The Noble Foundation, P.O. Box 2180, Ardmore, OK 73401; fax 405-221-7380.

Postdoctoral Position Laboratoire de Biologie Moléculaire des Relations Plantes-Microorganismes CNRS/INRA, France (New)

A postdoctoral position is available immediately to study the hypersensitive response (HR) in *Arabidopsis thaliana* in response to pathogenic bacteria. The objectives of this work will be to identify *Arabidopsis* mutants affected in the HR in response to *Xanthomonas campestris* pv. *campestris*, using an insertional mutant library. The project will include the characterization of such mutants and the cloning of the corresponding genes. A good background in genetics and molecular biology is required. Send curriculum vitae and three names of referees to: Dominique Roby, Laboratoire de Biologie Moléculaire des Relations Plantes-Microorganismes, INRA/CNRS, F-31326 Castanet-Tolosan Cedex, France; telephone 33-61-28-53-26, fax 33-61-28-50-61, e-mail roby@toulouse.inra.fr.

Postdoctoral Position

Yale University, New Haven, Connecticut (New)

A postdoctoral position is available to study pollen-pistil interactions. We are interested in identifying and characterizing molecules that participate in the pollen tube growth process and in understanding the mechanisms behind their functions. For background information, please refer to Proc. Nat. Acad. Sci. 92: 3077; Cell 82: 383; 395. Interested candidates should send curriculum vitae and names of two to three references to: Alice Y. Cheung, Department of Biology, Yale University, P.O. Box 20-8104, New Haven, CT 06520-8104.

Postdoctoral Position

Rice University, Houston, Texas (New)

A postdoctoral position is available to carry out genetic, biochemical and molecular studies on the Arabidopsis TCH genes (See: Cell 60, 357 [1990]; Plant Cell 6, 1553 [1994]; Plant Cell, 7, 1555 [1995]; Plant Journal 8, 623 [1995]). Goals are to identify the signals and isolate the factors that control TCH gene expression and to define the physiological and biochemical functions of the calmodulin and XET-related TCH gene products. Experience with genetics, molecular biology, and plant biology desirable. Send curriculum vitae, a short description of research interests and at least three letters of recommendation to: Dr. Janet Braam, Biochemistry and Cell Biology, Rice University, Houston, TX 77005-1892; e-mail braam@bioc.rice.edu. Affirmative action/equal opportunity employer.

Postdoctoral Position

Cornell University, Ithaca, New York (New)

A postdoctoral position is available immediately to study the regulation of chloroplast gene expression in *Chlamydomonas reinhardtii*. Our groups at the Boyce Thompson Institute (David Stern) and Cornell University (Karen Kindle) are using a variety of genetic and biochemical strategies to study processes that regulate chloroplast translation initiation and mRNA stability (see PNAS 90:497; EMBO J. 12:3627; Plant Cell 7:1295). Please send a statement of research interests, curriculum vitae, and the names, addresses, and phone numbers of three references to: Dr. Karen L. Kindle, 151 Biotechnology Building, Cornell University, Ithaca, NY 14853. The Boyce Thompson Institute and Cornell University are affirmative action and equal opportunity employers; women and minorities are encouraged to apply.

Postdoctoral Position

Oklahoma State University, Stillwater (Reopened)

A postdoctoral position is immediately open to use molecular (RFLP) techniques to evaluate the link between water-use efficiency and stable carbon isotope discrimination in tomato. The position is dependent on grant funding, which is currently available for 20 months. Persons with a Ph.D. degree and experience with plant molecular biology and RFLP technology are invited to submit applications before March 15, 1996. Applications should include curriculum vitae, transcripts, three letters of reference, and a brief description of applicant's expertise and research goals. Address applications and inquiries to Dr. Charles G. Tauer, Department of Forestry, telephone 405-744-5462, fax, 405-744-9693, e-mail ctauer@okway.okstate.edu or Dr. Bjorn Martin, Department of Agronomy, telephone 405-744-6410, fax 405-744-5269, e-mail bcm@soilwater.agr.okstate.edu, Oklahoma State University, Stillwater, OK 74078.

Postdoctoral Position

Mississippi Agricultural Forestry Experimental Station, Stoneville, Mississippi (New)

All duties are focused on discovery of blue-green algae-selective herbicides. About half of the project will involve screening of synthetic and natural compounds for selective algacidal properties. The other half of the project involves biorational design of selective algicides. This part of the project will involve study of blue-green algae-specific physiological and biochemical processes. Contact: Stephen O. Duke, USDA, ARS, P. O. Box 350, Stoneville, MS 38776; telephone 601-686-5272, fax 601-686-5422, e-mail sduke@ag.gov.

