PHYTOCHEMICAL SOCIETY OF NORTH AMERICA

Newsletter

Volume 30
Number 3

February 1991

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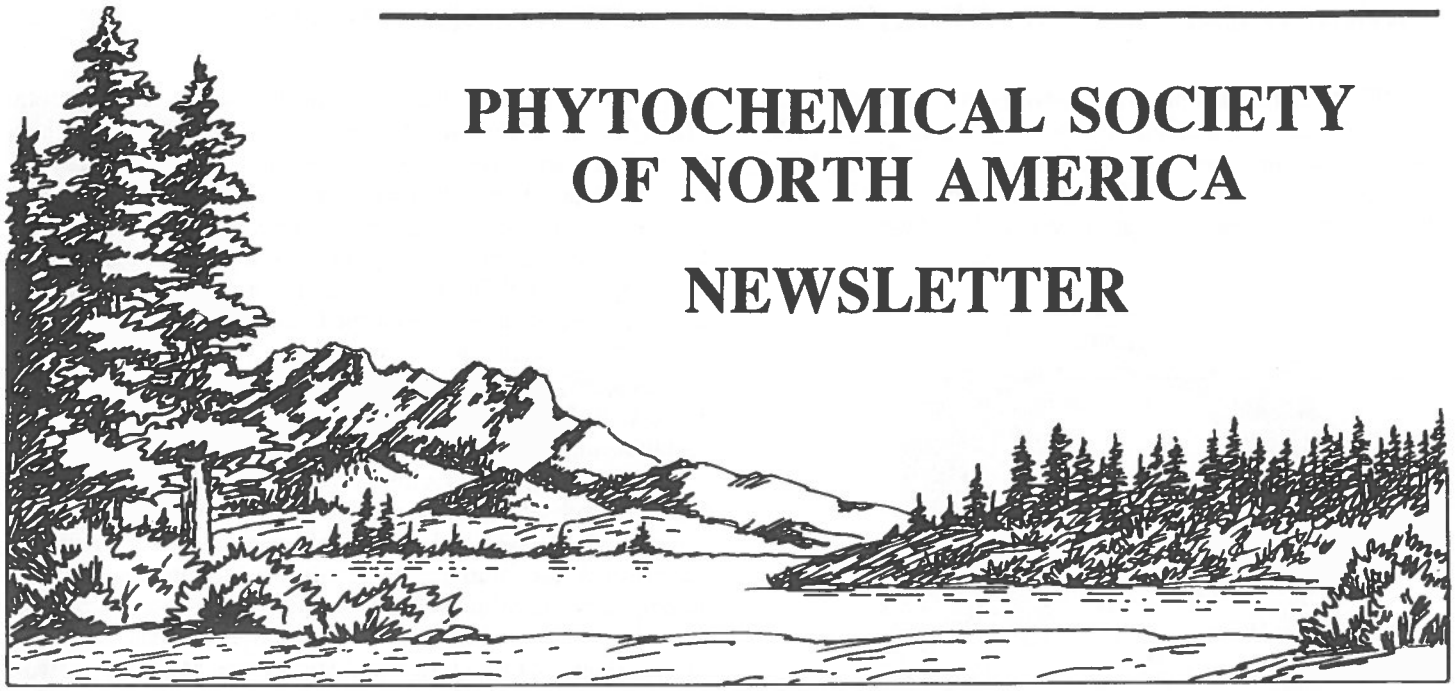
PSNA Advisory Committee

The Phytochemical Society of North America is a non-profit scientific organization whose membership (currently over 400) is open to anyone with an interest in phytochemistry, the role of plant substances, and in related fields. Annual membership dues are $15.00 for regular members and $8.00 for student members. Annual meetings featuring symposium topics of current interest and contributed papers by conference participants are held throughout the United States, Canada and Mexico. A newsletter is circulated to members several times a year to keep them informed of upcoming meetings and developments within the Society.

If you would like additional information about the PSNA or if you have material to be included in the newsletter, please contact the Society Secretary. Annual dues and changes in addresses should be sent to the Society Treasurer.



PHYTOCHEMICAL SOCIETY OF NORTH AMERICA

NEWSLETTER

FEBRUARY, 1991 VOLUME 30, NUMBER 3

CONTENTS

BIOGRAPHICAL SKETCH OF LIFE MEMBERSHIP AWARD WINNER

FRANK A. LOEWUS has been awarded life membership in the PSNA in recognition of his outstanding scientific achievements in and contributions to the field of phytochemistry. The award was announced at the Joint ISCE/PSNA meeting at Laval University last August.

Frank's interests in the plant sciences stemmed from his early days as a forestry student at Duluth Junior College and later at the University of Minnesota where he received his B.Sc. in biochemistry. After a four year stretch in the World War II Army Air Force, he returned to the University of Minnesota where he completed his studies in biochemistry. He then entered a postdoctoral program on the stereochemistry of hydrogen transfer by dehydrogenases under the direction of F. Westheimer and B. Vennesland at the University of Chicago. In 1955 he joined the Enzyme Unit, Western Regional Research Labs, USDA in Albany, California, where two of his favorite research interests emerged, one involving ascorbic acid metabolism and the other, myo-inositol biosynthesis. In 1964 he was appointed full professor at the State University of New York at Buffalo where he continued studies on carbohydrate metabolism, notably the role of myo-inositol in biosynthesis of cell wall uronosyl and pentosyl residues. During this period he became involved in summer activities at the Marine Biological Laboratory, Woods Hole, Massachusetts and later served as director of the summer program in experimental marine botany, a position he held until he left the east for his present position (now emeritus) in the Institute of Biological Chemistry at Washington State University. His spouse, Mary W. Loewus, shared in research efforts during his tenure at Buffalo and at Pullman, and it was during this period that several enzymic activities involved in the myo-inositol oxidation pathway were described. More recently, his interests shifted to fungal metabolism with the discovery that certain yeasts and fungi produce a five-carbon analog of ascorbic acid which has the potential of being an oxlate precursor, as ascorbic acid is in higher plants.

Frank's activities in PSNA included a term as president, several years as editor of *Recent Advances in Phytochemistry* and organizer of a joint meeting of PSNA with ASPP at Pullman in 1980, a memorable occasion linked to the Mount St. Helens eruptions. Congratulations on this well deserved recognition of excellence in phytochemistry!

TRAVEL ASSISTANCE AND BEST STUDENT PAPER AWARDS

The PSNA has again budgeted funds to support student travel to the annual meeting and for awards recognizing the best student oral and poster presentations. To be considered for an award, candidates should complete an abstract form and submit it by the April 1, 1991 deadline with a proposed travel budget, curriculum vitae and a letter of support from the supervising professor verifying need and status to Dr. Frank Stermitz.

During the 1990 meeting at Laval University, the PSNA executive committee agreed that post docs could be eligible for best student paper awards and established the following guidelines for travel and best paper awards:

1. Travel awards will be based on need and limited to those who are graduate students at the time of the meeting. Ordinarily the amount granted will be equal to 50% of economy class air fare.

2. Student best oral paper and best poster awards will be open to graduate students and post docs within one year of completing the Ph.D. degree.

3. Individuals must indicate at the time when abstracts are submitted that they wish to compete for an award.

4. Responsibility for administering these regulations will be assumed by the local meeting organizer(s).

A total of $3000 has been budgeted for best travel and best paper awards for 1991.

NEW PSNA MEMBERS

Robert L. Arslanian
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P.O. Box 460
Fort Collins, CO 80522

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467 Clank Hall
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Pullman, WA 99164-6340

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Univ. of Arizona
Tucson, AZ 85721

Chi Bao Do
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Saint-Hyacinthe, PQ
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UK

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Montreal, PQ
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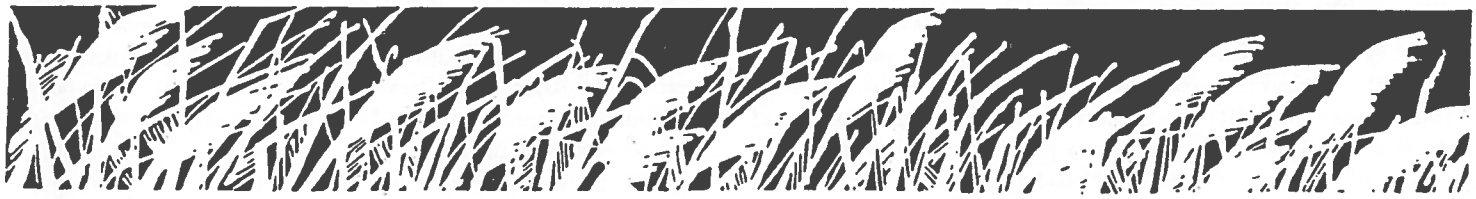
HJ Zeringue, Jr.
ARS, USDA, SRRC
P.O. Box 19687
New Orleans, LA 70179



CALL FOR NOMINATIONS

The PSNA constitution specifies that members are responsible for nominating candidates for election of officers. A new Vice President (President-Elect) is elected each year and automatically becomes President the next year or any time that the office of President may be vacated. The President of PSNA is not eligible for re-election to this office at a later date and cannot succeed himself (herself) as President. The Secretary and Treasurer are elected for three-year terms (which end in 1993 and 1991) and may be re-elected.

A form is provided (see center section of the newsletter) for submitting nominations for President-Elect and Treasurer. Please complete the nominations form and mail it to Jonathan Poulton, Department of Botany, University of Iowa, Iowa City, IA 52242. Nomination forms must be mailed by March 10, 1991. Election ballots will be distributed to members on April 10, 1991. All members, including those who joined in the past year, are urged to participate in the society's election process.

For the first time this year, ballots will include a photograph of and biographical information for each candidate. Those agreeing to run for office should be prepared to provide these materials by March 20.

REPORT OF THE TREASURER

The Society ended 1990 with assets totaling $44,672.92. The appended **Financial Statement** shows that $13,246.82 was collected by the Society during the year - this figure represents a 17% increase in revenues compared to FY 1989. The major sources of income included: royalties from sales of *Recent Advances in Phytochemistry* ($4,412.64); membership dues ($4,312.55); and donations from the National Scientific and Engineering Research Council of Canada ($2,546.70) and Concordia University ($1,300.00) for support of the 1990 and 1991 PSNA meetings, respectively. Interest from funds deposited into checking amounted to $336.93 for the year; rental of the PSNA mailing list accounted for $338.00 (an eleven fold increase over 1989). Membership dues collected over the year were down 3% from those collected during 1989, however this decline was offset by a significant increase in royalties (a 32% increase over 1989).

Expenditures for the year totaled $20,060.41. Costs associated with operating the annual meetings ($12,780.16) and administrative costs ($5,480.25) were the largest expenses. Accounts were settled with the University of British Columbia for the 1989 meeting at a cost to the Society of ($5,478.96; an itemized accounting was presented at the annual meeting in Quebec City). Additionally, $4,172.00 was paid to Laval University for the 1990 meeting, and an advance payment of $1,000.00 went to Colorado State University for the 1991 meeting. Eight students received travel awards to attend the Quebec City meeting ($1,430.00); awards for best paper were presented to Emidio De Carolis and Marios A. Menelaou ($100.00 ea). The level of support for student travel was down 18% compared to 1989 primarily because two students that applied for travel assistance were unable to attend the annual meeting. Travel for the Executive Committee amounted to $499.20. Administrative costs rose by 22% during 1990 (Secretary - $3,500.00; Editor-in-Chief - $2,000.00 and Treasurer - $1,780.25). Increased production costs associated with publication of the **PSNA Newsletter** and the **1990 PSNA Directory** account for most of this increase.

PSNA savings during 1990 was divided between two six-month CD accounts earning between 7.5 and 7.75% depending on the interest rate at each renewal. The Society began FY 1990 with $38,415.31 in these accounts. A total of $3,104.19 in interest was earned during the year to bring the balance to $41,519.50 at the close of the year. This represents an net increase of 8.1%. Interest from these accounts was added to the principle on renewal of each certificate. Since this interest was kept separate from checking account activity (i.e., receipts), it was listed separately under Savings Activity.

Overall, the Society posted a decline in net worth of $3,709.40 [(receipts + savings interest) - expenditures], a decrease of 7.7%. Increased costs associated with annual meetings was the major reason for this decline.

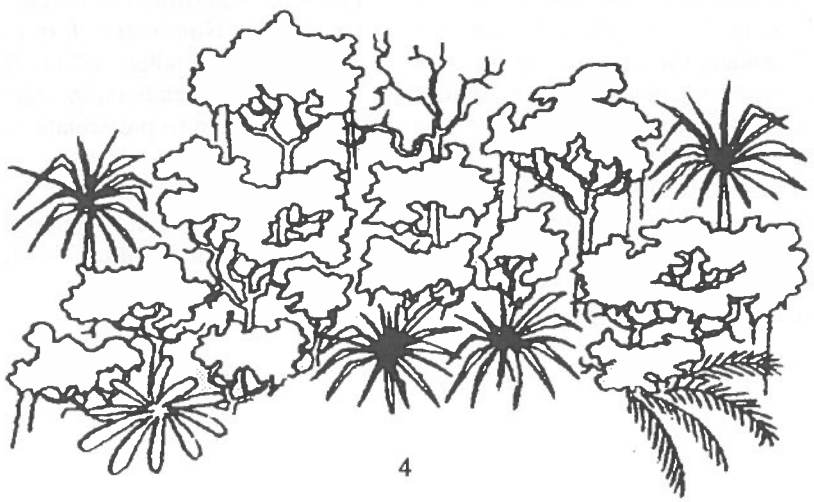
Since summaries of royalties for *Recent Advances in Phytochemistry* and PSNA membership information were included in the November 1990 newsletter, they will not be presented with this report.

Three final reminders: i) would those who have not already done so, please remit their 1991 dues to me as soon as possible; ii) members that expect to retire during the next year are reminded that they are entitled to "emertis status" and exemption from payment of annual dues (please let me know); and iii) if you are planning a move, please get your new address to me as soon as possible so that the PSNA database can be updated.

Concern over the increasing cost of a formal audit expressed at the most recent business meeting led to the decision to have an internal audit by two PSNA members as per Article 1, Section 4 of the PSNA Bylaws. Dr. Jonathan Poulton (Past-President & Past-Treasurer) and Dr. Murray Isman (President-elect) were asked to review the PSNA books for the year by Dr. Brian Ellis, President. As in past years, the books and auditor reports are available for inspection. Please feel free to contact me if you have any questions, comments or suggestions about investments, and/or concerns regarding the PSNA Treasury.

Respectfully submitted,

Kelsey R. Downum, Treasurer



PHYTOCHEMICAL SOCIETY OF NORTH AMERICA
NOMINATIONS FORM FOR 1991

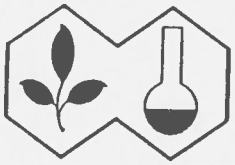
I nominate _____ for Vice President (President-Elect) 1991-92.

I nominate _____ for Treasurer, 1991-1994.

Fold here

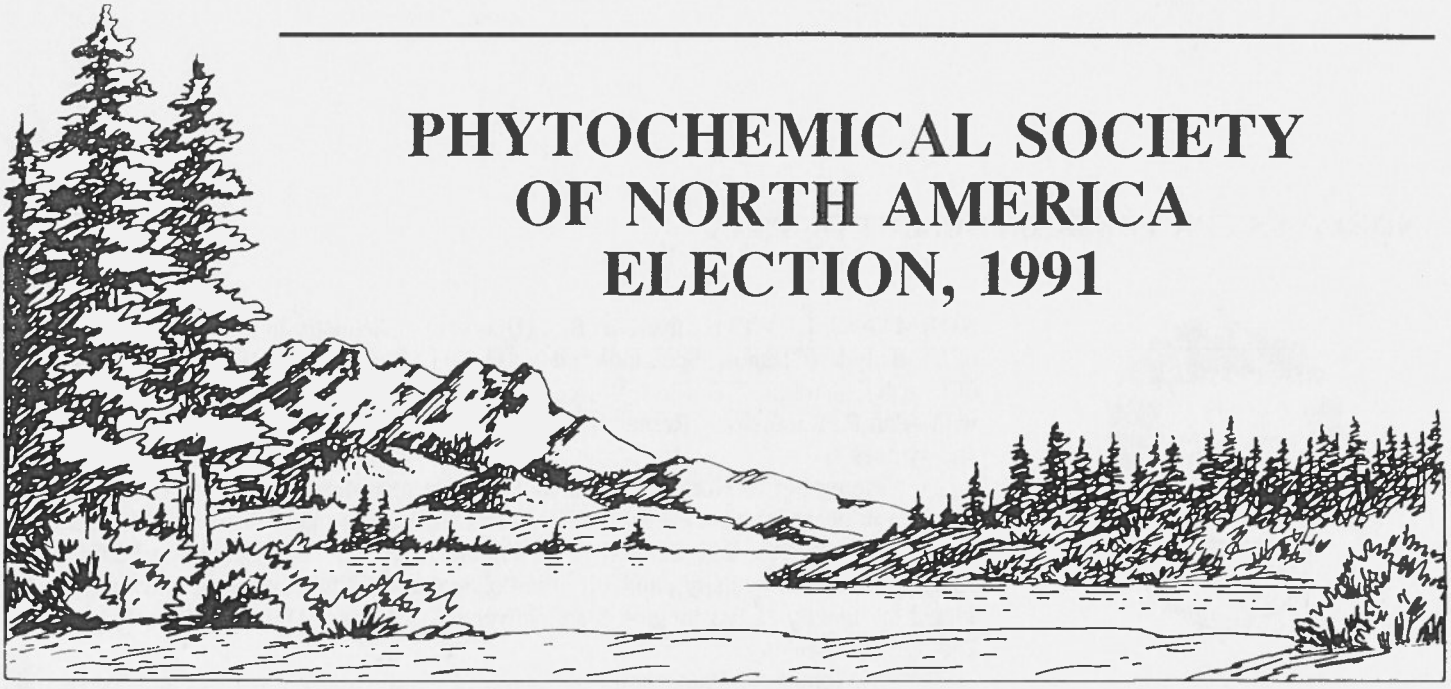
Fold here and tape to seal

Mail to Dr. Jonathan Poulton
Department of Botany
University of Iowa
Iowa City, OA 52242



Phytochemical Society
Of North America

Dr. Jonathan Poulton
Department of Botany
University of Iowa
Iowa City, IA 52242



PHYTOCHEMICAL SOCIETY OF NORTH AMERICA ELECTION, 1991

This year biographical information and photographs have been included for candidates running for President Elect and Treasurer of the PSNA. Please vote! Ballots are on pre-addressed post cards which require only that you check your choices for each office, attach appropriate postage and mail. Anyone who wishes to preserve the secrecy of his or her ballot may place it in an envelope for mailing.

CANDIDATES FOR TREASURER, 1991-94

GARY W. KUROKI received his Ph.D. in botany from the University of Iowa in 1985 where he worked with Jonathan Poulton on the purification and characterization of cyanogen specific B-Glucosidases in mature *Prunus serotina* seeds. He continued studies on cyanogenesis along with investigations into the regulation of the shikimate pathway in a postdoctoral program with Eric Conn at U.C. Davis (1986-88). This was followed by a second postdoctoral position at U.C. Riverside with Anthony Huang where he studied lipid metabolism in corn seeds (1988-90). Gary is currently employed in the floriculture group at DNA Plant Technology Corporation in Oakland, California. His research is focused on the utilization of genetic engineering to develop novel flower colors and patterns, investigating the biochemical and phytochemical aspects of flower pigments.

Gary has been a member of the PSNA since 1981 and received the outstanding student paper award at the 1985 meeting. He is also a member of the American Society for Biochemistry and Molecular Biology and the American Society of Plant Physiologists.

SUSAN McCORMICK received her B.S. in chemistry and biology from Illinois State University in Normal in 1977. She earned her Ph.D. in 1982 at the University of Texas in Austin. Her thesis research was on *Passiflora* flavonoids. After a postdoctoral position at the University of British Columbia, she joined the USDA in New Orleans as a plant physiology research associate working on aflatoxin biosynthesis and control. She is currently a research chemist at the USDA/ARS National Center for Agricultural Utilization Research in Peoria, Illinois, working on biosynthesis of trichothecene mycotoxins. She is a member of the American Society of Pharmacognosy, the American Chemical Society and has been a member of PSNA since 1980.

CANDIDATES FOR PRESIDENT ELECT OF PSNA

NORMAN G. LEWIS received his B.S. (Honors) in Chemistry in 1973 at the University of Strathclyde (Glasgow, Scotland) and his Ph.D. i.. Chemistry in 1977 at the University of British Columbia. This was followed by postdoctoral research at Cambridge University with Alan R. Battersby. Research topics included alkaloid and porphyrin biosynthesis and synthesis.

Returning to North America in 1979, Norman developed his current research program in phenylpropanoid metabolism, plant cell wall formation, and (bio)degradation at the National Research Council (Canada) the Pulp and Paper Research Institute of Canada (McGill University), and Virginia Polytechnic Institute and State University. He joined the faculty of Washington State University in 1990 as Director of the Institute of Biological Chemistry.

He joined the Phytochemical Society of North America in 1985, and has served on the Phytochemical Bank Committee.