Postdoctoral Position

University of Minnesota, St. Paul (New)

Postdoctoral position beginning July/August 1996 to study the biochemical and developmental response of white lupin roots to phosphorus stress (Plant Physiol 104:657-665, 1994). Project involves isolation and purification of protein and determination of mechanisms contributing to enzyme regulation of P-stressed plants. Strong background in plant physiology and laboratory skills in molecular techniques and protein/RNA purification desirable. Experience with light and/or electron microscopy helpful. Send curriculum vitae, brief statement of experience and goals, and names and addresses of three references to: Dr. Deborah Allan, Department of Soil,

Water and Climate, University of Minnesota, St. Paul, MN 55108; e-mail dallan@soils.umn.edu. Application review begins April 1, 1996. The University of Minnesota is an equal opportunity educator and employer.

Postdoctoral Position

Louisiana State University, Baton Rouge (New)

The project involves identification of a transcription factor that binds the E-box motif and up-regulates the bean seed storage protein B-phaseolin gene promoter. Applicant must have a Ph.D. in plant molecular biology, biochemistry, or genetics and research experience in screening of a cDNA expression library. Please refer to Plant Journal 2, 537-548 (1992), 2, 927-936 (1992), and 5, 885-890 (1994); and Transgenic Research 2, 21-28 (1993). Send resumes, publication list, transcripts, names and addresses of three references to: Dr. Norimoto Murai, Department of Plant Pathology and Crop Physiology, Louisiana State University, Baton Rouge, LA 70803; telephone 504-388-1380, fax 504 388- 1415.

Studentships

University of Waikato, Hamilton, New Zealand (New)

The University of Waikato is seeking qualified applicants for Ph.D. students in molecular biology. Two full-time studentships are now available for the preparation of libraries and cloning of genes from *Pinus radiata*. Candidates must have a B.Sc.(Hons) or M.Sc. in molecular biology and should have appropriate laboratory experience. Interested applicants are invited to send curriculum vitae with the names and contact information of two academic referees. The studentships will be through the University of Waikato, funded by a forestry industry cooperative, and students will have both industry and University facilities available for the research work. Residence can be in either the Bay of Plenty or Hamilton. The closing date for this position is March 29, 1996. Mail curriculum vitae and references or direct inquires to Dr. M. Connett, Dept. of Biological Sciences, University of Waikato, Private Bag, Hamilton, New Zealand; telephone 7 856 2889 ext. 8898, e-mail mconnett@waikato.ac.nz.

Postdoctoral Position

INRA, Versailles, France (New)

An EEC-funded two-year post-doctoral position is available for an EEC (non-

French) citizen to work in INRA, Laboratoire de Biologie Cellulaire, Versailles, France. The salary is 16,000 FF after deduction of social security and other taxes. As part of the analysis of plant development in Arabidopsis and as part of the identification of new plant plasma membrane proteins, the applicant will be in charge of the characterization of proteins that make up the cytoskeleton-plasma membrane-cell wall continuum. The applicant should have experience in plant membrane purification and two-dimensional protein electrophoresis. Contact : Dr Veronique Santoni, telephone 33 1 30 83 30 95, fax 33 1 30 83 30 99, e-mail santoni@versailles.inra.fr.

Junior Specialist

University of California, Berkeley
(New)

The Department of Plant Biology invites applications for a junior specialist position starting immediately. Bachelor's degree in biological science field and experience in cereal tissue culture is required. Cereal transformation experience is desired. The closing date for this position is March 12, 1996. Applicants should submit a résumé and summary of research experience, and arrange three letters of reference to be sent to: Dr. Peggy G. Lemaux, Department of Plant Biology, 111 Koshland Hall, University of California, Berkeley, California 94720. The University of California is an affirmative action/equal employment employer. Minorities and women encouraged to apply.

Postdoctoral Positions

University Of Guelph, Guelph, Ontario
(Repeat)

Contact: Barry Shelp, Department of Horticultural Science, University of Guelph, Guelph, Ontario, Canada N1G 2W1; telephone 519-824-4120 ext. 3089, e-mail bshelp@evbhort.uoguelph.ca. (Details November/December 1995.)

Postdoctoral Position

University of Toronto, Canada
(Repeat)

Contact: Dr. M.C. Heath, Botany Department, University of Toronto, 25 Willcocks St., Toronto, ON M5S 3B2, Canada; telephone 416-978-6304, fax 416-978-5878, e-mail heath@botany.utoronto.ca. (Details November/December 1995.)

Postdoctoral Position

University of Chicago, Chicago, Illinois
(Repeat)

Contact: Dr. Gayle Lamppa, Department of Molecular Genetics and Cell Biology, 920 E.