JAMES A. SAUNDERS received his bachelor's degree in 1971 from the University of South Florida where he worked with Richard Mansell on flavonoid chemotaxonomy. He obtained his Ph.D. from Miami University in 1975 where he studied flavonoid biosynthesis and localization with Jerry McClure and finished a two-year postdoctoral program at the University of California in Davis with Eric Conn on cyanogenic glucoside accumulation . He joined the USDA in 1977 and has worked on alkaloid, coumarin, phytoalexin, and flavonoid regulation in a number of plants. His latest research involves the development of gene transfer methods to regulate expression of defense related secondary natural products. He has more than 100 career publications in the area of phytochemistry and plant biochemistry.

He joincd the Phytochemical Sociсty of North America in 1971 and has participated in 18 of the last 21 annual meetings. As secretary of the society, 1980-84, he edited the PSNA newsletter and he has served on more than a dozen PSNA committees over the years. In 1986, he organized the PSNA meeting in College Park, MD, and co-edited the *Recent Advances in Phytochemistry Vol. 21, Phytochemical Effects of Environmental Compounds.*

PHYTOCHEMICAL SOCIETY OF NORTH AMERICA
31ST ANNUAL MEETING, FORT COLLINS, COLORADO
JUNE 22-26, 1991

SYMPOSIUM SPEAKERS

Dr. W. Barz, Lehrstuhl für Biochemie der Pflanzen Westfällische Wilhelms Universität, Münster, Germany	*Isoflavonoid Phytoalexins and Related Antimicrobial Metabolism*
Dr. R. A. Dixon, Plant Biology Division Samuel Roberts Noble Foundation, Ardmore, Oklahoma	*Molecular Biology of Isoflavonoid Phytoalexin Biosynthesis in Alfalfa*
Dr. Carl J. Douglas, Botany Department University of British Columbia, Vancouver, Canada	*Regulation and Elicitation of Phenylpropanoid Metabolism*
Dr. Anton G. M. Gerats, Laboratorium Voor Genetika, The Netherlands	*Genetics of Flavonoid Metabolism*
Dr. G. G. Gross, Abt. Allg. Botanik (Biol II) Rijksuniversiteit, Ghent, Belgium	*Enzymatic Synthesis of Gallotannins and Related Compounds*
Dr. Geza Hrazdina, Food Science and Technology Department, Agricultural Experiment Station, Geneva, NY	*Compartmentation of Aromatic Metabolism*
Dr. Ragai K. Ibrahim, Biology Department Concordia University, Montreal, Canada	*Immunolocalization of Flavonoid Conjugates and their Enzymes*
Dr. Christopher J. Lamb, Plant Biology Lab Salk Institute for Biol. Studies, La Jolla, California	*Molecular Mechanisms Governing Natural Product Biosynthesis: Flexible Integration of Developmental and Environmental Circuits*
Dr. Peter E. Laks, Inst. Wood Research Michigan Technological University, Brighton, Michigan	*Chemistry of Proanthocyanidins and Their Applications*
Dr. Norman Lewis, Institute of Biological Chemistry, Washington State University Pullman, Washington	*Biosynthesis, Enzymology and Structure of Lignins and Lignans*
Dr. Donald A. Phillips, Agronomy and Range Science, University of California, Davis, California	*Rhizobium-legume: Flavonoids and nod Genes*

PHYTOCHEMICAL SOCIETY OF NORTH AMERICA

JUNE 22-26, 1991

CALL FOR PAPERS

Registrants are invited to present a contributed paper or poster on any phytochemical topic. Please read the instructions carefully, and note the abstract must be **received** by 1 April, 1990.

GENERAL INFORMATION

Oral presentations will be 12 minutes, followed by a 3 minute question period. A standard 35 mm slide projector, an overhead projector, and a chalkboard will be available. Each poster presentation will be allotted a space 120 cm wide by 120 cm high (4 feet X 4 feet).

Please note that it may be necessary to limit the number of oral presentations, and to assign some applicants to a poster session. Should this be the case, you will be notified at least 4 weeks before the meeting.

PREPARATION OF ABSTRACTS

Abstracts must fit entirely within a rectangle 6.5 X 3.0 inches (16.5 X 7.6 cm). You may use the box provided, or use a plain piece of white paper---but the abstract **must** fit within the allotted space! The Abstract Submission Form (next page) must accompany your ORIGINAL, UNFOLDED abstract.

On plain paper, rule a practice box 6.5 X 3.0 inches. Compose the abstract to fit completely within the box---do not type on or beyond the box lines. For the final version, type or print clean, dark, perfect copy. YOUR ABSTRACT WILL APPEAR EXACTLY AS YOU SUBMIT IT. Include authors' full first and last names. Leave no blank line other than that shown in the example. **Underline** the name of the author presenting the paper or poster.

EXAMPLE OF ABSTRACT FORMAT:

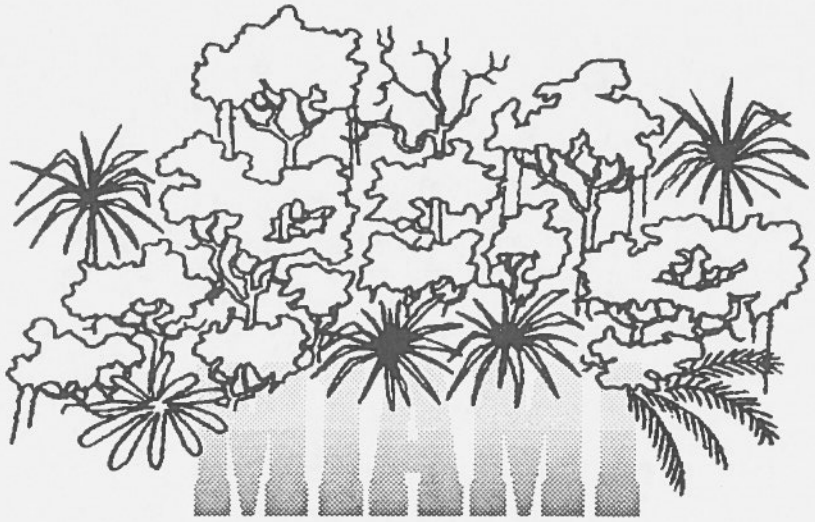
HOW TO PREPARE THE ABSTRACT, AND SUGGESTIONS TO IMPROVE THE QUALITY OF ORAL PRESENTATIONS.

Susan S. Martin, USDA Crops Research Lab., 1701 Center Ave., Fort Collins CO 80526 and Frank R. Stermitz, Dept. of Chemistry, Colorado State University, Fort Collins CO 80523.

An informative abstract will contain a concise statement of the problem or objectives, the experimental methods, and the results. The text should cite quantitative data from representative experiments, and should state findings and draw conclusions. Statements such as, "Such-and-so will be discussed," are not recommended.

Use only one idea per slide. If you are not going to discuss something, ***leave it off the slide.*** For a 35 mm slide, the narrow dimension of your copy should be 0.7 X the long dimension; double space lines, and use bold type. If more than a 4.5 X 3" area is used for typed copy (elite size), the final slide will not be suitable! A page of **HINTS FOR PREPARATION OF VISUAL AIDS** will be sent to those who submit abstracts.

ABSTRACT DEADLINE: 1 APRIL, 1991



Second Joint Meeting of the

PHYTOCHEMICAL SOCIETY

OF EUROPE

&

PHYTOCHEMICAL SOCIETY

OF NORTH AMERICA

Symposium Title:

Phytochemical Potential of Tropical Plants

Miami Beach, Florida USA
August 1 - 6, 1992

For information, contact:
Dr. Kelsey R. Downum
Department of Biological Sciences
Florida International University
Miami, FL 33199

TEL: (305) 348-3419
FAX: (305) 348-1986

FINANCIAL REPORT

January 01, 1990 - December 31, 1990

RECEIPTS

Membership Dues	4,312.55
Royalties	4,412.64
Donations	
- NSERC - 1990 mtg.	2,546.70
- Concordia Univ. - 1991 mtg.	1,300.00
Interest on Checking	336.93
Mailing List Rental	338.00
Total Receipt	**$13,246.82**

EXPENDITURES

Meeting Expenses	
- 1989 Meeting	$ 5,478.96
- 1990 Meeting	4,172.00
- 1991 Meeting	1,000.00
- Student Travel - 1990	1,430.00
- EC Travel - 1990	499.20
- Best Paper Awards - 1990	200.00
Executive Committee Expenses	
Secretarial	3,500.00
Editor-In-Chief	2,000.00
Treasurer	
- 1990 PSNA Directory (printing & postage)	1,169.48
- Supplies, etc.	610.77
Total Expenditures	**$20,060.41**

CHECKING SUMMARY

Receipts	$13,246.82
Expenditures	$20,060.41
Net Loss	**$-6,813.59**

SAVINGS SUMMARY

Interest (on $38,415.31)	$ 3,104.19
Net Gain	**$ 3,104.19**

ASSETS - January 01, 1990

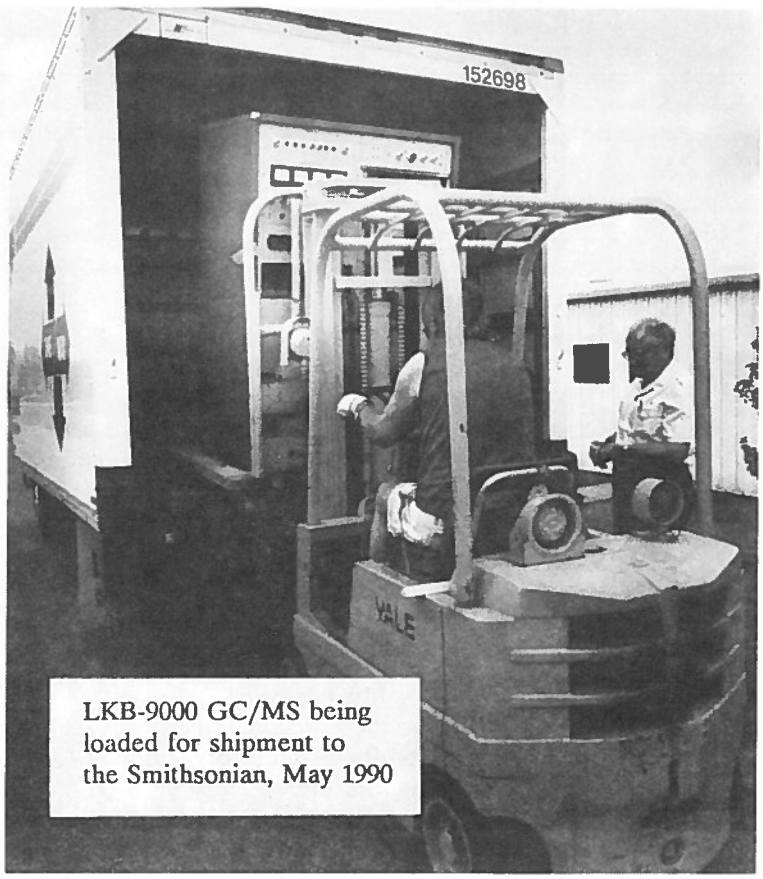
Checking	$ 9,967.01
Savings	38,415.31
Total	**$48,382.32**

ASSETS - December 31, 1990

Checking	$ 3,153.42
Savings	41,519.50
Total	**$44,672.92**

GEORGE R. WALLER HONORED AT RECENT RETIREMENT

At a reception and banquet held at Oklahoma State University, a proclamation by the Governor declared September 14, 1990 George Waller Day in Oklahoma. On this occasion he also received congratulatory letters from a long list of colleagues and former students.



LKB-9000 GC/MS being loaded for shipment to the Smithsonian, May 1990

George Waller, a native of North Carolina, earned a B.S. in Agricultural Biochemistry from North Carolina State University and an M.S. in Agricultural and Biological Chemistry from the University of Delaware. After working as a research chemist with the Imperial Paper and Color Corporation in Glens Falls, New York, he joined the faculty of the Department of Biochemistry at Oklahoma State University in 1956 and completed his Ph.D. there in 1961. He has since pursued his research interest in the biosynthesis of natural products at OSU.

In 1963 during a sabbatical leave spent at the Nobel Institute in Stockholm, Sweden, George learned about the Ryhage/Becker separator that used a mass spectrometer as the detector for a gas chromatograph. He envisioned that such an instrument could be applied to solving biological research problems and worked with Dr. Ryhage to build the prototype of what later became commercially available as the LKB 9000. Three such instruments were built, two remained in Sweden and the third was eventually shipped to Oklahoma State University. Shipment was made possible by a special congressional bill waiving the $10,000 import duty on the instrument and transportation was provided by Oklahoma National Guard aircraft. The LKB-9000 that arrived at OSU in 1965 was the first of its kind in the United States (for several years one of only three in the world) and scientists from the U.S. and abroad flocked to Stillwater in the late 1960s to work with Waller and use this machine.

George was promoted to Professor of Biochemistry in 1967 and from 1969 to 1975 he was Assistant Director of the Agricultural Experiment Station. In 1975 he returned to full time research and teaching. George directed the research of eight Ph.D. students, 18 M.S. students, 30 post docs and visiting investigators. He has published 156 journal articles, 113 abstracts, 13 book reviews, monographs and proceedings and 15 bulletins. His productivity has been legendary among OSU secretaries.

Before he retired, George solicited funds for support of a Mass Spectrometry Center that now exists in the Chemistry Department at Oklahoma State University. He served as president of the PSNA in 1978.

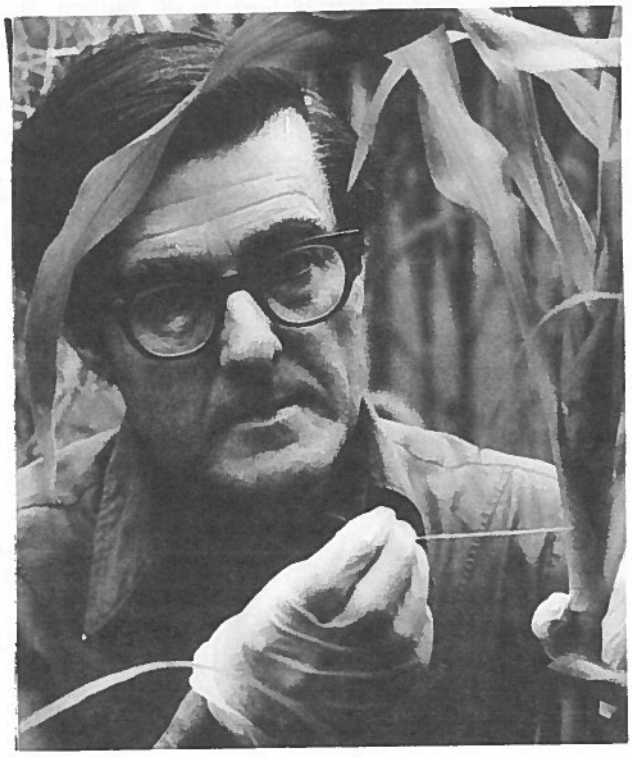
The original LKB-9000 Gas Chromatograph/Mass Spectrometer that was brought to OSU in 1965 is now in Washington, D.C., waiting to become part of a new exhibit at the Smithsonian Institution. George plans to visit Washington this summer to help plan the display which should be ready for public viewing by 1993.

PSNA MEMBER RECEIVED FIRST PERGAMON AWARD

The *First Pergamon Phytochemistry Medal* (and $5,000 prize) was presented to **Professor Edward Leete** at a meeting on Bioformation of Flavours, held in London in December, 1990.

Edward Leete was born in Leeds, England in 1928. He studied at the University of Leeds from 1945 to 1950 in the Department of Colour Chemistry and Dyeing and earned a B.Sc. in 1948, and a Ph.D. in 1950. While a postdoctoral fellow at the National Research Council of Canada in Ottawa from 1951 to 1954, he began study of the biosynthesis of alkaloids with Leo Marion. In 1954, Leete accepted his first academic position at the University of California, Los Angeles, where he became good friends with Ted Geissman, one of the founding members of our society. At that time Tony Swain, Jeffrey Harborne and Corny Steelink were members of Ted's research group, studying the biosynthesis and chemistry of flavanoid compounds. Leete moved to the University of Minnesota in Minneapolis in 1958 and became a full professor in 1963. He has studied the biosynthesis of a large number of natural products mostly found in higher plants. In chronological order these have involved investigations on the origin of hordenine, N-methyltyramine, gramine, hyoscyamine, stachydrine, damascenine, trigonelline, nicotine, anabasine, ricinine, morphine, d-nor-ψ-ephedrine, mescaline, tropic acid, ajmaline, colchicine, serpentine, reserpine, quinine, chelidonine, digitoxin, coniine, demecolcine, azetidine-2-carboxylic acid, ibogaine, conhydrine, vindoline, catharanthine, 3-dimethylamino-3-phenylpropanoic acid (in taxine), anhalonidine, β-erythroidine, ψ-conhydrine, tiglic acid, meteloidine, nornicotine, capsaicin, pinidine, conhydrinone, anhalamine, tuliposide A, dioscorine, N-methylanabasine, myosmine, shihunine, anatabine, tennellin, α,β-dipyridyl, brevicolline, cocaine, cuscohygrine, scopolamine, N^1-isopropylnornicotine, psilotin, ficine, hygrine, ethylene, 1-aminocyclopropane-1-carboxylic acid, riddelliine, 1-methylpyrrolidine-2-acetic acid, nicotine-1^1-oxide, and 2-methoxy-3-isopropylpyrazine.

At the December meeting in London, he presented a plenary lecture on the biosynthesis of 2-methoxy-3 isopropyl pyrazine, which is a widely distributed flavor compound found in many vegetables (peas, potatoes, green peppers) and also some microorganisms. Leete is the author of more than 220 papers, and recently he has been studying the origin of alkaloids in cell-free systems. He enjoys working in his private laboratory and is the sole author of 65 publications. He was recently a



visiting professor at the University of Kyoto, Japan, carrying out collaborative work with Professor Yasuyuki Yamada, in the Department of Molecular and Cellular Biology, on the biosynthesis of tropane alkaloids. He is currently writing an autobiography, because he feels that the world needs to know how scientists live and enjoy themselves.

In 1990 Professor Leete also won the Minnesota award sponsored by the Minnesota Section of the American Chemical Society. The above photograph shows Professor Leete feeding *Zea mays* by the wick method.

THE PERGAMON PHYTOCHEMISTRY MEDAL AND PRIZE

This international medal and prize of $5000 is awarded annually by Pergamon Press in recognition of sustained, outstanding contributions to the subject of phytochemistry. It is open to candidates of any nationality, subject to nomination. It is expected that those winning the award will have published a significant proportion of their research findings in the journal, *Phytochemistry*.

Nominations for the 1991 award should be sent, for onward transmission, either to the secretary of one of the established Phytochemical Societies (i.e. PSE, PSNA, PSJ, PSSA, PSLA) or to a member of the Editorial Board (for addresses, see inside front cover of *Phytochemistry)*. They need to be received in the editorial office by 30 April 1991, accompanied by appropriate documentation. This should consist of a one or two page letter making out the case for the candidate, a list of appointments (one page) and a list of major publications (no more than three pages). The award will be decided by the editorial board, which reserves the right not to make a recommendation in any given year, at its annual meeting in July. The result will be announced in the October issue of *Phytochemistry*.

MEETINGS AND PROGRAMS OF INTEREST

ADVANCES IN LABIATE SCIENCE, AN INTERNATIONAL SYMPOSIUM: Royal Botanic Gardens, Kew, U.K., April 2-5, 1991. This conference is sponsored by the Royal Botanic Gardens, The Phytochemical Society of Europe and the Linnean Society of London. Topics will include: Biographical and Chemical overviews; Supragenic Groupings; the tribe Prostanthereae; Taxonomy of Stachys in Africa; New-World Ocimeae; Taxonomic review of the Mentheae; Essential oils as taxonomic markers; Terpenoids and Flavonoids; Chemistry of flower color; Chromosomal evolution; Chloroplast DNA in Asteridae; Breeding systems; Pollen and Pollination; Animal: Plant interactions; Economic importance of Chinese and New-World Labiatae; Chemical components of Labiatae Oils. Poster presentations are invited. For further information, contact Dr. H. Harley or Dr. G. Kite, Royal Botanic Gardens, Kew, Richmond, Surrey TW93AE, U.K.

SECOND NORTH AMERICAN TANNIN CONFERENCE. PLANT POLYPHENOLS: BIOGENESIS, PROPERTIES AND SIGNIFICANCE. Michigan Technological University, Houghton, MI, June 17-21, 1991. The program and timing of this meeting complement the 31st annual meeting of the PSNA in Fort Collins, CO. For further information, contact Richard W. Hemingway, Southern Forest Experiment Station, USDA Forest Service, 2500 Shreveport Highway, Pineville, LA 71360 or Peter E. Laks, Institute of Wood Research, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931-1295 or Susan L. Bucheger, Public Service Professional Development, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931-1255 (Tel. 906-487-2262).

PHYTOCHEMICAL SOCIETY OF NORTH AMERICA: Fort Collins, Colorado, June 22-26, 1991. The symposium topic for this 30th anniversary meeting of the PSNA will be Phenolic Metabolism in Plants. See enclosed registration materials.

EIGHTEENTH ANNUAL MEETING OF THE PLANT GROWTH REGULATOR SOCIETY OF AMERICA: Boston, Massachusetts, July 28-August 1, 1991. The PGRSA provides a forum for scientists from diverse disciplines in academia, government, and industry to exchange ideas and information in the field of plant growth regulation. The Society fosters better understanding and stimulates research in the processes of plant growth and development.

Two symposia are scheduled for the meeting in Boston: "Biotransformation and Natural Products" and "Regulation of Growth in Greenhouse Crops". The keynote address will be presented by Dr. Marc Cathey, Director of the U.S. National Arboretum.

The Society invites oral or poster presentations and encourages graduate student participation. Awards will be presented for the best overall presentation and also for the best graduate student presentation. Abstracts of contributed presentations are due March 31, 1991 for publication in the *Quarterly*. Expanded abstracts or manuscripts are due at the meeting for publication in the *Proceedings*. Send abstracts and requests for information to: Dr. A.R. Templeton, Program Chair, Aquatrols Corp. of America, 1423 Union Ave., Pennsauken, NJ 08110, (Tel. 609-665-1130) or Dr. R.M. Devlin, Local Arrangements Chair, Cranberry Experiment Station Univ. Mass., Glen Charlie Rd., East Wareham, MA 02538 (Tel. 508-295-2213).

15TH INTERNATIONAL CONGRESS OF BIOCHEMISTRY: Jerusalem, Israel, August 4-9, 1991. For further information, contact: 1st IUB Congress, P.O. Box 50006, Tel Aviv 61500, Israel (Tel. 972-3654571; fax: 972-365-5674; Bitnet BNLITAUR@WEIZMANN).

THE PYRROLES OF PHOTOSYNTHETIC ORGANISMS: University of California, Davis, August 4-9, 1991. This conference aims to bring together scientists who are studying the pyrroles of photosynthetic organisms from a variety of perspectives. For further information, contact P.A. Castelfranco, University of California, Davis, CA 95616.

THIRD INTERNATIONAL CONGRESS OF PLANT MOLECULAR BIOLOGY: Tucson, Arizona, October 6-12, 1991. The Congress will stress current research in Molecular Aspects of Plant Growth and Development. Plenary sessions, concurrent symposia, poster, discussion sessions, and workshops will cover Advances in Gene Regulation; Differentiation; Seed and Fruit Development; Hormonal Regulation; Cell Biology; Plant Pathogenesis; Nitrogen Fixation; Responses to Environment; Genome Organization and Mapping; Photosynthesis; and Organelle Genomes. For more information, contact: ISPMB, Woo Wester Conference Consultants, 2934 1/2 Beverly Glen Circle, Suite 383, Los Angeles, CA 90077 (Tel. or fax: 213-474-5894).

IXTH INTERNATIONAL CONGRESS ON PHOTOSYNTHESIS: Nagoya, Japan, August 30-September 4, 1992. For further information, contact Prof. Noria Murata, Secretariat, IXth International Congress on Photosynthesis, National Institute for Basic Biology, Ozaki 444, Japan. (Phone/Fax 81 (JAPAN) 564-54-4866).

XV INTERNATIONAL BOTANICAL CONGRESS: Tokyo, Japan, August 28-September 3, 1993. The scientific program will include about 240 symposia and more than 1,000 posters in the following divisions: 1. Systematics and Evolution, 2. Structure and its Dynamics, 3. Phytochemistry and Natural Products, 4. Metabolism and Bioenergetics, 5. Developmental Botany, 6. Ecology and Environmental Botany, 7. Genetics, 8. Biotechnology and Breeding. For further information, contact the Congress Secretariat, XV International Botanical Congress Tokyo, c/o Department of Botany, Faculty of Science, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113, Japan.

PHYTOCHEMICAL SOCIETY OF NORTH AMERICA

Newsletter

Volume 31
Number 1

June 1991

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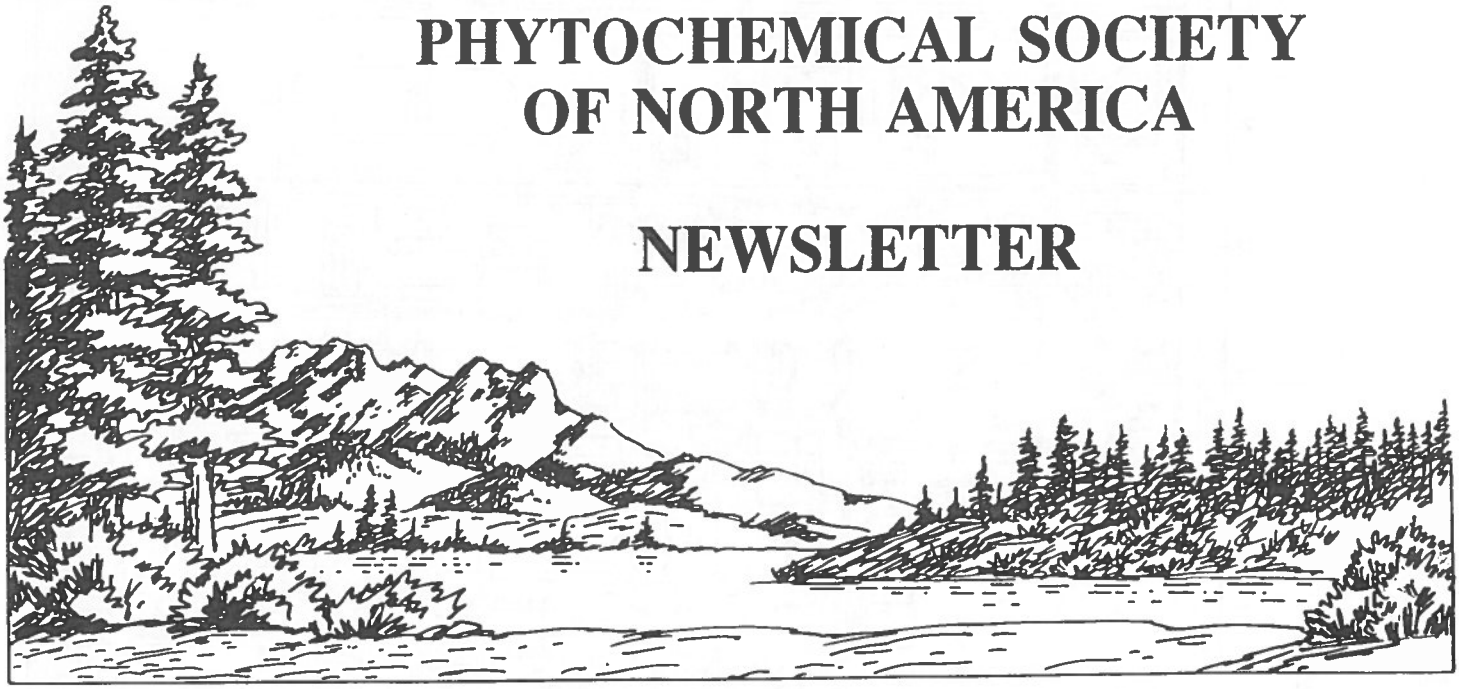
PSNA Advisory Committee

The Phytochemical Society of North America is a non-profit scientific organization whose membership (currently over 400) is open to anyone with an interest in phytochemistry, the role of plant substances, and in related fields. Annual membership dues are $15.00 for regular members and $8.00 for student members. Annual meetings featuring symposium topics of current interest and contributed papers by conference participants are held throughout the United States, Canada and Mexico. A newsletter is circulated to members several times a year to keep them informed of upcoming meetings and developments within the Society.

If you would like additional information about the PSNA or if you have material to be included in the newsletter, please contact the Society Secretary. Annual dues and changes in addresses should be sent to the Society Treasurer.

PHYTOCHEMICAL SOCIETY OF NORTH AMERICA

NEWSLETTER



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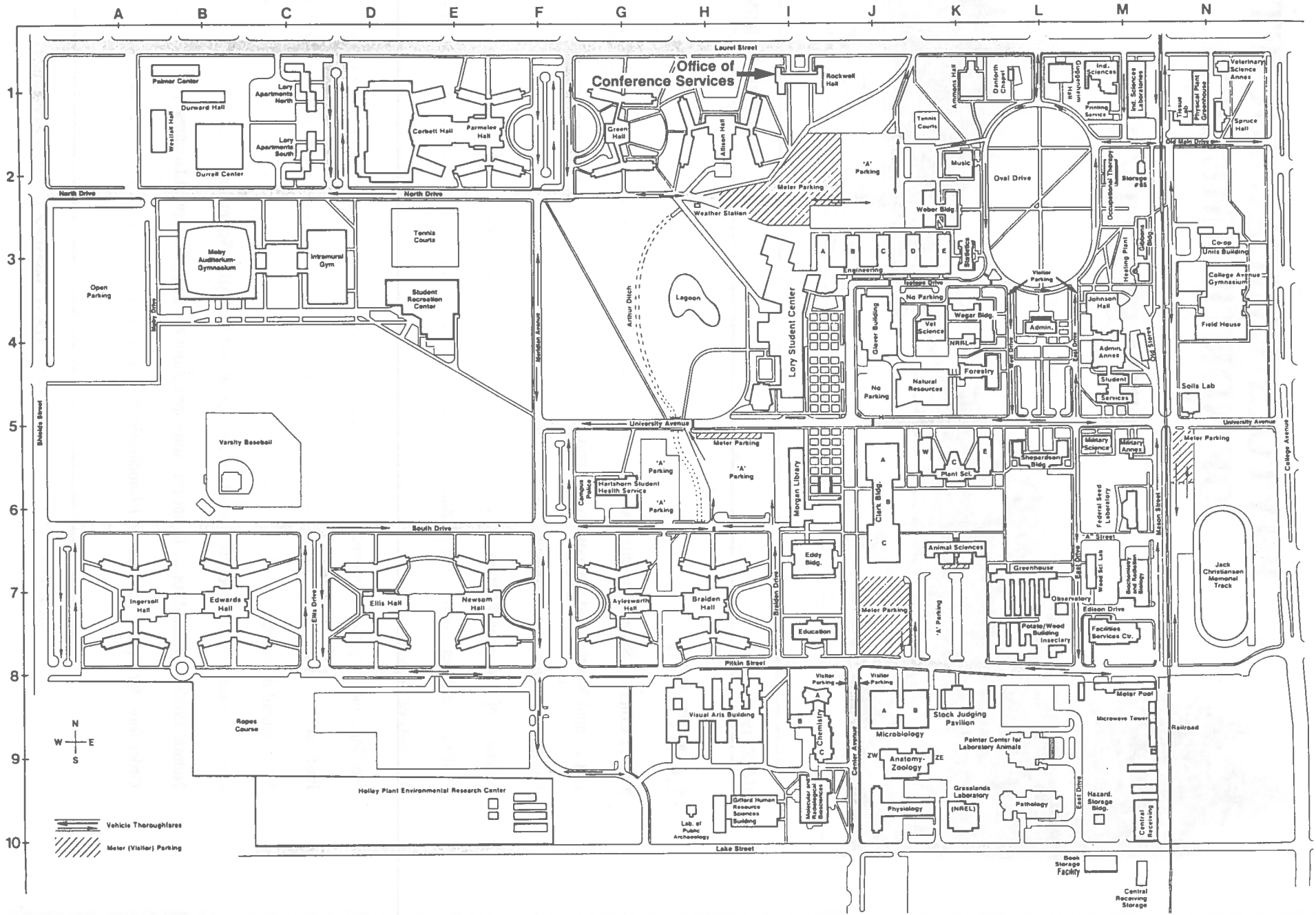
Colorado State University

Main Campus



PHYTOCHEMICAL SOCIETY OF NORTH AMERICA

31st ANNUAL MEETING AND SYMPOSIUM

Funds in support of this meeting were graciously donated by:
Colorado State University, Office of the Vice President for Research
Concordia University, Montreal, Quebec
The Samuel Roberts Noble Foundation, Inc., Ardmore OK
Colorado State University Agricultural Experiment Station

SATURDAY, JUNE 22

ARRIVAL AND REGISTRATION

4:00-6:00 Parmelee Residence Hall, Colorado State University campus

7:30-9:00 WELCOME RECEPTION AND MIXER
University Club, Lory Student Center, CSU

SUNDAY, JUNE 23

Morning REGISTRATION
Clark Building Foyer

All Sessions:
CLARK BUILDING, Room A-104

Symposium Session I (Helen A. Stafford, presiding)

8:15 Welcome - PSNA President Brian E. Ellis

8:30 Geza Hrazdina. [Symposium Paper 1.]
COMPARTMENTATION IN AROMATIC METABOLISM.

9:20 Ragai Ibrahim. [Symposium Paper 2.]
IMMUNOLOCALIZATION OF FLAVONOID CONJUGATES AND THEIR ENZYMES.

10:10 Break

10:30 Carl J. Douglas, Karl D. Hauffe, Susanne Reinhold, Mary Ellard, Elizabeth Molitor, Màrio Moniz de Sà, Rajgopal Subramaniam, and

Frank Williams. [Symposium Paper 3.]
GENES OF GENERAL PHENYLPROPANOID METABOLISM: STRESS AND DEVELOPMENTAL REGULATION.

11:20 Christopher J. Lamb. [Symposium Paper 4.]
MOLECULAR MECHANISMS GOVERNING NATURAL PRODUCT BIOSYNTHESIS: FLEXIBLE INTEGRATION OF DEVELOPMENTAL AND ENVIRONMENTAL CIRCUITS.

10:00 - 5:00 **POSTER SESSION I**, Clark Building Foyer
Posters #1-16. [Authors are asked to be present at their posters before and after sessions, and during breaks.]

Poster 1. Zareb Herman, Chi H. Fong and Shin Hasegawa. EFFECTS OF STORAGE AND ETHREL TREATMENT ON LIMONIN AND LIMONIN GLUCOSIDE LEVELS IN WASHINGTON NAVEL ORANGE.

Poster 2. Yasuyuki Hashidoko, Satoshi Tahara and Junya Mizutani. CONSTITUENTS OF GLANDULAR TRICHOME EXUDATES OF *Rosa rugosa* LEAVES.

Poster 3. Jim Burton and Eleanor Maness. BENTAZON HYDROXYLATION IN SHATTERCANE AND JOHNSONGRASS IS CATALYZED BY A CYTOCHROME P450 MONOOXYGENASE.

Poster 4. Wlodzimierz Borejsza-Wysocki and Geza Hrazdina. SYNTHESIS OF p-HYDROXYPHENYLBUTANONE IN FRUITS AND TISSUE CULTURES OF *Rubus idaeus* cv. ROYALTY.

Poster 5. H. J. Zeringue, Jr. C_6-C_{10} ALKENALS ELICIT A DEFENSE RESPONSE IN DEVELOPING COTTON BOLLS.

Poster 6. Timothy C. Morton, Andrew S. Zektzer, Jason P. Rife, and John T. Romeo. TRANS-4-METHOXYPIPECOLIC ACID, A NEW AMINO ACID FROM *Inga paterno*.

Poster 7. Frank R. Stermitz, Jeanne N. Tawara and Marc D. Pomeroy. ALKALOIDS OF SPRUCE (*Picea*) AND PINE (*Pinus*) SPECIES.

Poster 8. Alicja M. Zobel, Jeffrey Plomley and Kelsey Downum. COUMARINS ON THE SURFACE OF FIVE CITRUS SPECIES.

Poster 9. David McCaskill, Jonathan Gershenzon and Rodney Croteau. MONOTERPENE BIOSYNTHESIS BY ISOLATED SECRETORY CELL CLUSTERS DERIVED FROM GLANDULAR TIRCHOMES OF PEPPERMINT (*Mentha piperita*).

Poster 10. Jeffrey D. Weidenhamer, Francisco A. Macias, Nikolaus H. Fischer, and G. Bruce Williamson. WATER SOLUBILITY AND THE ALLELOPATHIC POTENTIAL OF MONOTERPENES.

Poster 11. Steven F. Vaughn and Gayland F. Spencer. VOLATILE MONOTERPENES AS MODELS FOR NEW HERBICIDE CHEMISTRY.

Poster 12. Dennis V.C. Awang, Daryl G. Kindack, Cliff W. Crompton, Robin J. Marles and J. Thor Arnason. VARIATION IN PARTHENOLIDE CONTENT AND BIOACTIVITY OF FEVERFEW [*Tanacetum parthenium* (L.) Schultz-Bip.].

Poster 13. Dirk Selmar, Victor Wray, and David S. Seigler. p-COUMAROYL-CARDIOSPERMIN - THE MAJOR CYANOGENIC COMPOUND FROM LEAVES OF *Ungnadia speciosa*.

Poster 14. Elisabeth Swain, Chun-Ping Li and Jonathan E. Poulton. DEVELOPMENT OF THE POTENTIAL FOR CYANOGENESIS DURING MATURATION OF BLACK CHERRY (*Prunus serotina* Ehrh.) FRUITS.

Poster 15. Chun-Ping Li, Elisabeth Swain, Hua-Cheng We, and Jonathan E. Poulton. IMMUNOCYTOCHEMICAL LOCALIZATION OF MANDELONITRILE LYASE AND ASSOCIATED ENZYMES IN MATURE *Prunus serotina* SEEDS.

Poster 16. Jerry W. McClure and Lan Liu. EFFECT OF UV-B AT LEVELS EXPECTED FROM OZONE DEPLETION ON GROWTH, PHOTOSYNTHESIS, FLAVONOIDS AND FERULIC ACID IN BARLEY LEAVES.

12:10 Lunch

Afternoon: **Contributed Papers** (Kelsey R. Downum, presiding)

1:30 Barend C. B. Bezuidenhoudt, S. Catherine Bezuidenhout, Annelie Swanepoel, and Daneel Ferreira. [Paper 1]. α-HYDROXYDIHYDROCHALCONES IN FLAVONOID BIOSYNTHESIS - CHEMICAL ANALOGIES.

1:45 Maike S. Petersen. [Paper 2]. ENZYMES OF ROSMARINIC ACID BIOSYNTHESIS FROM CELL CULTURES OF *Coleus blumei*.

2:00 Peter E. Brodelius. [Paper 3]. PHENYLPROPANOID METABOLISM IN CELL SUSPENSION CULTURES OF *Vanilla planifolia*.

2:15 M. Kaouadji, P. Ravanel, J. M. Morand, M. Tissut, D. Barron, A. J. Chulia, D. Crouzet, S. Chiron, F. Thomasson, S. Samiri and A. M. Mariotte. [Paper 4]. *C*-PRENYLATED FLAVONES AND FLAVONOLS FROM PLANE-TREE.

2:30 Denis Barron, Mourad Kaouadji and Anne-Marie Mariotte. [Paper 5]. CHEMICAL SYNTHESIS OF PRENYLATED FLAVONES AND FLAVONOLS.

2:45 Yuejin Sun, Nancy L. Paiva, Richard A. Dixon, Hans D. Van Etten and Geza Hrazdina. [Paper 6]. MOLECULAR CLONING OF THE GENE WHICH SPECIFIES 7,2'-DIHYDROXY-4',5'-METHYLENEDIOXYISOFLAVONE OXIDOREDUCTASE FROM $CuCl_2$ TREATED PEA (*Pisum sativum* L.) SEEDLINGS.

3:00 Break

3:30 E. Vincent Brandt, J. Mattheus Botha, Barend C. B. Bezuidenhoudt

and Daneel Ferreira. [Paper 7]. PROFISETINIDIN-TYPE 4-ARYLFLAVAN-3-OLS AND RELATED δ-LACTONES.

3:45 Jan P. Steynberg, Johannes C. S. Malan and Daneel Ferreira. [Paper 8]. *BIS*-FISETINIDOLS AND RELATED C-RING ISOMERIZED ANALOGUES FROM *Colophospernum mopane*.

4:00 Osamu Kodama, Morifumi Hasegawa and Tadami Akatsuka. [Paper 9]. ISOLATION OF NARINGENIN 7-O-METHYLTRANSFERASE, THE TERMINAL ENZYME OF FLAVONOID RICE PHYTOALEXIN BIOSYNTHESIS IN UV-TREATED RICE LEAVES.

4:15 M. E. Snook and G. C. Gueldner. [Paper 10]. AN HPLC SURVEY OF CORN (*Zea mays* L.) POPULATIONS AND INBREDS FOR SILK FLAVONOL-GLYCOSIDE CONTENTS.

4:30 James A. Rasmussen, Angela M. Hejl and Frank A. Einhellig. [Paper 11]. EFFECTS OF SORGOLEONE ON PLANT MITOCHONDRIAL RESPIRATION.

Evening

6:30 **STEAK BARBEQUE** (Outdoors)
(by CSU Lagoon, northwest corner of Lory Student Center)

MONDAY, JUNE 24

Symposium Session II. (Ragai Ibrahim, presiding)

8:30 Anton G. M. Gerats. [Symposium Paper 5.]
GENETICS OF FLAVONOID METABOLISM.

9:20 Donald A. Phillips. [Symposium Paper 6.]
FLAVONOIDS AS PLANT SIGNALS TO SOIL MICROBES.

10:10 Break

10:30 W. Barz. [Symposium Paper 7.]
ISOFLAVONOID PHYTOALEXINS AND RELATED ANTIMICROBIAL METABOLISM.

11:20 Richard A. Dixon. [Symposium Paper 8.]
MOLECULAR BIOLOGY OF ISOFLAVONOID PHYTOALEXIN SYNTHESIS IN ALFALFA.

12:10 Lunch

Afternoon: FREE.

Tours of the National Seed Storage Laboratory on the CSU campus will be available (sign up at registration).

[No group outing is planned, but information on local and nearby attractions (including Rocky Mountain National Park, about 45 miles away) will be available.]