58th Street, University of Chicago, Chicago, IL 60637; telephone 312-702-9837, fax 312-702-3172, e-mail gklamppa@midway.uchicago.edu. (Details November/December 1995.)

Postdoctoral Positions

Noble Foundation, Ardmore, Oklahoma
(Repeat)

Contact: Dr. Madan K. Bhattacharyya, Staff Scientist, Plant Biology Division, Noble Foundation, P. O. Box 2180, Ardmore, Oklahoma 73402; telephone 405-223-5810, fax 405-221-7380. The Noble Foundation is an equal opportunity employer. (Details November/December 1995.)

Postdoctoral Position

Washington State University, Pullman
(Repeat)

Contact: Dr. Thomas W. Okita, Institute of Biological Chemistry, Washington State University, Pullman, Washington 99164-6340; telephone 509-335-3391, fax 509-335-7643, e-mail tokita@wsu.edu. (Details November/December 1995.)

Postdoctoral Position

University of Alberta
Edmonton, Alberta, Canada
(Repeat)

Contact: Dr. Gregory Taylor, Department of Biological Sciences, University of Alberta, Edmonton, Alberta, T6G 2E9, Canada; e-mail gjtaylor@gpu.srv.ualberta.ca. (Details November/December 1995.)

Postdoctoral Position

University of Nevada, Reno
(Repeat)

Contact: Dr. Katherine Osteryoung, Department of Biology/314, University of Nevada, Reno, NV 89557; telephone 520-621-3977 or 702-784-6188, e-mail osteryok@gas.uug.arizona.edu. Application review will begin January 5, 1996, and continue until position is filled. AA/EEO. (Details November/December 1995.)

Postdoctoral Position

University of Nevada, Reno
(Repeat)

Contact: Dawn Arnold, Biochemistry/330, University of Nevada, Reno, NV 89557. Questions contact: Dr. DellaPenna, 602-621-8725, fax 602-621-7186, e-mail ddpenna@ag.arizona.edu until April 1996. Application review begins February 1, 1996. AA/EEO. (Details November/December 1995.)

Postdoctoral Position

University of Nevada, Reno
(Repeat)

Contact: Dr. DellaPenna, 602-621-8725, fax 602-621-7186, e-mail ddpenna@ag.arizona.edu until April 1996. Application review begins February 1, 1996. AA/EEO. (Details November/December 1995.)

Postdoctoral Fellowships

North Carolina State University, Raleigh
(Repeat)

Contact: Eric Davies, Director NCSU-NSCORT, Botany Department, Box 7612, North Carolina State University, Raleigh, NC 27695-7612. Internet: nscort@ncsu.edu. NCSU is an equal opportunity employer. (Details November/December 1995.)

Research Specialists

Westvaco Corporation
Summerville, South Carolina
(Repeat)

Contact: Cindy McCord at 803-851-4733, fax 803-875-7185, e-mail cmccord@awod.com. Westvaco is an equal opportunity employer m/f. (Details November/December 1995.)

FELLOWSHIPS, TRAINEESHIPS, GRADUATE ASSISTANTSHIPS, AND ETC.

Ph.D Fellowship in

Plant Carbohydrate Biotechnology
North Carolina State University, Raleigh
(New)

This is a three-year USDA/National Needs Fellowship with a stipend of \$17,000 per year. A fourth year will be funded by the University if required. The student will participate in an interdisciplinary research program on the regulation and genetic manipulation of carbohydrate metabolism and transport in plants. Applicants must be U.S. citizens and hold a master's degree in a relevant discipline. For further information contact: Dr. Dennis J. Werner, Graduate Program Director, Department of Horticultural Science, NCSU, Raleigh, NC 27695-7609; telephone 919-515-1226; e-mail dennis_werner@ncsu.edu.

Doctoral Fellowships in

Plant Biotechnology
University of Minnesota, St. Paul
(Repeat)

Contact: Plant Biological Sciences Program Secretary, University of Minnesota, Department of Plant Biology, 220 Bioscience

Center, 1445 Gortner Avenue, St. Paul, MN 55108-1095; telephone 612-625-4222, e-mail krogh001@maroon.tc.umn.edu.

USDA National Needs Graduate Fellowships in Plant Biotechnology
Texas A&M University, College Station (Repeat)

Contact: Dr. Andrew H. Paterson, Plant Biotechnology National Needs Fellowship Program, Department of Soil and Crop Sciences, Texas A&M University, College Station, TX 77843-2474; telephone 409-845-3773, e-mail ahp2343@bioch.tamu.edu. (Details November/December 1995.)