TUESDAY, JUNE 25

Symposium Session III. (Helen A. Stafford, presiding)

8:30 Peter A. Laks. [Symposium Paper 9.]
CHEMISTRY OF PROANTHOCYANIDINS AND THEIR APPLICATIONS.

9:20 Norman G. Lewis. [Symposium Paper 10.]
BIOSYNTHESIS AND STRUCTURE OF LIGNINS, LIGNANS, AND NEOLIGNANS.

10:10 Break

10:30 G. G. Gross. [Symposium Paper 11.]
ENZYMATIC SYNTHESIS OF GALLOTANNINS AND RELATED COMPOUNDS.

10:00 - 5:00. **POSTER SESSION II.** Clark Building Foyer.
Posters #17-31. [Authors are asked to be present at their posters before and after sessions, and during breaks.]

Poster 17. Annemarie Cronjè, Barend C.B. Bezuidenhoudt, Jan P. Steynberg, E. Vincent Brandt, and Daneel Ferreira. CONVERSION OF B- TO A-TYPE PROANTHOCYANIDINS.

Poster 18. Frank Petereit, Herbert Kolodziej and Adolf Nahrstedt. PROANTHOCYANIDINS AND BIOGENETICALLY RELATED DIHYDROFLAVONOLS FROM *Cistus incanus*.

Poster 19. Kathy Slindee, Kevin Davies, Marie Bradley, Simon Deroles, Susan Ledger, Robyn Miller and Nigel Given. CHANGING THE COLOUR OF *Dendranthema* (CHRYSANTHEMUM) FLOWERS.

Poster 20. Francois Cormier, Chi Bao Do, Diane Montpetit and Thi Man Nguyen. ANTHOCYANOPLASTS OR FLAVONOSOMES ???

Poster 21. Satoshi Tahara, Masaaki Moriyama, John L. Ingham and Junya Mizutani. STRUCTURE DIVERSITY AND BIOGENESIS OF *Piscidia erythrina* ISOFLAVONOIDS.

Poster 22. Nichole R. O'Neill. DEFENSE RESPONSES AND THE ROLE OF MEDICARPIN IN RESISTANCE OF ALFALFA TO *Colletotrichum trifolii*.

Poster 23. Nancy L. Paiva, Robert Edwards and Richard A. Dixon. ISOFLAVONE REDUCTASE FROM ALFALFA: MOLECULAR CLONING AND EXPRESSION IN *E. coli* OF A STEREOSPECIFIC ENZYME OF PTEROCARPAN BIOSYNTHESIS.

Poster 24. David Netzly and Cindy Schutt. EFFECT OF APIFOROL AND APIGENINIDIN ON THE GROWTH OF FUNGI.

Poster 25. Guillaume Bècard, Dominique B. Rolin and Philip E. Pfeffer. GROWTH STIMULATION OF VESICULAR-ARBUSCULAR MYCORRHIZAL (VAM) FUNGI BY FLAVONOIDS.

Poster 26. Carl A. Maxwell, Robert Edwards and Richard A. Dixon. IDENTIFICATION, PURIFICATION, AND CHARACTERIZATION OF AN ALFALFA ISOLIQUIRITIGENIN-2'-O-METHYL TRANSFERASE.

Poster 27. M. Hungria, C. M. Joseph and D. A. Phillips. FLAVONOID *nod*-GENE INDUCERS RELEASED NATURALLY FROM COMMON BEAN SEEDS AND ROOTS.

Poster 28. Quindong Wu, Geza Hrazdina and Thomas A. Larue. LUTEOLIN IS NOT A *Nod* GENE INDUCER IN ALFALFA.

Poster 29. Malcolm M. Campbell, Jack Pitel, Robert Rutledge and Brian E. Ellis. MOLECULAR CLONING OF THE GENE FROM PINE ENCODING PHENYLALANINE AMMONIA-LYASE.

Poster 30. Malcolm M. Campbell and Brian E. Ellis. CHARACTERIZATION OF LIGNIN FROM ELICITED PINE CELL CULTURES.

Poster 31. Ross Whetten, David O'Malley and Ronald Sederoff. ENZYMES OF LIGNIN BIOSYNTHESIS IN XYLEM OF LOBLOLLY PINE.

11:20 Lunch

Contributed Papers: BEST PAPER COMPETITION.
(Jonathan E. Poulton, presiding)

1:00 Thomas L. Eberhardt, Laurence B. Davin, Etsuo Yamamoto, Jan B. Wooten and Norman G. Lewis. [Paper 12]. PHENYLPROPANOID METABOLISM IN *Pinus taeda* CELL CULTURE.

1:15 Lanfang He, Laurence B. Davin, David M. O'Malley, Ronald R. Sederoff and Norman G. Lewis. [Paper 13]. IMMUNOCYTOCHEMICAL LOCALIZATION OF ENZYMES AND SUBSTRATES IN LIGNIN AND LIGNAN FORMATION.

1:30 Malcolm M. Campbell and Brian E. Ellis. [Paper 14]. PHENYLPROPANOID METABOLISM IN ELICITOR-TREATED PINE CELL CULTURES.

1:45 Mark A. Bernards and Brian E. Ellis. [Paper 15]. THE ROLE AND PROPERTIES OF PHENYLALANINE AMMONIA-LYASE IN TOMATO CELL CULTURES INOCULATED WITH *Verticillium albo-atrum*.

2:00 Luc Varin and Normand Brisson. [Paper 16]. MOLECULAR CLONING OF cDNA ENCODING FLAVONOL 3- and 4'-SULFOTRANSFERASES.

2:15 Mamdouh M. Abou-Zaid, John T. Arnason and Constance Nozzolillo. [Paper 17]. BIOLOGICAL ACTIVITY OF FLAVONOIDS TOWARDS THE EUROPEAN CORN BORER, *Ostrinia nubilalis* (HUBNER) LARVAE.

2:30 Leon Brimer. [Paper 18]. IDENTITY AND CONCENTRATION OF SECONDARY METABOLITES IN STYLES/STIGMAS, AND ANTHERS/FILAMENTS - AS COMPARED TO OTHER ORGANS.

2:45 BREAK

3:00 Sally L. Van Wert and James A. Saunders. [Paper 19]. EFFECT OF EXTRACELLULAR NUCLEASES ON FOREIGN DNA DURING POLLEN ELECTROTRANSFORMATION.

3:15 Karin E. Readel and D. S. Seigler. [Paper 20]. ALKALOIDS OF *Leitneria floridana*.

3:30 Mark Gijzen, Efraim Lewinsohn and Rodney Croteau. [Paper 21]. MONOTERPENE BIOSYNTHESIS IN GRAND FIR TREES AND SAPLINGS.

3:45 Brett J. Savary and Hector E. Flores. [Paper 22]. BIOSYNTHESIS OF EXTRACELLULAR PROTEINS BY ROOT CULTURES OF CHINESE MEDICINAL CUCUMBER (*Trichosanthes* spp.).

4:00 BUSINESS MEETING

Evening:

6:00 Social Hour

6:45 **BANQUET**

University Park Holiday Inn
425 West Prospect Rd. (South of CSU campus)

WEDNESDAY, JUNE 26

Contributed Papers. (Brian E. Ellis, presiding)

8:30 Laurence B. Davin, Wai-Lam A. Chu, Toshiaki Umezawa and Norman G. Lewis. [Paper 23]. STEREOCHEMISTRY AND ENZYMOLOGY OF LIGNAN/NEOLIGNAN FORMATION.

8:45 Ma. Estela J. Inciong, Laurence B. Davin, Ronald R. Sederoff and Norman G. Lewis. [Paper 24]. SUBSTRATE SPECIFICITY OF UDP-GLUCOSE: CONIFERYL ALCOHOL GLUCOSYLTRANSFERASES IN *Pinus* AND *Fagus* SPECIES.

9:00 Marie-Josee Poulin and Yves Piche. [Paper 25]. HYPHAL GROWTH ENHANCEMENT OF THE VESICULAR-ARBUSCULAR MYCORRHIZAL (VAM) FUNGUS *Gigaspora margarita* BY PLANT FLAVONOIDS AND CARBON DIOXIDE.

9:15 Jacques Grandmaison. [Paper 26]. ALTERED DISTRIBUTION OF ROOT PHENOLICS BY VA MYCORRHIZATION.

9:30 Thomas Vogt and Brian Ellis. [Paper 27]. SINAPINE SYNTHASE FROM *B. napus* - PURIFICATION AND CHARACTERIZATION.

9:45 Clint Chapple, Thomas Vogt, Brian Ellis and Chris Somerville. [Paper 28]. MUTANTS OF *Arabidopsis thaliana* DEFECTIVE IN SINAPOYL MALATE BIOSYNTHESIS.

10:00 BREAK

10:30 Sungsook Lee, Shouguang Jin, Eugene W. Nester and Heinz G. Floss. [Paper 29]. VIRULENCE GENES ACTIVATION BY PLANT PHENOLIC MOLECULES IN *Agrobacterium tumefaciens*.

10:45 Richard C. Gueldner, Michael T. Smith, and Charles C. Reilly. [Paper 30]. SEASONAL CHANGES IN COMPONENTS OF LEAF, RACHIS AND NUTS OF PECAN AS DETERMINED BY HPLC.

11:00 Efraim Lewinsohn, Mark Gijzen and Rodney Croteau. [Paper 31]. RENATURATION AFTER SDS-PAGE OF A WOUND-INDUCIBLE PINENE CYCLASE FROM GRAND FIR STEMS.

11:15 Frank A. Einhellig, Milton J. Haar and Nikolaus H. Fischer. [Paper 32]. ALLELOPATHIC POTENTIAL OF SESQUITERPENE LACTONES.

11:30 Hiroki Hamada and Masayoshi Imura. [Paper 33]. BIOTRANSFORMATION OF TESTOSTERONES BY A GREEN CELL SUSPENSION CULTURE OF *Marchantia polymorpha*.

11:45 Toshihiro Ona, Laurence B. Davin, Jan B. Wooten and Norman G. Lewis. [Paper 34]. PLANT CELL WALL FORMATION IN MICROGRAVITY.

12:00 LUNCH

Contributed Papers. (Frank R. Stermitz, presiding)

1:15 K. R. Downum, L. A. Swain, D. Provost-Buisson and J. Bouton. [Paper 35]. ACETYLENIC THIOPHENES IN *Flaveria* (ASTERACEAE).

1:30 Eric S. McCloud and May R. Berenbaum. [Paper 36]. EFFECTS OF UV-B ON NUTRITIONAL AND SECONDARY CHEMISTRY OF *Citrus limon*.

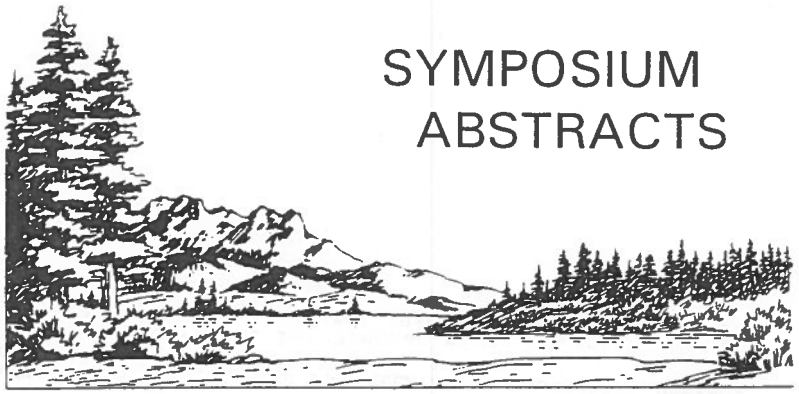
1:45 Lee A. Swain, Jeff Weidenhamer, J.M.E. Quirke, Stephen A. Winkle and Kelsey R. Downum. [Paper 37]. CHEMISTRY AND BIOLOGICAL ACTIVITY OF *Pouteria campechiana*.

2:00 D. Bergvinson, J. T. Arnason, R. I. Hamilton, J. Mihm and G.H.N. Towers. [Paper 38]. ROLE OF TRUXILLIC ACIDS IN MAIZE RESISTANCE TO EUROPEAN CORN BORER.

2:15 Cathy A. McCloskey and Murray B. Isman. [Paper 39]. INFLUENCE OF CANOLA AND MUSTARD FOLIAR GLUCOSINOLATES ON NATURAL INFESTATION BY DIAMONDBACK MOTH *Plutella xylostella*.

2:30 Harold E. Nordby and Roy E. McDonald. [Paper 40]. RELATIONSHIP OF EPICUTICULAR WAX COMPOSITION TO CHILLING INJURY IN STORED LEMONS.

2:45 MEETING ADJOURNED



SYMPOSIUM ABSTRACTS

Sunday 8:30 Symposium Paper 1

COMPARTMENTATION IN AROMATIC METABOLISM.

Geza Hrazdina, Institute of Food Science, Cornell University, Geneva, N.Y. 14456.

The aromatic metabolism in plants has three major segments. These are the shikimate pathway segment that produces the three aromatic amino acids phenylalanine, tyrosine and tryptophan, the phenylpropanoid segment which produces the coumarins, the plant structural component lignin and the activated form of p-coumaric acid, and the flavonoid segment which produces the diverse flavonoid compounds. End products of each segment may accumulate in different tissues and at different subcellular sites in the cells. The involvement of different tissues in the synthesis and accumulation of the various pathway end products will be discussed, as well as the subcellular localization of the biosynthetic apparatus.

Sunday 9:20 Symposium Paper 2

IMMUNOLOCALIZATION OF FLAVONOID CONJUGATES AND THEIR ENZYMES

Ragai Ibrahim, Plant Biochemistry Lab., Concordia Univiversity, Montreal, Quebec, Canada H3G 1M8.

Although flavonoid compounds may accumulate in the cellular vacuole or secreted on plant surfaces, the enzymes involved in their biosynthesis are believed to be localized in cytoplasmic microcompartments or associated with the endoplasmic reticulum.

Recent reports dealing with tissue, cellular and subcellular localization of flavonoids and their biosynthetic enzymes have provided valuable information as to their respective sites of compartmentation, despite the limitations of the various methods used in these studies. On the other hand, the binding reaction between antibodies and their corresponding antigens, whether macromolecules or haptens, allows for increased specificity and sensitivity in localization studies.

The basic aspects of immunocytochemistry will be briefly reviewed with the aim of fostering the application of this powerful technique to localization studies. In addition, examples of flavonoid enzymes and metabolites will be presented and discussed.

Sunday 10:30 Symposium Paper 3

GENES OF GENERAL PHENYLPROPANOID METABOLISM: STRESS AND DEVELOPMENTAL REGULATION.

Carl J. Douglas, Karl D. Hauffe, Susanne Reinhold, Mary Ellard, Elizabeth Molitor, Mário Moniz de Sá, Rajgopal Subramaniam, and Frank Williams. Department of Botany, University of British Columbia, Vancouver, B.C. Canada V6T 1Z4.

The biosynthesis of a variety of phenylpropanoid metabolites is required both during organ differentiation and upon perception of environmental signals. Since the general phenylpropanoid pathway is required to provide substrates for the synthesis of all or most such compounds, the corresponding genes are subject to complex regulation. We have analyzed the expression of genes encoding phenylalanine ammonia-lyase (PAL) and 4-coumarate:CoA ligase (4CL) in poplar, and the parsley 4CL-1 gene in transgenic tobacco. The poplar PAL and 4CL genes are coordinately regulated during stem and leaf development and are elicitor inducible in cell cultures. *In situ* hybridization and histocnemical analysis of the expression of parsley 4CL-1 and 4CL1-GUS fusions showed that this gene is developmentally regulated in several cell types and tissues, in a manner similar to the endogenous tobacco gene(s). The *cis*-acting elements required for developmentally regulated 4CL-1 expression are under investigation, and are at least partially separate from those elements required for stress-induced expression.

Sunday 11:20 Symposium Paper 4

MOLECULAR MECHANISMS GOVERNING NATURAL PRODUCT BIOSYNTHESIS: FLEXIBLE INTEGRATION OF DEVELOPMENTAL AND ENVIRONMENTAL CIRCUITS.

Christopher J. Lamb, Plant Biology Laboratory, The Salk Institute, P.O. Box 85800, San Diego CA 92186-5800.

Induction of phytoalexins, lytic enzymes and wall reinforcement involves transcriptional activation of defense genes, in some cases within 2-3 minutes of an elicitation signal. Rapid response genes include those encoding chitinase and phenylpropanoid biosynthetic enzymes for production of phytoalexins and lignin monomers. Genes encoding cell wall hydroxyproline-rich glycoproteins are induced more slowly and at a distance from the initial perturbation, in response to several distinct endogenous intercellular stress signals. Recent studies to characterize cis-acting nucleotide sequences and trans-acting factors involved in these complex patterns of defense gene activation will be described. Many defense genes undergo developmental as well as environmental regulation and recent findings on the tissue- and cell-type-specific expression of defense genes and the molecular mechanisms underlying the interplay between developmental programs and environmental stimuli will be considered. Moreover, expression of a bean phenylalanine ammonia-lyase (PAL) gene in transgenic tobacco under the control of a chimeric CaMV 35S - PAL promoter causes abnormal development. The phenotypes involve both inhibition of the synthesis of bulk phenylpropanoid products such as lignin and flavonoid pigments and also hormonal-like effects suggesting dysfunction of novel signal systems based on phenylpropanoid compounds. We have recently observed the apparent disappearance of two specific cell wall structural proteins in response to fungal elicitor or glutathione. This response, which reflects the insolubilization of these major wall proteins by H_2O_2-mediated oxidative cross-linking, is initiated within 1 to 2 minutes of elicitor addition, and complete within 5 minutes. We propose that this protein cross-linking, which presumably toughens the cell wall, is a novel, ultra-rapid defense mechanism.

Monday 8:30 Symposium Paper 5

GENETICS OF FLAVONOID METABOLISM.
Anton G. M. Gerats, Rijksuniversiteit Ghent, Ghent, Belgium.

[ABSTRACT NOT AVAILABLE]

Monday 9:20 Symposium Paper 6

FLAVONOIDS AS PLANT SIGNALS TO SOIL MICROBES
Donald A. Phillips, Dept. of Agronomy and Range Science, University of California, Davis, CA 95616

Recent results show that flavonoids from legumes induce transcription of nodulation (*nod*) genes in rhizobial bacteria. These plant signals are the first step in forming N_2-fixing root nodules, and they help determine which plants are infected by rhizobia. Flavonoids also promote spore germination in symbiotic fungi that form endomycorrhizal roots on plants. Because flavonoids produce half-maximum bacterial gene induction at concentrations as low as 1 nM, reporter gene fusions in bacteria offer a more sensitive, but less specific, tool for detecting the molecules than traditional analytical methods. Some data suggest flavonoids persist in soil at physiologically active levels. If flavonoid effects on microbial growth and development extend beyond rhizobia and mycorrhizal fungi, they may play an important role in soil formation and nutrient cycling.

Monday 10:30 Symposium Paper 7

ISOFLAVONOID PHYTOALEXINS AND RELATED ANTIMICROBIAL METABOLISM.
W. Barz, Lehrstuhl für Biochemie der Pflanzen, Westfällische Wilhelms Universität, Hindenburgplatz 55, D-4400 Munster, FRG.

[ABSTRACT NOT AVAILABLE]

Monday 11:20 Symposium Paper 8

MOLECULAR BIOLOGY OF ISOFLAVONOID PHYTOALEXIN BIOSYNTHESIS IN ALFALFA.
Richard A. Dixon, Plant Biology Division, The Samuel Roberts Noble Foundation, P. O. Box 2180, Ardmore, OK 73402.

Alfalfa produces the pterocarpan phytoalexin (-)-medicarpin in response to attack by fungal pathogens. Several key enzymes of medicarpin biosynthesis, and other branch pathways of phenylpropanoid metabolism, have been purified, their cDNAs cloned and their genomic organization studied. These include L-phenylalanine ammonia-lyase (PAL), chalcone synthase (CHS), isoflavone O-methyltransferase, isoflavone reductase (IFR), chalcone 2'-O-methyltransferase and caffeic acid O-methyltransferase (COMT). PAL, CHS, IFR and COMT transcripts are rapidly induced in elicitor-treated alfalfa suspension cultures, and are expressed in a tissue-specific manner during plant development. A bean CHS promoter drives expression of reporter genes in electroporated alfalfa protoplasts and in stably transformed plants. Functional promoter deletion analyses and in vitro binding studies have defined cis-elements and cognate trans-factors for the regulation of CHS expression in alfalfa.

Tuesday 8:30 Symposium Paper 9

CHEMISTRY OF PROANTHOCYANIDINS AND THEIR APPLICATIONS
Peter E. Laks, Michigan Technological University, Houghton, Michigan 49931

Proanthocyanidins (condensed tannins) are polymeric flavonoids found in many plant species and types of plant tissues. In some cases, such as barks and seed coats, the proanthocyanidin content can be as high as 50%. Despite this widespread occurrence, their structure and properties are not widely understood.

Proanthocyanidins can often be relatively easily purified and fractionated by low pressure column chromatography. Techniques most often used for structural analysis are ^{13}C and ^{1}H NMR, FAB-MS, and thiolysis followed by HPLC analysis of the degradation products. New techniques are being developed, however, to deal the more complex structures now being found which are derivitized with methyl, isoprenyl, and various aryl groups, or structures that include nonflavonoid co-monomers. Their widespread availability has led to interest in the utilization of proanthocyanidins, particularly as adhesives.

Tuesday 9:20 Symposium Paper 10

BIOSYNTHESIS AND STRUCTURE OF LIGNINS, LIGNANS AND NEOLIGNANS.
Norman G. Lewis, Institute of Biological Chemistry, Washington State University, Pullman, WA 99164-6340.

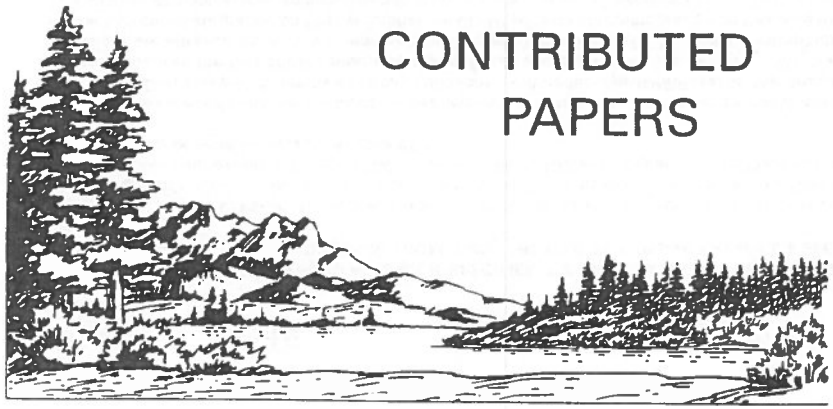
The single most important feature distinguishing aquatic from terrestrial vascular plants lies in the composition of their phenylpropanoid metabolites. This paper describes factors affecting lignin, lignan and neolignan formation with particular emphasis being placed upon E- and Z-monolignol (glucoside) formation, monolignol transport, stereoselectivity of phenylpropanoid coupling reactions and lignin structure *in situ*.

Tuesday 10:30 Symposium Paper 11

ENZYMATIC SYNTHESIS OF GALLOTANNINS AND RELATED COMPOUNDS.

Georg G. Gross, Universität Ulm, Abteilung Allgemeine Botanik, D-7900 Ulm, Germany

The metabolic pathways from gallic acid to hydrolyzable tannins were studied with enzymes from oak or sumach leaves. ß-Glucogallin (1-*O*-galloylglucose), formed from UDPG and free gallic acid, was not only the first intermediate but served also as both the preferred acyl donor in a series of highly position-specific galloylation steps, yielding 1,2,3,4,6-pentagalloyl-glucose, and the subsequent conversion of this ester to complex gallotannins. In addition, also 1,6-digalloylglucose and related intermediates were active donors in these reactions. In contrast, no conclusive evidence on the biogenesis of ellagitannins is available to date.



CONTRIBUTED PAPERS

Sunday 1:30 Contributed Paper 1

α-HYDROXYDIHYDROCHALCONES IN FLAVONOID BIOSYNTHESIS - CHEMICAL ANALOGIES.

Barend C.B. Bezuidenhoudt*, S. Catherine Bezuidenhout, Annelie Swanepoel, and Daneel Ferreira

Department of Chemistry, University of the Orange Free State, P.O. Box 339, Bloemfontein, 9300 South Africa.

In contrast to the established chalcone-flavanone system, the α-hydroxydihydrochalcone - α-hydroxychalcone pair may act as central precursor in flavonoid biosynthesis. Such a proposal is substantiated by the following *in vitro* transformations:

(i) Mild interconvertability
(ii) Photochemical transformation of α-hydroxydihydrochalcones into α-methyldeoxybenzoins and isoflavanones.
(iii) Formation of 1,3-diarylpropanes and a substituted but-2-enolide from related α-hydroxydihydrochalcones.

Sunday 1:45 Contributed Paper 2

ENZYMES OF ROSMARINIC ACID BIOSYNTHESIS FROM CELL CULTURES OF *Coleus blumei*.

Maike S. Petersen, Institut für Entwicklungs- und Molekularbiologie der Pflanzen, Heinrich-Heine-Universität Düsseldorf, Universitätsstr. 1, D-4000 Düsseldorf, FRG.

Rosmarinic acid (RA), an ester of caffeic acid and 3,4-dihydroxyphenyllactic acid, is synthesized by cell cultures of *Coleus blumei* in very high amounts. In a production medium with 4% sucrose up to 20% of the cell dry weight are accumulated as RA.

The enzymes involved in the biosynthesis of RA were isolated and characterized in enzyme preparations from these cell cultures. Phenylalanine is transformed into 4-coumaroyl-CoA by the enzymes of the general phenylpropanoid pathway. Tyrosine aminotransferase converts tyrosine into 4-hydroxy-phenylpyruvate, which is further reduced to 4-hydroxyphenyllactate by hydroxyphenylpyruvate reductase. Rosmarinic acid synthase catalyzes the transesterification of 4-coumaroyl-CoA and 4-hydroxyphenyllactate. Membrane-bound hydroxylase activities introduce the missing OH-groups in positions 3 of the aromatic rings of the ester 4-coumaroyl-4-hydroxyphenyllactate and thus form RA.

In conclusion, all enzyme activities necessary for the biosynthesis of RA can be found in enzyme preparations from cell cultures of *Coleus blumei*.

Sunday 2:00 Contributed Paper 3

PHENYLPROPANOID METABOLISM IN CELL SUSPENSION CULTURES OF *Vanilla planifolia*.

Peter E. Brodelius, Department of Plant Biochemistry, University of Lund, P.O. Box 7007, S-22007 Lund, Sweden.

No flavour compounds are produced by cell suspension cultures of *Vanilla planifolia* under standard conditions. Elicitation of the cells with chitosan results in induction of enzymes of the phenylpropanoid metabolism, leading to increased synthesis of ligneous material. Trace amounts of 4-hydroxybenzoic acids are formed after feeding cinnamic acids. Inhibition of 4-coumarate:CoA-ligase results in increased formation of vanillic acid. 4-Methoxycinnamic acids are converted to the corresponding 4-hydroxybenzoic acids. Vanillic acid synthesis is induced by treatment of the cells with kinetin. This treatment results in the induction of a catechol-4-O-methyltransferase. In cultivated cells of *V. planifolia* the methylation of caffeic acid to ferulic or isoferulic acid appears to be a key step in the flow of phenolics into ligneous material and vanillic acid, respectively.

Sunday 2:15 Contributed Paper 4

***C*-PRENYLATED FLAVONES AND FLAVONOLS FROM PLANE-TREE**

M. Kaouadji, P. Ravanel, J. M. Morand, M. Tissut, D. Barron, A. J. Chulia*, D. Crouzet, S. Chiron, F. Thomasson, S. Samiri and A. M. Mariotte

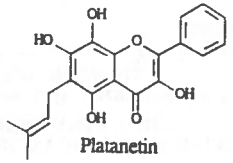
Laboratoires de Pharmacognosie, Chimie Thérapeutique et Physiologie Végétale, Université Joseph Fourier-Grenoble I, Domaine de La Merci, F-38706 La Tronche Cedex, France.
Laboratoire de Pharmacognosie, UFR de Pharmacie, Université de Limoges, 2, Rue Dr Marcland, 87025 Limoges Cedex, France. (*)

Comparative phytochemistry of plane-tree (*Platanus acerifolia*) buds secretion and young branches bark showed the presence of *C*-prenylated flavones and flavonols in both materials.The flavonoid content relative to the buds secretion was generally characterized by *o*-di-oxygenated and *C*-prenylated A-ring. On the opposite, the branches bark accumulated flavonoids which lack *o*-di-oxygenated system but having *C*-prenylation indiferently occurring on the A- or the B-ring. Furthermore, in the latter case, the C_5 chain can be cyclized as dimethyl pyran, isopropyl dihydrofuran or simple furan ring.

Sunday 2:30 Contributed Paper 5

CHEMICAL SYNTHESIS OF PRENYLATED FLAVONES AND FLAVONOLS.

Denis Barron, Mourad Kaouadji and Anne-Marie Mariotte, Pharmacognosy Laboratory, Joseph Fourier University-Grenoble I. 38706 La Tronche Cédex, France.



Platanetin

Platanetin is a constituent of *Platanus* buds that inhibits the external NADH dehydrogenase of the inner mitochondrial membrane. The design of a QSAR study, however, was conditioned to the obtention of a series of structural analogues of platanetin, only a few of them being easily accessible from natural sources. Thus the chemical synthesis of prenylated flavones and flavonols was undertaken. Reexamination of the persulfate oxidation demonstrated that although the 8-hydroxylated compound was the major product, some 6-hydroxylated and 6,8-dihydroxylated derivatives were produced as well. Using *m*-chloro perbenzoic acid, the situation was reversed, *i.e.* the 6-oxidized compound being the major product. The reactivities of the 6- and 8-positions towards *C*-prenylation (prenyl bromide/NaOMe in acetone) appeared to be similar, giving rise to a mixture of 6-, 8- and 6,8-di-*C*- prenylated compounds. The yield in prenylated derivatives was found to be higher when the 7-hydroxyl was not methylated.

Sunday 2:45 Contributed Paper 6

MOLECULAR CLONING OF THE GENE WHICH SPECIFIES 7,2'-DIHYDROXY-4',5'-METHYLENEDIOXYISOFLAVONE OXIDOREDUCTASE FROM $CuCl_2$ TREATED PEA (*Pisum sativum* L.) SEEDLINGS.

Yuejin Sun, Nancy L. Paiva[1], Richard A. Dixon[1], Hans D. Van Etten[2], and Geza Hrazdina, Institute of Food Science, Cornell University, Geneva, N.Y. 14456, [1]Plant Biology Division, The Samuel Roberts Noble Foundation, P.O. Box 2180, Ardmore, OK 73402 and [2]Department of Plant Pathology, University of Arizona, Tucson, Arizona 85721.

Pterocarpan phytoalexins are produced by pea (*Pisum sativum* L.) in response to microbial infection. 7,2'-Dihydroxy-4',5'-methylenedioxyisoflavone oxidoreductase (DMIRase) is the enzyme which introduces the first chiral center into the molecule and determines the (+) $(NH_4)_2SO_4$ fractionation, gel filtration on AcA 44, ion-exchange chromatography on DEAE-biogel, hydrophobic interaction chromatography on Phenyl-Sepharose CL-4B, affinity chromatography on Reactive Red 120 agarose and preparative sodiumdodecylsulfate polyacrylamide gel electrophoresis. The enzyme has been characterized for its substrate specificity, pH optimum, PI, Km, molecular mass and product configuration. Antibodies against the DMIRase were produced in a rabbit. A cDNA clone which specifies DMIRase in pea has been obtained and its characteristics will be discussed.

Sunday 3:30 Contributed Paper 7

PROFISETINIDIN-TYPE 4-ARYLFLAVAN-3-OLS AND RELATED δ-LACTONES.

E. Vincent Brandt*, J. Mattheus Botha, Barend C.B. Bezuidenhoudt, and Daneel Ferreira

Department of Chemistry, University of the Orange Free State, P.O. Box 339, Bloemfontein, 9300 South Africa.

4α- And 4β-(2,4-dihydroxy-3-methoxyphenyl)-(-)-fisetinidols, and a related δ-lactone, 7,8,9,13-tetrahydroxy-2-(3,4-dihydroxyphenyl)-2,3-*trans*-3,4-*cis*-2,3,10-trihydrobenzopyrano[3,4-*c*]-2-benzopyran-1-one, from the heartwood of *Peltophorum africanum*, represent the first natural profisetinidin-type 4-arylflavan-3-ols. The δ-lactone is accompanied in the heartwood of *Burkea africana* by its 2-(3,4,5-trihydroxyphenyl)-analogue and the 3-*O*-galloyl ester of (-)-robinetinidol, the first gallate involving a 5-deoxy flavan-3-ol. *In vitro* transformations and synthetic attempts are established to endorse a plausible biogenetic relationship between these compounds.

Sunday 3:45 Contributed Paper 8

BIS*-FISETINIDOLS AND RELATED C-RING ISOMERIZED ANALOGUES FROM *COLOPHOSPERNUM MOPANE

Jan P. Steynberg*, Johannes C.S. Malan and Daneel Ferreira

Department of Chemistry, University of the Orange Free State, P.O. Box 339, Bloemfontein, 9300 South Africa.

The identification of the first profisetinidins based on C-8 (A-ring) and C-6' (B-ring) substituted (-)-fisetinidol units and the investigation of a biomimetic sequence to these novel metabolites are discussed. Related C-ring isomerized analogues represent the first examples of pyran rearranged isomers derived from precursors in which the nucleophilicities of the participating phenolic rings are of comparable magnitude. Difficulties associated with the *in vitro* synthesis of (4,8)- and (4,6') linked *bis* fisetinidols reflects the important role of enzymes in the biosynthesis of this unique metabolites.

Sunday 4:00 Contributed Paper 9

ISOLATION OF NARINGENIN 7-O-METHYLTRANSFERASE, THE TERMINAL ENZYME OF FLAVONOID RICE PHYTOALEXIN BIOSYNTHESIS IN UV-TREATED RICE LEAVES.

Osamu Kodama, Morifumi Hasegawa and Tadami Akatsuka, Faculty of Agriculture, Ibaraki University, Ami, Abaraki 300-03 JAPAN.

Oryzalexins A, B, C, D and momilactones A, B are known to be diterpenoid rice phytoalexins. We have recently isolated sakuranetin from blast-infected, UV-irradiated and $CuCl_2$-treated rice leaves as flavonoid rice phytoalexin. An enzyme which synthesizes sakuranetin by methylating the naringenin was extracted from UV-treated rice leaves. This naringenin 7-O-methyltransferase activity was inducible by treatment of rice leaves with UV-irradiation. Maximum enzyme activity was reached 48 hr after UV-irradiation and the timing of induction coincided with that of sakuranetin production.

Sunday 4:15 Contributed Paper 10

AN HPLC SURVEY OF CORN (Zea mays L.) POPULATIONS AND INBREDS FOR SILK FLAVONOLGLYCOSIDE CONTENTS.

M. E. Snook and R. C. Gueldner USDA-ARS, P.O. Box 5677, Athens, GA 30613, N. W. Widstrom, USDA-ARS, P.O. Box 748, Tifton, GA 31793, and C. E. Costello, Dept. of Chemistry, MIT, Cambridge, MA 02139.

The resistance of "Zapalote Chico" cornsilks to the corn earworm, Heliothis zea (Boddie), has been attributed to the presence in the silks of one major luteolin-C-glycoside called maysin. HPLC was used to analyze several hundred corn populations and inbreds in order to identify high maysin-containing (or other flavonolglycosides) corn lines for breeding experiments. Of 110 populations and 260 inbred corn lines, 57 entries had maysin levels greater than 1% dry wt. The resistant line, Z. Chico, silks averaged 2% maysin, while 30 lines had higher maysin levels. The PI-340856 population line gave maysin levels approaching 10% of the dry weight of the silk. Several other corn lines contained high levels of flavonols, other than maysin. TX501, SC144, and 9-201 silks contained large amounts of a methoxymaysin, while the silks of NC7 and SC353 contained large amounts of an apigenin-analogue of maysin. T218 and T315 silk flavonol profiles resembled corn leaf profiles rather than the majority of the silk lines analyzed. The structures of other luteolin and apigenin flavonols found in the silks will be discussed.

Sunday 4:30 Contributed Paper 11

EFFECTS OF SORGOLEONE ON PLANT MITOCHONDRIAL RESPIRATION.

James A. Rasmussen, Dept. of Biology, Mount Marty College, Yankton, SD 57078; Angela M. Hejl and Frank A. Einhellig, Dept. of Biology, University of South Dakota, Vermillion, SD 57069.

Previous work showed that sorgoleone (SGL), an exudate of grain sorghum [Sorghum bicolor (L.) Moench] roots, inhibited plant growth. The intent of these investigations was to determine if this inhibition occurred due to interference with mitochondrial respiration. Tests were conducted on mitochondria isolated from 4-day-old etiolated soybean and corn seedlings. Treatments as low as 1.0 uM SGL/mg protein/ml decreased the rate of ADP-dependent and ADP-independent respiration with either NADH or succinate as the electron source. SGL also inhibited the respiratory rate of mitochondria which had been uncoupled. Absorption spectra indicated a block in the ETS at the b/c_1 complex. These data indicate Sorghum allelopathy is partially due to SGL-mediated interference with respiration.

Tuesday 1:00 Contributed Paper 12*

PHENYLPROPANOID METABOLISM IN *PINUS TAEDA* CELL CULTURE.

Thomas L. Eberhardt,[1] Laurence B. Davin,[1] Etsuo Yamamoto,[1] Jan B. Wooten[2] and Norman G. Lewis,[1] [1]Institute of Biological Chemistry, Washington State University, Pullman, WA 99164-6340. [2]Philip Morris Research Center, P.O. Box 26583, Richmond, VA 23261.

Cell suspension cultures of loblolly pine (*Pinus taeda*) grown on media containing 2,4-D as a growth regulator do not undergo substantial lignification (< 1.5%) as evidenced by assays of key enzyme activities and chemical/histochemical analyses. Yet these cultures synthesize small amounts of lignans, such as (-)-matairesinol. When NAA is used as a growth regulator, lignin formation (~ 10%) is induced. By judicious choice of [^{13}C]-labelled substrates. i.e., [1-^{13}C], [2-^{13}C] and [3-^{13}C]phenylalanine, the bonding environments of lignified tissue *in situ* in suspension cell cultures can be observed. This system is an excellent model for studying the early stages of lignification and allows us to decipher the relationships between lignan and lignin formation.

Tuesday 1:15 Contributed Paper 13*

IMMUNOCYTOCHEMICAL LOCALIZATION OF ENZYMES AND SUBSTRATES IN LIGNIN AND LIGNAN FORMATION.

Lanfang He,[1] Laurence B. Davin,[1] David M. O'Malley,[2] Ronald R. Sederoff[2] and Norman G. Lewis,[1] [1]Institute of Biological Chemistry, Washington State University, Pullman, WA 99164-6340. [2]Department of Forestry, North Carolina State University, Raleigh, NC 27695-8008.

Lignification is a carefully orchestrated process involving temporal and spatial deposition of preformed precursors into the cell wall. Factors affecting lignin deposition, i.e., monolignol formation and transport from the cytoplasm to the cell wall, are poorly understood. To address this problem, the immunocytochemical localization of key substrates and enzymes involved in lignification has been initiated in our laboratory. Antibodies against various monolignols (i.e., coniferyl alcohol) conjugated to bovine serum albumin, phenylalanine ammonia lyase, cinnamyl alcohol dehydrogenase and UDP-glucose:coniferyl alcohol glucosyltransferase from *Pinus taeda* are currently being used to determine the subcellular location of the corresponding monolignols and enzymes. The results of these investigations will be presented.

Tuesday 1:30 Contributed Paper 14*

PHENYLPROPANOID METABOLISM IN ELICITOR-TREATED PINE CELL CULTURES

Malcolm M. Campbell, Dept. of Chem. & Biochem., University of Guelph, Guelph, Ont., N1G 2W1 and Brian E. Ellis, Dept. of Plant Science, University of British Columbia, Vancouver, BC, V6T 2A2

We have developed a model system to investigate inducible phenylpropanoid metabolism in conifer tissue, utilizing suspension cultures of *Pinus banksiana* and an elicitor derived from the ectomycorrhizal fungus *Thelephora terrestris*. Elicited pine cell cultures rapidly lignify but do not undergo cell death. We have investigated the molecular basis of this response using the techniques of natural products chemistry, enzymology and molecular biology. The results of these experiments will be considered with reference to their relevance to the colonization of pine roots by ectomycorrhizal fungi. The importance of the *Pinus banksiana* cell culture/ fungal elicitor system as a model for the study of lignification in an economically important softwood species will also be discussed.

Tuesday 1:45 Contributed Paper 15*

THE ROLE AND PROPERTIES OF PHENYLALANINE AMMONIA-LYASE IN TOMATO CELL CULTURES INOCULATED WITH *VERTICILLIUM ALBO-ATRUM*

Mark A. Bernards and Brian E. Ellis, Department of Plant Science, University of British Columbia, 2357 Main Mall Vancouver, BC, Canada, V6T 2A2

Tomato (*Lycopersicon esculentum*) responds to challenge by the vascular wilt pathogen *Verticillium albo-atrum* by invoking a variety of biochemical defense mechanisms, the most prominent of which involves the synthesis and deposition of cell wall coating materials within the vasculature of infected plants. Tomato cell cultures resond in an apparently analogous fashion by accumulating phenylpropanoid-derived metabolites in their cell walls when inoculated with *V. albo-atrum*. Concomitant with metabolite accumulation was the induction of phenylalanine ammonia-lyase, both at the enzyme and mRNA levels. Inhibition of tomato PAL using the substrate analogue 2-amino-2-indanephosphate (AIP) reduced both the quantity and complexity of accumulating metabolites.

Tomato PAL was purified to apparent homogeneity (>3400-fold) from *V. albo-atrum*-inoculated cell cultures using anion exchange, chromatofocussing and gel filtration chromatography. Isoform analysis of the tomato PAL induced by fungal inoculation revealed a single predominant form of the enzyme with characteristics consistent with those reported for PAL from other Solanaceous species.

*Best Paper Competition

Tuesday 2:00 Contributed Paper 16*

MOLECULAR CLONING OF cDNA ENCODING FLAVONOL 3 AND 4'-SULFOTRANSFERASES.