USDA National Needs Graduate Research Fellowships in Plant Biotechnology
Iowa State University, Ames (Repeat)

Contact: National Needs Fellowships, IPPM Graduate Admissions, 353 Bessey Hall, Iowa State University, Ames, IA 50011; telephone 515-294-0132, fax 515-294-1337, e-mail ippm@iastate.edu. (Details November/December 1995.)

Postdoctoral Fellowships in Advanced Root Biology
The Pennsylvania State University, University Park (Repeat)

Contact: Dr. Hector E. Flores, 315 Wartik Laboratory, The Pennsylvania State University, University Park, PA 16802; telephone 814-865-2955, fax 814-863-7217, e-mail hector_flores@agcs.psu.edu. Women and minorities are especially encouraged to apply. Deadline for applications: open; anticipated start date July 1, 1996 (available to U.S. citizens or residents only). (Details November/December 1995.)

Graduate Research Fellowships Calcium Signaling and Gravid Perception in Plants
North Carolina State University, Raleigh (Repeat)

Contact: Eric Davies, Director NCSU-NSCORT, Botany Department, Box 7612, North Carolina State University, Raleigh, NC 27695-7612. Internet: nscort@ncsu.edu. NCSU is an equal opportunity employer. (Details November/December 1995.)

Undergraduate Summer Research Traineeships in Root Biology
The Pennsylvania State University, University Park (Repeat)

Contact: Dr. Hector E. Flores, 315 Wartik Laboratory, The Pennsylvania State University, University Park, PA 16802; telephone 814-865-2955, fax 814-863-7217. Women and minorities are especially encouraged to apply. Deadline for summer research traineeship application: February 28, 1996 (available to U.S. citizens and residents only). (Details November/December 1995.)

Graduate Fellowships in Plant Biotechnology
Indiana University, Bloomington (Repeat)

Contact: Ms. Gretchen Clearwater, Administrative Assistant, National Needs Fellowships Program, Department of Biology, Indiana University, Bloomington, IN 47405; telephone 812-855-1861; fax 812-855-6705; e-mail gclearwa@indiana.edu. Although NNF fellows must be U.S. citizens or nationals, the Department of Biology also awards research assistantships on a competitive basis regardless of nationality. (Details November/December 1995.)

NSF Graduate Research Traineeships in Plant Biology
University of California, Riverside (Repeat)

Contact: Dr. Elizabeth A. Bray, Department of Botany and Plant Sciences, University of California, Riverside, CA 92521; telephone 909-787-4548, fax 909-787-4437, e-mail bray@ucrac1.ucr.edu.

Multidisciplinary Graduate Training and Research Opportunities in Molecular Crop Improvement
Cornell University, Ithaca, New York (Repeat)

Contact: Dr. Elizabeth D. Earle, Chairperson, or Dr. John C. Steffens at the Department of Plant Breeding, 252 Emerson Hall, Cornell University, Ithaca, NY 14850-1902; telephone 607-255-2180; fax 607-255-6683, e-mail clm15@cornell.edu. Applications should be received by January 10, 1995. National Needs Fellows must be U.S. citizens or nationals. (Details November/December 1995.)

Graduate Research Assistant
Texas A&M University, College Station (Repeat)

Contact: C. Wayne Smith or Rod A. Wing, Department of Soil & Crop Sciences, Texas A&M University, College Station, TX 77843-2474. (Details November/December 1995.)

Graduate Research Assistantships
University of Florida, Gainesville (Repeat)

Contact: Dr. Robert R. Schmidt, Graduate Coordinator, PMCB Program, Microbiology and Cell Science Department, P.O. Box 110700, University of Florida, Gainesville, FL 32611-0700; telephone and fax 904-392-0236, e-mail pmcb@gvn.ifas.ufl.edu. (Details November/December 1995.)

American Society of Plant Physiologists

Membership Proposal

Please return this form (or a copy of it) with your mailing label attached, correcting the label if appropriate. ASPP headquarters staff will do the rest (send the proposed member an invitation to join and correct your address as necessary) and inform you of it. We welcome new members worldwide, recognizing that in science, especially, to remain static is to wither. To acquire new members is to infuse science with ideas, understanding, and the intellectual tools that lead to creative, innovative transfer of knowledge and skills.

DR. MR.
MRS. MS.

FIRST NAME

MIDDLE INITIAL

LAST NAME

STREET

CITY

STATE

ZIP

COUNTRY

TELEPHONE NUMBER

The above-named individual desires membership as a

FULL MEMBER

STUDENT MEMBER

AMERICAN SOCIETY OF PLANT PHYSIOLOGISTS
15501 Monona Drive
Rockville, MD 20855-2768 USA

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