Luc Varin and Normand Brisson, Department of Biochemistry, University of Montréal, Montréal, Canada H3C 3J7.

A number of position-specific flavonol sulfotransferases (ST) have recently been characterized from *Flaveria chloraefolia*. These enzymes exhibited strict specificity for positions 3 of flavonol aglycones, and 3' and 4' of flavonol 3-sulfate.

Anti-3-ST antibodies were produced and used to screen a cDNA library generated from poly(A)$^+$ mRNA isolated from shoot tips of *F. chloraefolia*. cDNA clones coding for the 3(pFST3) and 4'(pFST4') STs were isolated and characterized. Their identity was confimed by determining the substrate and position specificity of the respective STs that were expressed in *E. coli* transformed with pFST3 and pFST4'. The complete nucleotide sequence of both clones has been determined, and comparison of their deduced amino acid sequences revealed an overall identity of 69% in 311 amino acid residues. The two flavonol STs share sequence similarities with other STs characterized from animal tissues suggesting a common ancestral origin.

Tuesday 2:15 Contributed Paper 17*

BIOLOGICAL ACTIVITY OF FLAVONOIDS TOWARDS THE EUROPEAN CORN BORER, *Ostrinia nubilalis* (HUBNER) LARVAE

Mamdouh M. Abou-Zaid, John T. Arnason and Constance Nozzolillo, Department of Biology, University of Ottawa, Ottawa, Ontario, Canada K1N 6N5.

The study of the biochemical, pharmacological, insecticidal and structural-activity relationships of plant flavonoids in biology and medicine follows a multidisciplinary approach. Considerable progress has been made in elucidating the structures and biosynthetic pathways of flavonoids. Flavonoids have been shown to have insect antifeedant or insecticidal properties (e.g.rotenoids), although these compounds have received less attention in plant-insect relations studies than other secondary compounds. The present study deals with the effect of nine pure flavonoids (flavanone, pinocembrin, naringenin, epicatechin, DL-catechin, quercetin, rhamnetin, quercitrin and rutin) on the growth of a polyphagous insect the European corn borer, *Ostrinia nubilalis* (Hubner). In growth studies with flavonoids (0.001, 0.01, 0.1 and 1.0 mg/g diet), the mean times to pupation and adult emergence were significantly lengthened and increased in a concentration dependent manner. Pupal and adult weights, for both females and males, decreased with an increase in concentration of flavonoids. The results show that all the flavonoids tested possess biological activity with respect to a phytophagous lepidopteran.

Tuesday 2:30 Contributed Paper 18*

Identity and concentration of secondary metabolites in styles/stigmas, and anthers/filaments - as compared to other organs.

Leon Brimer, Dep. of Pharmacology and Pathobiology, Royal Veterinary and Agricultural Univ., 13 Bülowsvej, DK-1870 Frederiksberg, Denmark.

Except for very few plant species, both identity and concentration of - even major secondary metabolites - remain uninvestigated, as concerns flower organs. However, recent years plant-biotechnology has focussed on advantages in production of secondary metabolites by means of differentiated tissues, i.e., among others, stigmalike tissues (e.g. Crocus sativum).

The present investigation resulted in comparable data for identity and concentration for several groups of metabolites found in both flower parts and leaves. Examples (anther/filament - style/stigma - leaf; µg/mg dry weight): Caffeic acid ester-glycosides (Forsythia spp.) 15 - 84 - 65: Cyclopentenoid cyanohydrin glycosides (Turnera ulmifolia) 0,4 - 1,4 - 6,7; Nicotine (Nicotiana tabacum) 0,014 - 0,008 - 5,4; Prunasin (Prunus padus) 210 - 127 - 220.

Tuesday 3:00 Contributed Paper 19*

EFFECT OF EXTRACELLULAR NUCLEASES ON FOREIGN DNA DURING POLLEN ELECTROTRANSFORMATION. Sally L. Van Wert and James A. Saunders, USDA, Plant Sciences Institute, Bldg 9, Rm 5, Beltsville MD 20705.

Pollen electrotransformation is a technique being developed in our lab to genetically modify plants by the electroporation of foreign DNA into germinating pollen. The reported release of DNA nucleases from germinating pollen grains implied that foreign DNA added to germinating pollen would be degraded within a few minutes. We added plasmid pBI221 DNA (20 ug) to germinating tobacco (*Nicotiana gossei*) pollen (4 mg) and observed the effect of released nucleases on the DNA by agarose gel electrophoresis. Isolated DNA from the pollen/pBI221 suspensions showed only minimal degradation of pBI221 after a 10 min incubation with the pollen. When the suspension was electroporated immediately after the addition of pBI221 substantial degradation was not seen until 60 min afterward. EDTA, a nuclease inhibitor, had little effect on DNase activity. The electroporated pollen was placed on the stigmas of emasculated flowers and viable, transformed seed was produced. It was concluded that nucleases released from germinating pollen would not significantly degrade foreign DNA in the time period necessary for the uptake of DNA during pollen electroporation.

Tuesday 3:15 Contributed Paper 20*

ALKALOIDS OF *Leitneria floridana*.

Karin E. Readel and D. S. Seigler, Department of Plant Biology, University of Illinois, Urbana, IL 61820.

Cork wood, *Leitneria floridana*, a shrub found in low, wet areas of the southeastern United States, is considered to belong to the monotypic family Leitneriaceae which is of uncertain taxonomic affinities. Methanolic extraction of the wood yields a series of compounds of which the major alkaloid (based on the Dragendorf test) is 5-methoxy-canthin-6-one. This compound was purified by thin layer chromatography and the structure elucidated by ^{1}H NMR, EIMS and exact mass of the parent ion. Because indole alkaloids of the canthin-6-one type have only been isolated from the Rutaceae and Simaroubaceae, the presence of 5-methoxy-canthin-6-one in *Leitneria floridana* supports Thorne's placement of this enigmatic family in the suborder Rutineae, order Rutales.

Tuesday 3:30 Contributed Paper 21*

MONOTERPENE BIOSYNTHESIS IN GRAND FIR TREES AND SAPLINGS

Mark Gijzen, Efraim Lewinsohn, and Rodney Croteau, Institute of Biological Chemistry, Washington State University, Pullman, WA 99164-6340

Grand fir (Abies grandis) oleoresin is a complex mixture of monoterpene olefins and diterpene resin acids. The monoterpenes are synthesized by a class of enzymes called monoterpene cyclases. Comparison of monoterpene cyclase activity in cell-free extracts of control and wounded grand fir sapling showed a ten-fold or greater increase in cyclase activity following wounding. Mature grand fir trees growing in the wild also revealed increases in extractable cyclase activity when tissues around the wound site were sampled one and two weeks after wounding. Using two-year-old saplings, the response was confirmed to be localized to the wound site, and the increase in cyclase activity was dependent on the severity of the wound.

*Best Paper Competition

Tuesday 3:45 Contributed Paper 22*

BIOSYNTHESIS OF EXTRACELLULAR PROTEINS BY ROOT CULTURES OF CHINESE MEDICINAL CUCUMBER (*TRICHOSANTHES* SPP.)

Brett J. Savary[1] & Hector E. Flores[2]. [1]Graduate Program in Plant Physiology and [2]Dept. of Plant Pathology/Biotechnology Institute. Pennsylvania State University, University Park. PA 16802.

To study the biosynthesis of ribosome-inactivating proteins (RIPs) of the Chinese medicinal herb *Trichosanthes kirilowii* and related species, we have established "hairy root" cultures from four *Trichosanthes* species by transformation with *Agrobacterium rhizogenes*. Extracellular proteins were accumulated in the growth medium of cultures from each species during late exponential-stationary phase of batch-grown cultures. Productivities ranged from 1 to 10 mg protein/L. Root extracts of *T. kirilowii*, and culture media from *T. cucumeria*, *T. cucumeroides* and *T. kirilowii* inhibited protein synthesis in the rabbit reticulocyte lysate bioassay. A 26-27 kD extracellular protein common to all species was purified from *T. kirilowii*. The N-terminal amino acid sequence of this protein was different from that reported for trichosanthin, the RIP purified from *T. kirilowii* roots. Current efforts are directed toward the analysis and purification of the other major bands of extracellular proteins.

*Best Paper Competition

Wednesday 8:30 Contributed Paper 23

STEREOCHEMISTRY AND ENZYMOLOGY OF LIGNAN/NEOLIGNAN FORMATION.

Laurence B. Davin, Wai-Lam A. Chu, Toshiaki Umezawa and Norman G. Lewis, Institute of Biological Chemistry, Washington State University, Pullman, WA 99164-6340.

Identifying the mechanisms by which stereoselective coupling of phenylpropanoids to give lignans/neolignans has been elusive. Recently, we discovered the first two enzymes involved in the formation of the optically pure lignans (-)-secoisolariciresinol and (-)-matairesinol, in *Forsythia intermedia*. (-)-Secoisolariciresinol is formed by stereoselective coupling of two coniferyl alcohol molecules in a reaction requiring NAD(P)H and H_2O_2 as cofactors; the (+)-antipode is not formed. Formation of (-)-matairesinol, and not its (+)-enantiomer, occurs by stereoselective dehydrogenation of (-)-secoisolariciresinol in presence of NAD(P); (+)-secoisolariciresinol was not converted into either (+)- or (-)-matairesinol. Progress toward the purification of these enzymes is described.

Wednesday 8:45 Contributed Paper 24

SUBSTRATE SPECIFICITY OF UDP-GLUCOSE: CONIFERYL ALCOHOL GLUCOSYLTRANSFERASES IN *PINUS* AND *FAGUS* SPECIES.

Ma. Estela J. Inciong,[1] Laurence B. Davin,[1] Ronald R. Sederoff[2] and Norman G. Lewis,[1] [1]Institute of Biological Chemistry, Washington State University, Pullman, WA 99164-6340. [2]Department of Forestry, North Carolina University, Raleigh, NC 27695-8008.

The exclusivity of E-monolignols as sole precursors of lignification has been challenged in recent years, when *Fagus* bark was shown to accumulate only *cis*-monolignols and their glucosides. The glucosyltransferase from *Fagus grandifolia* exhibits a very unusual and strict substrate specificity for *cis*, and not *trans*, monolignols. The corresponding enzyme from *Pinus taeda* exhibits no such strict stereospecificity and can readily catalyze the glucosylation of either isomer. The purification and characterization of these enzymes are described.

Wednesday 9:00 Contributed Paper 25

Hyphal growth enhancement of the vesicular-arbuscular mycorrhizal (VAM) fungus *Gigaspora margarita* by plant flavonoids and carbon dioxide.

Marie-Josée Poulin & Yves Piché , Centre de Recherche en Biologie Forestière, Faculté de Foresterie et de Géomatique, Université Laval, Sainte-Foy, Québec, Canada. G1K-7P4.

The hyphal growth of germinated spores of the VAM fungus *Gigaspora margarita* was increased approximately 4-fold in the presence of either quercitine or myrecitine(10µM) and carbon dioxide (2%), when cultured under axenic conditions. These plant flavonoids also enhanced hyphal branching and the formation of auxiliary cells by *G. margarita*. However, other flavonoid compounds, such as nariginine (10µM), did not stimulate the development of *G. margarita* hyphae .

The results of these *in vitro* bioassays suggest that some flavonoids, when provided in combination with CO_2, may act as molecular mediators and initiate the early developmental stages of VAM symbiosis.

Wednesday 9:15 Contributed Paper 26

ALTERED DISTRIBUTION OF ROOT PHENOLICS BY VA MYCORRHIZATION

Jacques Grandmaison, Plant Biochemistry Laboratory, Concordia University, Montreal, Quebec, Canada H3G 1M8.

Comparative phytochemical studies of onion root phenolics were carried out on endomycorrhized (VAM) and non-mycorrhized plants. Their major phenolic constituents were purified by HPLC and crystallized prior to ^{1}H- and ^{13}C-NMR analysis. These were identified as ferulic acid (FA) and *N*-feruloyltyramine (FT) and their amounts were quantified as soluble and wall-bound forms. There were no differences in incorporation of label from ^{14}C-cinnamate for both mycorrhized and non-mycorrhized plants. Time course studies revealed that the association of FA and FT with cell wall fraction was found to increase with mycorrhization. Furthermore, the increased wall binding of cinnamoyl compounds was confirmed by immunocytochemical data obtained from ultrastructural localization. The biological significance of these results is discussed in relation to the regulation of symbiotic establishment and its consecutive effect in protecting roots against pathogenic fungi.

Wednesday 9:30 Contributed Paper 27

Sinapine Synthase from B. napus - Purification and Characterization

Thomas Vogt and Brian Ellis, University of British Columbia, Department of Plant Science, 2357 Main Mall, Vancouver, B.C. V6T 2A2, Canada

Sinapine synthase (SCT) is the key enzyme responsible for the synthesis and the accumulation of sinapoylcholine (sinapine) in seeds of B. napus (rape seed, canola) as well as other members of the Brassicaceae. One approach to reducing the undesirably high level of sinapine in rape seed meal, which is used as an animal feed supplement, is to genetically engineer existing canola varieties by introducing an antisense RNA-construct for sinapine synthase.

As the first step in this approach, SCT from B. napus has been purified to apparent homogenity by various chromatographic techniques. The enzyme has been characterized and compared to SCT of related Brassicaceae. Polyclonal antibodies have been raised and a partial amino acid sequence established.

Wednesday 9:45 Contributed Paper 28

MUTANTS OF *ARABIDOPSIS THALIANA* DEFECTIVE IN SINAPOYL MALATE BIOSYNTHESIS.

Clint Chapple[1], Thomas Vogt[2], Brian Ellis[2], and Chris Somerville[1], [1]MSU-DOE Plant Research Laboratory, Michigan State University, East Lansing MI, 48824-1312, [2]Department of Plant Science, University of British Columbia, Vancouver B.C., V6T 2A2.

O-Sinapoyl-L-malate and other sinapic acid esters are major phenolics accumulated in leaves and seeds of *Arabidopsis thaliana*. In an effort to determine whether these compounds have a function in the plant, an ethylmethane sulfonate-mutagenized population of *Arabidopsis* was screened for mutants with altered sinapoyl malate metabolism. Extracts of individual leaves were fractionated by TLC and sinapic acid esters were visualized with UV light. Of 4200 individuals screened, 6 mutants have been identified which show a >95% reduction in leaf sinapoyl malate levels. At least two of these mutants are allelic. The absence of sinapoyl malate in the mutants does not have a significant effect on plant growth, at least under standard laboratory conditions. One of the mutants that lacks sinapoyl malate instead accumulates the sinapoyl malate precursor, 1-*O*-sinapoyl-ß-D-glucose in leaves of the mature plant, although the presence of this compound is normally restricted to seeds and young seedlings. The biochemical lesions in the mutants are presently under investigation.

Wednesday 10:30 Contributed Paper 29

Virulence genes activation by plant phenolic molecules in *Agrobacterium tumefaciens*.

Sungsook Lee[1], Shouguang Jin[2], Eugene W. Nester[2], and Heinz G. Floss[1], Departments of Chemistry[1] and Microbiology[2], University of Washington, Seattle, WA 98195.

Agrobacterium virulence genes are induced by plant phenolic compounds such as acetosyringone through the VirA-VirG two-component regulatory system. The VirA protein is a membrane-spanning sensor molecule that possesses an autophosphorylating activity, and the VirG protein is a sequence-specific DNA-binding protein. N-terminal domain of the VirA senses the presence of plant signal and gets autophosphorylated at its C-terminal domain (histidine residue) in the cytoplasm. This high energy phosphate is then directly transferred to the N-terminal portion of the VirG molecule (aspartate residue). Single amino acid changes of either histidine to glutamate in VirA or aspartate to asparagine in VirG abolished their ability to activate *vir* gene expression in response to plant signal, which suggest the importance of VirA/VirG phosphorylation *in vivo*. Phosphorylation of the VirG protein does not change its sequence specific DNA binding property but enables it to activate *vir* gene transcription.

Wednesday 10:45 Contributed Paper 30

SEASONAL CHANGES IN COMPONENTS OF LEAF, RACHIS AND NUTS OF PECAN AS DETERMINED BY HPLC.

Richard C. Gueldner, USDA-ARS, Russell Research Center, P.O. Box 5677, Athens, GA 30613, Michael T. Smith, USDA-ARS, Delta States Res. Center, P.O. Box 346, Stoneville, MS 38776, and Charles C. Reilly, Southeastern Fruit & Tree Nut Laboratory, P.O. Box 87, Byron, GA 31008.

Component profiles of leaf, rachis and nut surface and whole parts of pecan for the growing season of 1989 was determined by HPLC. One objective of this work is to attempt to correlate the chemical changes with insect and pathogen behavior throughout the season. Another objective is to identify surface and whole part components represented in the HPLC profile. The major component in the leaves and nuts (whole parts of each) is the juglone precursor, 1,4,5-trihydroxy naphthalene-5-glucoside. The shuck of the nut contains almost all of the juglone precursor while the interior portion of the nut contained catechin, dihydromyricetin, and unknown derivatives similar to these as suggested by the UV spectra taken on-the-fly with a diode array detector. The whole leaf and rachis methanol extracts contained flavonoid glycosides which differed from bark compounds. In addition, the water washes of leaf, nut, and rachis surfaces had distinctive profiles and differed significantly from the interior components.

Wednesday 11:00 Contributed Paper 31

RENATURATION AFTER SDS-PAGE OF A WOUND-INDUCIBLE PINENE CYCLASE FROM GRAND FIR STEMS.

Efraim Lewinsohn, Mark Gijzen and Rodney Croteau, Institute of Biological Chemistry, Washington State University, Pullman, WA 99164-6340.

Monoterpenes are a major component of conifer resin which plays an important role in defense against pathogen and insect attack. Monoterpene biosynthesis is greatly enhanced in grand fir (Abies grandis) in response to wounding. This enhancement is the result of the induction of at least five distinct monoterpene synthase activities that form different olefinic products from the common precursor geranyl pyrophosphate. The major induced activity, producing ~ 35% (-)-α- and ~ 60% (-)-β-pinene, was purified by discontinuous native PAGE at neutral pH. This pinene cyclase was further purified by denaturing SDS-PAGE and the activity was renatured (to 5 to 10%) by the addition of 1% Tween 20. The product distribution generated by the renatured protein was identical to that generated by the intact enzyme. This purification procedure provided a homogenous protein with apparent M_r of 62 kDa. The native molecular weight, as determined by gel permeation chromatography, was 63 kDa, indicating that the active protein was a monomer.

Wednesday 11:15 Contributed Paper 32

ALLELOPATHIC POTENTIAL OF SESQUITERPENE LACTONES.

Frank A. Einhellig and Milton J. Haar, Dept. of Biology, University of South Dakota, Vermillion, SD 57069; Nikolaus H. Fischer, Dept. of Chemistry, Louisiana State University, Baton Rouge, LA 70803.

A variety of sesquiterpene lactones (C_{15}) have been isolated from plants involved in allelopathic interference. While there has been considerable work on the stereochemical and biosynthetic aspects of these compounds, relatively little is known about their biological roles. Bioassays with Eragrostis tef (tef) and Lemna minor established that many of these compounds were inhibitory to plant growth. Sixteen of 17 compounds tested reduced tef radicle elongation at treatments 1.0 mM or lower. Toxicities varied with the two most inhibitory, Santamarin-Reysonin and Helenalin, inhibiting growth at 10 uM. These results indicate that sesquiterpene lactones probably have a role in allelopathy.

Wednesday 11:30 Contributed Paper 33

BIOTRANSFORMATION OF TESTOSTERONES BY A GREEN CELL SUSPENSION CULTURE OF *MARCHANTIA POLYMORPHA*.

Hiroki Hamada and Masayoshi Imura, Dept. of Applied Sci., Okayama Univ. of Sci., 1-1 Ridai-cho Okayama 700, JAPAN.

The biotransformation of testosterones by a green cell suspension culture of *Marchantia polymorpha* was investigated. It was found that (i) a green cell suspension culture of *M. polymorpha* hydrolyzes the acetoxyl group of 17α-acetoxy-epitestosterone and 17β-acetoxy-testosterone to their corresponding alcohols, (ii) a green cell suspension culture oxidizes the hydroxyl group at C-17 of epitestosterone, whereas no oxidation of the hydroxyl group of testosterone occurred, (iii) a green cell suspension culture stereoselectively reduces the carbonyl group of 4-androstene-3,17-dione from the *re*-face at C-17, and (iv) a green cell suspension culture regio- and stereo-selectively hydroxylates the 6-position of testosterone. Such a hydroxylation has not been observed in the biotransformation of testosterone by plant cell suspension culture.

Wednesday 11:45 Contributed Paper 34

PLANT CELL WALL FORMATION IN MICROGRAVITY.

Toshihiro Ona,[1] Laurence B. Davin,[1] Jan B. Wooten[2] and Norman G. Lewis,[1] [1]Institute of Biological Chemistry, Washington State University, Pullman, WA 99164-6340. [2]Philip Morris Research Center, P.O. Box 26583, Richmond, VA 23261.

Although the effects of gravity on plant cell wall formation is poorly understood, it is generally considered that space-grown plants undergo considerable metabolic, physiological and structural changes when compared to the earth-grown counterparts. Vegetative tissue from *Brassica pekinensis*, *Raphanus sativus* and *Triticum aestivum* have been grown on the Soviet space lab MIR. Differences in plant cell wall formation and chemical composition between these plants and their corresponding ground controls have been determined and the results will be discussed.

Wednesday 1:15 Contributed Paper 35

ACETYLENIC THIOPHENES IN FLAVERIA (ASTERACEAE).

K.R. Downum[1], L.A. Swain[1], D. Provost-Buisson[1], J. Bouton[2], [1]Dept. of Biol., FL Internat. Univ., Miami, FL 33199, [2]Dept. of Genetics, Univ. of GA, Athens, GA 30602.

Acetylenic thiophenes are an important class of biologically active metabolites produced by members of the family Asteraceae. These phototoxic allelochemicals are ultimately derived from the fatty acid oleate following decarboxylation, the formation of a conjugated acetylenic bonds and the introduction of 1-3 sulfur atoms. In contrast to other Asteraceae studied previously, analysis of the genus Flaveria suggests that: i) members of the genus tend to accumulate a wide variety of the biosynthetic intermediates of thiophene metabolism; and ii) thiophene profiles of aerial and below-ground plant tissues are distinct. In Flaveria linearis, the most extreme example, end-products of thiophene metabolism (bi- and terthiophenes) accumulate in root tissues, while acetylenic and monothiophene precursors exclusively occur in aerial portions of the plants. The significance of phytochemical polarization in the genus Flaveria and the implications in plant defense will be discussed.

Wednesday 1:30 Contributed Paper 36

EFFECTS OF UV-B ON NUTRITIONAL AND SECONDARY CHEMISTRY OF *Citrus limon*.

Eric S. McCloud and May R. Berenbaum, Dept. of Entomology, University of Illinois, Urbana IL 61801.

Anthropogenic inputs of chlorofluorocarbons threaten to degrade stratospheric ozone, resulting in increased UV-B irradiation at the earth's surface. We are examining the effect of increaseed UV-B irradiance on plant-herbivore interactions of *Citrus limon*. Cuttings of *C. limon* were exposed to three levels of UV-B irradiance in three separate greenhouse experiments. Control plants received no UV-B. Clonal populations of trees were obtained by propagating cuttings from single trees. Two furanocoumarins, psoralen and bergapten, were measured, as were soluble protein, total nitrogen, and water content. Intermediate levels of irradiation (12.1 kJ/day) caused an approximate doubling of foliar furanocoumarins over non-irradiated controls. High UV-B (19.1 kJ/day) decreased both soluble protein and bergapten. Clonal origin and leaf age strongly affected furanocoumarin and soluble protein content as well. Clonal origin, leaf age, and UV-B interact with each other in a complex pattern of effects on nutritional quality and secondary chemistry which may have consequences for pathogen and herbivore interactions in this species.

Wednesday 1:45 Contributed Paper 37

CHEMISTRY AND BIOLOGICAL ACTIVITY OF POUTERIA CAMPECHIANA.

Lee A. Swain[1], Jeff Weidenhamer[2], J.M.E. Quirke[3], Stephen A. Winkle[3], and Kelsey R. Downum[1]. [1]:Dept. Biol. Sci., FIU, Miami, FL 33199, [2]:Dept. Chemistry, Ashland Univ., Ashland OH 44805, [3]:Dept. Chemistry, FIU, Miami, FL 33199.

Seed extracts of Pouteria campechiana (Sapotaceae), an important tropical fruit crop, have demonstrated antibiotic properties to both gram positive and gram negative bacteria and this activity is greatly enhanced with UV-A irradiation. No antibiotic or phototoxic reaction was observed when the extract was tested against the yeast Saccharomyces cerevisiae. A compound with the molecular formula $C_3H_5N_7O_2$ has been isolated from the active fraction, and a chemical structure has been proposed on the basis of ^{1}H-NMR, ^{13}C-NMR, ^{15}N-NMR, MS, and IR data.

Wednesday 2:00 Contributed Paper 38

ROLE OF TRUXILLIC ACIDS IN MAIZE RESISTANCE TO EUROPEAN CORN BORER

D. Bergvinson[1], L.T.Arnason[1], R.I. Hamilton[2], J.Mihm[3] and G.H.N.Towers[4],Biology Department, University of Ottawa[1], Agriculture Canada[2], International Centre for Wheat and Maize Improvement[3], Botany Department, University of British Columbia[4]

Phototodimerization of hydroxycinnamic acids to produce truxinic and truxillic acids has recently been reported in cereals. Phototodimers of phenolic carbohydratecomplexes produce cross-links in cell walls that strengthen and harden these stuctures. Field trials with UV transparent and UV absorbing plastic greenhouses demonstrated UV light dependent production of truxillic acid in leaves of four inbreds of maize. Plants, artificially infested with European corn borer larvae, showed significantly higher damage when grown in the field under UV absorbing plastic. The results suggest a new mechanism of maize resistance to leaf feeding lepidoptera, in addition to hydroxamic acids and lignin.

Wednesday 2:15 Contributed Paper 39

INFLUENCE OF CANOLA AND MUSTARD FOLIAR GLUCOSINOLATES ON NATURAL INFESTATION BY DIAMONDBACK MOTH *PLUTELLA XYLOSTELLA*

Cathy A. McCloskey and Murray B. Isman, Department of Plant Science, University of British Columbia, Vancouver, B.C., Canada V6T 1Z4.

A sampling study was carried out under field conditions to determine the influence of host plant glucosinolate profile on natural infestation levels of the diamondback moth, *Plutella xylostella*. Plots of six cultivars of Canola (*Brassica campestris* and *B. napus*) and mustard (*B. juncea* and *Sinapis alba*) were grown at uniform densities. Weekly destructive samples of foliage and flower heads (when present) were taken; foliar glucosinolates were determined by HPLC.

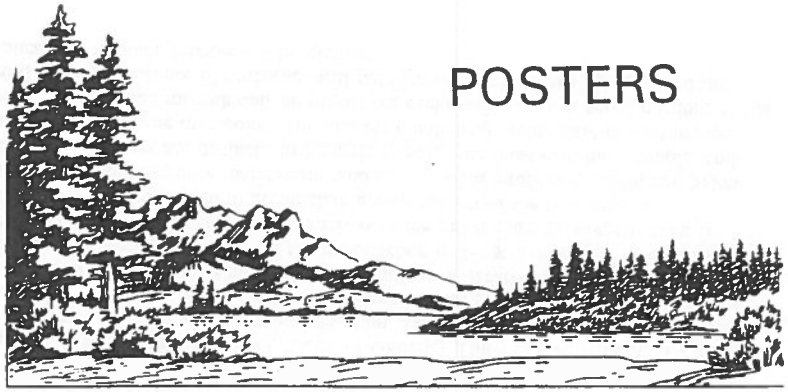
There were no apparent differences in larval populations between high and low glucosinolate cultivars, nor did the presence of sinigrin as the predominant glucosinolate in one of the mustards appear to influence the degree of infestation. Our results suggest that foliar factors other than glucosinolates may be important in host selection by the crucifer specialist *P. xylostella*.

Wednesday 2:30 Contributed Paper 40

RELATIONSHIP OF EPICUTICULAR WAX COMPOSITION TO CHILLING INJURY IN STORED LEMONS

Harold E. Nordby and Roy E. McDonald, U.S. Department of Agriculture, ARS, 2120 Camden Rd., Orlando, FL 32803.

Lemons, like grapefruit, are quite susceptible to chilling injury (CI) when stored 3 or more weeks at 1-5C and, like grapefruit, they can be temperature-conditioned to minimize this injury. In previous studies with grapefruit, compounds showing the greatest increase with optimal temperature-conditioning were tetracosanal > squalene > hexancosanal. In this study, levels of all epicuticular wax components from lemons stored at various temperature-conditioning temperatures were determined. Compounds showing the greatest increase with conditioning at 15C for 7 days were: squalene, 465%; valencene, 445%; and tetracosanal, 307%; indicating preferential lipid synthesis by different commodities.



POSTERS

Sunday 10-5 Poster 1

EFFECTS OF STORAGE AND ETHREL TREATMENT ON LIMONIN AND LIMONIN GLUCOSIDE LEVELS IN WASHINGTON NAVEL ORANGE

Zareb Herman, Chi H. Fong and Shin Hasegawa, USDA Fruit and Vegetable Chemistry Lab., 263 S. Chester Ave., Pasadena, CA 91106.

Limonoid-caused bitterness in citrus juices, such as navel orange juice, is a major problem in the citrus industry with bitter juices having a lower market value for producers. In this experiment, the effects of storage and 2-chloroethylphosphonic acid (Ethrel) treatment on limonin levels in Washington navel oranges were studied. Fruit was picked once per month for four months, and each month's fruit was divided into three groups. Group A was juiced immediately; Group B was juiced after 6 days storage; Group C was immediately soaked in 1,000 ppm Ethrel for 2 hours, then stored for 6 days and juiced. Juice was analyzed by HPLC for bitter limonin and nonbitter limonin glucoside. Limonin glucoside levels did not show significant changes. However, groups B and C were found to contain significantly lower levels of limonin in the juice. When compared to Group A, limonin levels dropped by an average of 14% and 27% in Groups B and C, respectively. These simple treatments may be useful in reducing the levels of bitter limonin in citrus juices.

Sunday 10-5 Poster 2

Constituents of Glandular Trichome Exudates of *Rosa rugosa* Leaves

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Constituents of the glandular trichome exudates of *Rosa rugosa* leaves were investigated. The constituents include bisabolanoids, acoranoids, carotanoids, a 2-phenoxychromone and an unidentified sugar derivative. The sesquiterpenoids consisted of sesquiterpene hydrocarbons, alcohols, aldehydes, and carboxylic acids. Rugosal A, an antifungal carotane sesquiterpene peroxide, and its related compounds were present as the major constituents. These compounds were supposedly produced to play active defensive role in *R. rugosa*. The high concentration of an acoradiene in the exudate suggested a close biogenetic relationship between acoranoids and carotanoids.

Sunday 10-5 Poster 3

BENTAZON HYDROXYLATION IN SHATTERCANE AND JOHNSONGRASS IS CATALYZED BY A CYTOCHROME P450 MONOOXYGENASE.

Jim Burton and Eleanor Maness, Dept. of Horticultural Sci., North Carolina State University, Raleigh, NC 27695.

Hydroxylation of the herbicide bentazon was studied using cotyledons and microsomal preparations from shattercane (SC, *Sorghum bicolor*) and johnsongrass (JG, *S. halapense*). The effect seed pretreatment with naphthalic annhydride (NA) on bentazon hydroxylation was also studied. Bentazon was metabolized by both SC and JG *in vivo* and the metabolite formed was the glycosyl conjugate of 6-OH bentazon. NA pretreatment increased the rate of bentazon metabolism *in vivo* in both species. The P450 inhibitor tetcyclacis (50 µM) inhibited bentazon metabolism in both untreated and NA treated cotyledons. Bentazon hydroxylation was demostrated in microsomal preparations from SC and JG cotyledons, and the only product formed was 6-OH bentazon. Seed pretreatment with NA increased bentazon hydroxylation in microsomes from both SC and JG by 2-fold. Bentazon hydroxylation in microsomes from NA treated and untreated SC and JG was dependent on NADPH and inhibited by carbon monoxide, tetcyclacis, and piperonyl butoxide. Both constitutive and induced bentazon hydroxylase activity in SC and JG is apparently catalyzed by a cytochrome P450 monooxygenase.

Sunday 10-5 Poster 4

SYNTHESIS OF p-HYDROXYPHENYLBUTANONE IN FRUITS AND TISSUE CULTURES OF *Rubus idaeus* cv. ROYALTY.

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p-Hydroxyphenylbutanone (pHPB) is one of the major aroma components of raspberry (*Rubus idaeus* fruits. This compound is synthesized by the fruits from malonyl- and p-coumaryl:CoA's. In ripening raspberry fruit the activity of p-hydroxyphenylbuten-3-on synthase activity inreases rapidly toward the end of the ripening stage. This increase in enzyme activity is paralleled by the increase in pHPB content in the fruits. pHPB synthesis also takes place in raspberry tissue cultures under osmotic stress of sucrose.

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Sunday 10-5 Poster 5

C_6-C_{10} ALKENALS ELICIT A DEFENSE RESPONSE IN DEVELOPING COTTON BOLLS.

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In separate experiments, microbial-free compressed air carried individual C_6, C_7, C_8, C_9, C_{10}-alkenals and alkanals into enclosed systems containing artificially wounded and non-wounded Acala SJ-2 developing cotton bolls. Two days after treatment, discs were excised from the treated cotton bolls surfaces and were extracted to determine the induction of the sesquiterpenoid naphthol phytoalexins, 2,7-dihydroxycadalene and 2-hydroxy-7-methoxy cadalene, their oxidation products lacinilene C and lacinilene C 7-methyl ether, and the coumarin phytoalexin-scopoletin. Highest concentrations of the described phytoalexins were elicited by C_6-C_{10} alkenals in artificially wounded cotton bolls. C_6-C_{10} alkenals may function as air signals to elicit a defense response in the cotton plant.

Sunday 10-5 Poster 6

TRANS-4-METHOXYPIPECOLIC ACID, A NEW AMINO ACID FROM *Inga paterno*.

Timothy C. Morton, Andrew S. Zektzer*, Jason P. Rife* and John T. Romeo, Department of Biology and Department of Chemistry*, University of South Florida, Tampa, FL 33620.

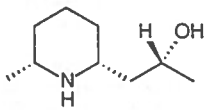
A new *trans*-4-methoxy derivative of pipecolic acid was isolated from the tropical legume, *Inga paterno*. Structure elucidation and conformational analyses were ascertained using a variety of NMR techniques. Information from proton, carbon and DEPT spectra were combined with two-dimensional homo- and heteronuclear correlation analysis to establish structure. Confirmation of the *trans* form was established from NOESY spectra. This is the first report of a naturally occurring methoxylated pipecolic acid. A distributional survey in eight species of *Inga* native to Costa Rica showed the compound may have systematic and ecological importance. It is restricted to species found at high elevations.

Sunday 10-5 Poster 7

ALKALOIDS OF SPRUCE (*PICEA*) AND PINE (*PINUS*) SPECIES.

Frank R. Stermitz, Jeanne N. Tawara and Marc D. Pomeroy, Department of Chemistry, Colorado State University, Fort Collins, Colorado 80523.

The alkaloid pinidinol and a variety of related piperidine alkaloids have been isolated from *Piceae abies* (Norway spruce) and *Pinus jeffreyi* (Jeffrey pine). The particular alkaloid spectrum varies depending upon plant part. Alkaloids are also found in a mistletoe, *Arceuthobium campylopodium*, which parasitizes Jeffrey pine. Mass spectrometry and NMR spectroscopy were used to determine the structures of the various alkaloids from these two conifers and an attempt is being made to assess the ecological importance of the alkaloids.



pinidinol

Sunday 10-5 Poster 8

COUMARINS ON THE SURFACE OF FIVE CITRUS SPECIES.

Alicia M. Zobel[1], Jeffrey Plomley[1] and Kelsey Downum[2], Department of Chemistry[1], Trent University, Peterborough, ON K9J 7B8, and Department of Biology, Florida International University, Miami, FL 33199.

Plants of the Rutaceae and Umbelliferae are known to cause contact photophytodermatitis, and a recently developed method of brief dipping into almost-boiling water (Zobel and Brown, 1988, *J. Nat. Prod.* 51: 941) revealed the presence of psoralens on plant leaves, seeds and fruits (Zobel and Brown, 1990, *J. Chem. Ecol.* 16: 693). In *Ruta graveolens* concentrations on the surface reached very high levels of milligrams per gram fresh weight (Zobel and Brown, 1989, *Can. J. Bot.* 67: 915). Brushing against lime bushes caused dermatitis in boy scouts in Florida. We collected leaves and fruits of five *Citrus* species sold commercially, as well as growing in their natural habitat, to measure concentrations of furanocoumarins on their surface. Besides psoralens HPLC chromatograms showed over 10 additional peaks, of which some were identified. Their co-occurrence is of great importance, as some can react synergistically. The leaf and fruit surface is a *new* compartment opened for investigation, because numerous compounds are deposited there.

Sunday 10-5 Poster 9

MONOTERPENE BIOSYNTHESIS BY ISOLATED SECRETORY CELL CLUSTERS DERIVED FROM GLANDULAR TRICHOMES OF PEPPERMINT (*MENTHA PIPERITA*)

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The glandular trichomes of peppermint (*Mentha piperita*) contain secretory cells which synthesize and secrete monoterpenes (primarily menthone) into an extracellular, subcuticular oil droplet. The secretory cells responsible for this synthesis were isolated in high yield by mechanized surface abrasion. The isolated secretory cells are semi-permeable, which allowed the examination *in situ* of the cofactor requirements for precursor incorporation into monoterpenes. In the absence of exogenous reducing equivalents, [8-^{3}H]geranyl pyrophosphate is incorporated almost exclusively into limonene, the first cyclic monoterpene olefin (98% of the total cyclic products, 50-60% total incorporation). Addition of a source of exogenous reducing equivalents (either NADPH or glucose-6-phosphate with NADP+) resulted in incorporation into limonene (64% of the total products), menthone (28% of the total) and traces of neomenthol and menthol. These results indicate that the isolated cells are depleted in endogenous, water soluble redox substrates and cofactors, due to their permeability. When provided with the appropriate cofactors (including NADPH, NAD+, ATP and CoASH), the isolated cells are capable of the *de novo* biosynthesis of monoterpenes from [U-^{14}C]sucrose, indicating that they maintain a high degree of metabolic integrity in spite of their leaky nature.

Sunday 10-5 Poster 10

WATER SOLUBILITY AND THE ALLELOPATHIC POTENTIAL OF MONOTERPENES

Jeffrey D. Weidenhamer, Dept. of Chem., Ashland Univ., Ashland, OH 44805 USA; Francisco A. Macias, Dept. de Química Orgánica, Univ. de Cádiz, 11510 Puerto Real (Cádiz) Spain; Nikolaus H. Fischer, Dept. of Chem. and G. Bruce Williamson, Dept. of Botany, Louisiana State Univ., Baton Rouge, LA 70803 USA

Monoterpenes occur widely in plants and have several recognized ecological functions, but are not considered important in most allelopathic interactions due to low water solubilities. Chemical studies of the allelopathic shrubs Conradina canescens and Calamintha ashei have revealed that both plants contain monoterpenes as major constituents. Because the proposed mechanism of allelochemical release requires water transport, the water solubility of 40 monoterpenes was determined. Solubilities of hydrocarbons such as α-pinene were low, as expected (<10 ppm). However, functional groups containing oxygen greatly increased solubility. For example, the solubility of (+)-camphor was >500 ppm. (+)-Camphor reduced germination of test species at concentrations of 1 ppm. Our data demonstrate that the solubilities of many monoterpenes are sufficient for them to be potent allelopathic agents.

Sunday 10-5 Poster 11

VOLATILE MONOTERPENES AS MODELS FOR NEW HERBICIDE CHEMISTRY.

Steven F. Vaughn and Gayland F. Spencer, USDA, ARS, Bioactive Constituents Research, National Center for Agricultural Utilization Research, 1815 N. University Street, Peoria, IL 61604.

Certain volatile monoterpenes have been shown to be inhibitory to seed germination and growth and have also been implicated as allelopathic agents. The purpose of this study was to determine if any of these compounds displayed selective phytotoxicity between crop and weed species, and could then be chemically modified to produce herbicidally-active compounds. We found several monoterpenes that, while exhibiting little phytotoxicity towards the crop species (corn, soybeans, wheat) tested, strongly inhibited the germination and growth of several weeds which are problems in those crops. Subsequent chemical modification of these parent monoterpenes will be conducted with the intent to develop new herbicide chemistry.

Sunday 10-5 Poster 12

VARIATION IN PARTHENOLIDE CONTENT AND BIOACTIVITY OF FEVERFEW [*Tanacetum parthenium* (L.) Schultz-Bip.].

Dennis V.C. Awang and Daryl G. Kindack, Bureau of Drug Research, Health and Welfare Canada, Tunney's Pasture, Ottawa, Ontario, Canada, K1A 0L2; Cliff W. Crompton, Biosystematics Research Centre, Agriculture Canada, Ottawa, Ontario, Canada, K1A 0C6; Robin J. Marles and J. Thor Arnason, Ottawa-Carleton Institute of Biology, University of Ottawa, Ottawa, Ontario, Canada, K1N 6N5.

Parthenolide is the main sesquiterpene lactone of British-grown feverfew, a herbal remedy proven efficacious in the prophylaxis of migraine. The plant variety with white ray florets, popularly regarded as the most therapeutically effective, is widely thought to have highest parthenolide content in its leaves just prior to flowering. At this preanthesis stage, up to 0.97% (dry weight) of parthenolide has been found, with the parthenolide level in the leaves declining thereafter but increasing in the flowering tops, to a maximum content of 1.52%, found in the seeds. However, *T. parthenium* f. *flosculosum*, whose flowers are devoid of ray florets, was found to have 0.33% parthenolide in leaves preantheis, but 1.27% in leaves postanthesis, and only 0.46% in flowering tops. Variations in a number of geographical varieties of feverfew are also reported, as assessed by HPLC and a bioassay based on the ability of fresh leaf ethanolic extracts to inhibit the release of serotonin (an early step in the pathogenesis of migraine) from bovine blood platelets.

Sunday 10-5 Poster 13

p-COUMAROYL-CARDIOSPERMIN - THE MAJOR CYANOGENIC COMPOUND FROM LEAVES OF *UNGNADIA SPECIOSA*

Dirk Selmar, Botanisches Institut, Technische Universität Braunschweig, FRG
Victor Wray, Gesellschaft für Biotechnologische Forschung, Braunschweig, FRG
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Leaves from *Ungnadia speciosa* (Sapindaceae) are strongly cyanogenic, but the source of this HCN-liberation was still unknown. Whereas in the related seeds, high amounts of cyanogenic lipids occur, these cyanogens are absent in leaves of Ungnadia (1). Just recently, it was shown that the cyanogenic glucoside proacacipetalin is present in leaves of young *Ungnadia* seedlings, but in contrast to this, no proacacipetalin occurs in the cyanogenic leaves of the related adult plants (1).
The major cyanogenic compound was extracted from adult Ungnadia leaves and purified by HPLC. Using MS, ^{1}H- and ^{13}C-NMR-spectroscopy, the structure was elucidated as p-coumaroyl-cardiospermin. In further studies it is analyzed if in these leaves also free cardiospermin, which is hydroxy-proacacipetalin does occur.

(1) Selmar, D., Grocholewski, S., Seigler, D. S. 1990, Plant Physiol. 93, 631 - 636

Sunday 10-5 Poster 14

DEVELOPMENT OF THE POTENTIAL FOR CYANOGENESIS DURING MATURATION OF BLACK CHERRY (*Prunus serotina* Ehrh.) FRUITS

Elisabeth Swain, Chun-Ping Li and Jonathan E. Poulton, Department of Botany, University of Iowa, Iowa City, IA 52242.

Biochemical changes relating to cyanogenesis were monitored during development of black cherry fruits. At weekly intervals from flowering until full maturation, whole fruits, or parts thereof, were analyzed for (1) fresh and dry weights, (2) cyanogenic glycoside levels, and (3) levels of synthetic and catabolic enzymes involved in cyanoglycoside metabolism. Immature fruits (0-35 DAF) accumulated prunasin (to approx. 3 µmol/fruit) as sole cyanogen although mandelonitrile glucosyltransferase activity was not detectable until 35 DAF. During this period, the fruits lacked prunasin hydrolase and were acyanogenic. Concomitant with cotyledon development (beginning 42 DAF), prunasin levels rapidly declined, especially in seed tissues. Meanwhile, the levels of amygdalin and the catabolic enzymes (amygdalin hydrolase, prunasin hydrolase and mandelonitrile lyase) increased dramatically in seed tissues from zero to reach high levels which were maintained until fruit abscission.

Sunday 10-5 Poster 15

IMMUNOCYTOCHEMICAL LOCALIZATION OF MANDELONITRILE LYASE AND ASSOCIATED ENZYMES IN MATURE *Prunus serotina* SEEDS

Chun-Ping Li, Elisabeth Swain, Hua-Cheng Wu, and Jonathan E. Poulton, Department of Botany, University of Iowa, Iowa City, IA 52242.

Mature black cherry (*Prunus serotina*) seeds contain the cyanogenic glycoside (*R*)-amygdalin, which, upon tissue disruption, is rapidly degraded to HCN and benzaldehyde by the sequential action of amygdalin hydrolase (AH), prunasin hydrolase (PH) and mandelonitrile lyase (MDL). These enzymes have been purified to homogeneity and deglycosylated by treatment with TFMS. The monospecificity of polyclonal antibodies raised against each deglycosylated protein was assessed by immunoblotting. Using immunogold electron microscopy MDL was localized in cotyledon tissue primarily in cell walls with lesser amounts associated with the protein bodies, while, in endosperm tissue, this labeling pattern was reversed. Localization of AH and PH is underway. Upon completion, these studies should help identify the mode of compartmentation whereby large-scale cyanogenesis is prevented in intact seeds.

Sunday 10-5 Poster 16

EFFECT OF UV-B AT LEVELS EXPECTED FROM OZONE DEPLETION ON GROWTH, PHOTOSYNTHESIS, FLAVONOIDS AND FERULIC ACID IN BARLEY LEAVES.

Jerry W. McClure and Lan Liu, Botany Department, Miami University, Oxford, OH 45056.

Barley (Atlas 68) was grown under 260 $\mu E\ m^{-2}\ s^{-1}$ cool-white fluorescent light, or in the greenhouse, with UV-B at levels simulating 30% O_3 depletion at 40°N. UV-B had no significant effect on leaf growth, maximum photosynthetic rates, nor CO_2 compensation points. UV-B decreased PAL activity at day 5 but on day 10 PAL activity was detected only in leaves given UV-B. UV-B had no significant effect on chalcone-flavanone isomerase, decreased peroxidase activity in older leaves, but doubled levels of flavonoids and ferulic acid esters. Approximately 40% of the flavonoids and ferulic acid were found in the lower epidermis. In summary, UV-B induction of UV-B-absorbing phenolics may provide barley seedlings with adequate protection from levels of UV-B expected to occur from 30% O_3 depletion at 40°N.

Tuesday 10-5 Poster 17

CONVERSION OF B- TO A-TYPE PROANTHOCYANIDINS

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Base-catalyzed C-ring isomerization of a B-type prorobinetinidin exclusively afforded the A-type analogue. The mechanism for the formation of this novel proanthocyanidin with 3,4-*cis* C-ring configuration presumably involves the oxidative removal of a hydride ion at C-2(C). Repetition of this base-catalyzed reaction under conditions excluding atmospheric oxygen, afforded C-ring isomerized products in favour of the A-type compound. Owing to conformational restraints imposed on the C-ring, A-type proanthocyanidins exhibit identical ^{1}H NMR coupling constants irrespective of the 3,4-stereochemistry.

Tuesday 10-5 Poster 18

PROANTHOCYANIDINS AND BIOGENETICALLY RELATED DIHYDROFLAVONOLS FROM CISTUS INCANUS

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Investigations aimed at characterizing the active principle(s) of *Cistus incanus* L. traditionally used in the folk medicine, led to the identification of a series of monomeric and oligomeric flavan-3-ols. Novel compounds amongst these metabolites included the gallocatechin 3-O-gallate, catechin-(4α→8)-gallocatechin and gallocatechin-(4α→6)-gallocatechin. Structural assessment was effected by means of spectral studies (^{1}H NMR, CD) and chemical degradation. The co-occurrence of the putative precursors dihydrokaempferol, dihydroquercetin and dihydromyricetin in a ratio of ca 1: < 1:5 respectively, indicates both preferred tri-hydroxylation of the B-ring and absence of a reductase capable of reducing dihydrokaempferol to the 3,4-diol analogue, when taken in conjunction with the conspicuous absence of propelargonidins.

Tuesday 10-5 Poster 19

CHANGING THE COLOUR OF *DENDRANTHEMA* (CHRYSANTHEMUM) FLOWERS

Kathy Slindee, Kevin Davies, Marie Bradley, Simon Deroles, Susan Ledger, Robyn Miller and Nigel Given, MAF Technology, Levin, New Zealand and Ken Markham, DSIR Chemistry, Gracefield, New Zealand.

Dendranthema (chrysanthemum) flowers accumulate cyanidin derivatives. To produce a cultivar that accumulates pelargonidin derivatives, we inserted into the binary vector pGA643 a dihydroflavonol-4-reductase (DFR) gene from a pelargonidin-producing *Antirrhinum* flower. We used this vector to transform a *D. indicum* cultivar via an *Agrobacterium tumefaciens*-mediated transformation system we developed. The outcome of this experiment will be determined when the transformed plants flower.

Also, to aid in our understanding of flavonoid biosynthesis in *Dendranthema*, we identified the flavonoids in 40 commercial varieties, and conducted supplementation experiments on a selected few. Apigenin, acacetin, luteolin, diosmetin, quercetin, naringenin and eriodictyol are present and occur variously as glucosides, glucuronides, diglucosides, malonated mono- or diglucosides and rutinosides. Cyanic cultivars fed dihydrokaempferol and leucopelargonidin separately produce, respectively, cyanidin and pelargonidin glycosides. This may indicate a biosynthetic block at the DFR step in the pathway.

Tuesday 10-5 Poster 20

ANTHOCYANOPLASTS OR FLAVONOSOMES ???

Francois Cormier, Chi Bao Do, Diane Montpetit and Thi Man Nguyen. Food Research and Development Centre, Agriculture Canada, 3600 Casavant Blvd., West, St.-Hyacinthe (Québec), Canada J2S 8E3.

This paper reports a preliminary study into the metabolic role of so-called anthocyanoplasts in grape (*Vitis vinifera* L.) cell suspensions. Transmission electron microscope observations of the cells revealed the presence of single membrane anthocyanoplasts (approx. 2 μm in length) in the cytoplasm and the vacuole. At times, cytoplasmic anthocyanoplasts were seen fused to the tonoplast and discharging their content into the vacuole. Condensed material within the organelles is a common occurrence. Their strong electron density suggests tannin-like compounds. Vacuolar bodies of strongly condensed material (up to 50 μm in diameter) were not delimited by a membrane. Observations under optical microscope revealed that these inclusions were pigmented with anthocyanins and while they could be discolored and partly "solubilized" by 1% HCl, they remained pigmented and intact under milder conditions of membrane destabilization (200 μl/l geraniol). These observations suggest that anthocyanins are associated (co-pigmented) with the condensed material. Anthocyanoplasts seem to possess a wider function than solely that of anthocyanin synthesis. In fact, at times, the bulk of their content might be condensed tannin-like compounds.

Tuesday 10-5 Poster 21

STRUCTURE DIVERSITY AND BIOGENESIS OF PISCIDIA ERYTHRINA ISOFLAVONOIDS

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The root bark of Jamaican dogwood (P. erythrina L.) is known to be rich in isoflavonoid components (isoflavones, rotenoids, coumaronochromones and coumaranochroman-4-one). A detailed phytochemical examination of the Piscidia isoflavonoids has yielded variously oxygenated and mono- or di-prenylated (=3,3-dimethylallyl substituted) isoflavones. The structures of two major isoflavones, piscidone and 6'-prenylpiscerythrone respectively believed to be 5,7,4',5'-tetrahydroxy-2'-methoxy-6'-(3,3-dimethylallyl)isoflavone and 5,7,2',4'-tetrahydroxy-5'-methoxy-3',6'-di(3,3-dimethylallyl)-isoflavone so far, have been revealed incorrect and revised unambiguously to 5,7,3',4'-tetrahydroxy-5'-methoxy-2'-(3,3-dimethylallyl)isoflavone and 5,7,3',4'-tetrahydroxy-5'-methoxy-2',6'-di(3,3-dimethylallyl)isoflavone.

The biogenesis of Piscidia isoflavonoids will be briefly discussed.

Tuesday 10-5 Poster 22

Defense responses and the role of medicarpin in resistance in alfalfa to Colletotrichum trifolii.

Nichole R. O'Neill, USDA, ARS, Beltsville, Maryland 20705.

The role of phytoalexins in resistance to anthracnose in alfalfa was examined by comparing the effectiveness of medicarpin in inhibiting growth stages of races 1 and 2 of Colletotrichum trifolii, and by quantifying the accumulation of medicarpin and phenylalanine ammonia lyase in resistant and susceptible seedlings and cotyledons. Medicarpin was the major phytoalexin among 7 fungitoxic compounds extracted and was inhibitory to spore germination and growth of pre-germinated spores but not to hyphal growth of race 1 and 2 isolates. The activity of defense enzymes PAL and chalcone synthase related to the accumulation of alfalfa phytoalexins in cultivars with specific resistance genes. RNA extracted from incompatible cotyledons hybridized with heterologous soybean DNA probes for PAL and CHS. A cDNA expression library constructed from mRNA extracted from resistant and susceptible alfalfa tissues will be used to identify defense related genes.

Tuesday 10-5 Poster 23

ISOFLAVONE REDUCTASE FROM ALFALFA: MOLECULAR CLONING AND EXPRESSION IN E. COLI OF A STEREOSPECIFIC ENZYME OF PTEROCARPAN BIOSYNTHESIS.

Nancy L. Paiva. Robert Edwards, and Richard A. Dixon, The Samuel Roberts Noble Foundation, Ardmore, OK; Yuejin Sun and Geza Hrazdina, Cornell University, Geneva, NY

One response of alfalfa (Medicago sativa) to attack by fungal pathogens is the production of the isoflavonoid phytoalexin (-) or (6aR, 11aR)-medicarpin, a pterocarpan. According to the proposed pathways, isoflavone reductase (IFR) from alfalfa reduces the achiral substrate 2'-hydroxyformononetin to (3R)-vestitone, which is next reduced and dehydrated to form (6aR, 11aR)-medicarpin. We have isolated a cDNA clone for IFR which expresses a catalytically active IFR in E. coli; the product of the reaction was shown to be optically active, predominantly (3R)-vestitone, as predicted. A correlation between IFR activity, messenger RNA, and medicarpin levels has been observed. The potential use of this clone to alter and study phytoalexin biosynthesis will be discussed.

Tuesday 10-5 Poster 24

EFFECT OF APIFOROL AND APIGENINIDIN ON THE GROWTH OF FUNGI.

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Selected fungi were grown in agar plates in the presence of naringenin, apiforol, apiforol 7-O-rhamnoglucoside, or apigeninidin. Only apigeninidin inhibited the growth of any of the fungi. Fusarium oxysporum, Gibberella zeae, Gliocladium roseum, Rhizopus stolonifer (+), Alternaria solani and Phytophthora infestans growth was inhibited by apigeninidin. Growth of Rhizoctonia solani, Sclerotium rolfsii and Rhizopus stolonifer (-) was only temporarily inhibited by apigeninidin. Since apigeninidin and apiforol are present in seeds of certain Sorghum bicolor lines, we hypothesize that apigeninidin may play an important role in mold-resistance in the seed and that apiforol accumulates as a biosynthetic precursor of apigeninidin, not as a fungal defense compound.

Tuesday 10-5 Poster 25

GROWTH STIMULATION OF VESICULAR-ARBUSCULAR MYCORRHIZAL (VAM) FUNGI BY FLAVONOIDS.

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Several flavonoids (quercetin, rutin, kaempferol) and chalcone were found to stimulate the growth of three species of VAM fungi: *Gigaspora margarita, Glomus etunicatum* and *Glomus intraradix*. The presence of 10 µM of quercetin prolonged hyphal growth of *Gi. margarita* germinating spores from 10 days to more than 6 weeks, with 6 to 7 times more elongation of hyphae and auxiliary cells. Since no stimulation of hyphal growth was found in the presence of exudates from sugar beet (non-host) Ri T-DNA transformed root in contrast to exudates from carrot roots (host) we undertook a detailed HPLC analysis of their respective flavonoid content. The possibility that certain flavonoids may play an important role in the VAM symbiosis, as they do in the rhizobium N_2-fixing symbiosis can now be considered.

Tuesday 10-5 Poster 26

IDENTIFICATION, PURIFICATION, AND CHARACTERIZATION OF AN ALFALFA ISOLIQUIRITIGENIN-2'-O-METHYL TRANSFERASE

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Isoliquiritigenin (2',4,4'-trihydroxychalcone) is an intermediate in the formation of both isoflavonoid phytoalexins and flavonoid transcriptional activators of *Rhizobium meliloti nod* genes. Methylation of the 2' OH of the chalcone forms the nod-gene inducer 4,4'-dihydroxy-2'-methoxychalcone and precludes subsequent use in phytoalexin biosynthesis. An enzyme has been identified in roots of alfalfa seedlings, and purified to near homogeneity from alfalfa cell cultures, which methylates the 2' OH with a high degree of specificity. The enzyme has a MW of 42 kD by PAGE and 55 kD by gel permeation, has no divalent cation requirement, an apparent pI of 4.7, and a pH optimum of 9.

Tuesday 10-5 Poster 27

FLAVONOID *nod*-GENE INDUCERS RELEASED NATURALLY FROM COMMON BEAN SEEDS AND ROOTS

M. Hungria, C.M. Joseph & D.A. Phillips, Dept. of Agronomy and Range Science, University of California, Davis, CA 95616

Fourteen compounds released naturally from seeds and roots of a black-seeded bean (*Phaseolus vulgaris* L., cv. PI165426CS) under sterile conditions induce transcription of nodulation (*nod*) genes in *Rhizobium leguminosarum* bv. *phaseoli*. UV/visible, proton NMR, and MS analyses were coupled with assays for ß-galactosidase activity transcribed from *nodA-lacZ* and *nodC-lacZ* fusions to purify and identify the active molecules. Ten glycosides released from seeds contained anthocyanidins (delphinidin, petunidin, and malvidin) or flavonols (myricetin, quercetin, and kaempferol). Seedling roots released two aglycones (naringenin and eriodictyol) and a genistein glycoside. These anthocyanidins are the first *nod*-inducing compounds identified from that group of flavonoids.

Tuesday 10-5 Poster 28

LUTEOLIN IS NOT A *Nod* D GENE INDUCER IN ALFALFA.

Qindong Wu[1], Geza Hrazdina[1] and Thomas A. Larue[2], [1]Institute of Food Science, Cornell University, Geneva, N.Y. 14456 and [2]Boyce Thompson Institute, Tower Road, Cornell University, Ithaca, N.Y. 14853 USA.

Bacteria of the genus *Rhizobium* specifically recognize and infect legume plants, resulting in a complex morphological and biochemical differentiation into nitrogen fixing nodules. In *Rhizobium meliloti*, whose host plant is alfalfa, groups of linked plasmid born genes are involved in nitrogen fixation (*nif* genes) and nodulation (*nod* genes). The nod genes are organized in several transcription units on the symbiotic plasmid pRmM57. These comprise NodABC, NodD, and NodFE, with NodD being a positively acting regulatory gene whose product activates transcription of the two other operons which contain genes essential for nodulation. It has recently been reported (Peters et al., 1986 Science 233:977-980) that for the expression for the Nod genes not only the product of NodD is required, but also a factor present in alfalfa root exudates or extracts, which has been identified as luteolin. The major NodD inducing compound in alfalfa roots is not a flavonoid. TLC, HPLC separations, spectral properties and mass spectral fragmentation patters of the inducer indicate the presence of inositol, phosphate, C_{14}, C_{16} and C_{18} fatty acids. Incubation of the inducer preparation with phospholipase D resulted in loss of NodD inducing activity. These data indicate that the structure of the inducer may be a phosphatidylinositol derivative.

Tuesday 10-5 Poster 29

MOLECULAR CLONING OF THE GENE FROM PINE ENCODING PHENYLALANINE AMMONIA-LYASE

Malcolm M. Campbell, Dept. of Chem. & Biochem., University of Guelph, Guelph, Ont., N1G 2W1, Jack Pitel and Robert Rutledge, Petawawa National Forestry Institute, Chalk River, Ont. and Brian E. Ellis, Dept. of Plant Science, University of British Columbia, Vancouver, BC, V6T 2A2

The very large size of the conifer genome makes it difficult to clone single-copy genes by conventional library screening methods. We have taken advantage of the properties of the polymerase chain reaction (PCR) to amplify sequences encoding phenylalanine ammonia-lyase (PAL, EC.4.3.1.5) in *Pinus banksiana*. Several regions of the PAL gene from *P. banksiana* have been amplified using pairs of PAL-specific PCR primers, with both cDNA and genomic DNA as template. Sequence analysis has revealed that the pine PAL gene is similar to that from angiosperm species but displays some unique features. The analysis of these clones, as well as the pattern of inducible transcription of the *P. banksiana* PAL gene following fungal elicitation, will be presented.

Tuesday 10-5 Poster 30

CHARACTERIZATION OF LIGNIN FROM ELICITED PINE CELL CULTURES

Malcolm M. Campbell, Dept. of Chem. & Biochem., University of Guelph, Guelph, Ont., N1G 2W1 and Brian E. Ellis, Dept. of Plant Science, University of British Columbia, Vancouver, BC, V6T 2A2

Pine cell cultures treated with ectomycorrhizal fungus-derived elicitor exhibit a strong positive reaction with phloroglucinol-HCl and rapidly accumulate large amounts of thioglycolic acid-extractable cell wall complexes. These reactions are commonly thought to indicate the presence of lignin, but are not definitive. The cell wall complexes accumulated in elicited pine cells have been shown to be polymeric, aromatic and dominated by guaiacyl structural units. The ^{1}H NMR spectrum closely resembles that of softwood lignin. Radiotracer and inhibitor studies confirmed that the complexes are biosynthetically derived from phenylalanine. The results of these chemical and biochemical analyses, and the role of phenylalanine ammonia-lyase in the control of lignification in elicitor-treated pine cultures will be presented.

Tuesday 10-5 Poster 31

ENZYMES OF LIGNIN BIOSYNTHESIS IN XYLEM OF LOBLOLLY PINE.

Ross Whetten, David O'Malley and Ronald Sederoff, Department of Forestry, North Carolina State University, Raleigh NC 27695.

The biosynthetic pathway for lignin monomers is known, but the regulation of monomer production and polymerization is not fully understood. We are working to understand the regulation of lignification in differentiating wood of loblolly pine, through biochemistry and molecular biology.

We have isolated from differentiating wood the first (PAL) and last (CAD) enzymes of the monolignol biosynthetic pathway, and characterized the purified proteins. Pine PAL shows no evidence of isozymes; a single pI (5.7) and K_m (27 μM) were found. Pine CAD shows a marked preference for coniferaldehyde over sinapaldehyde as substrate; segregation analysis indicates a single gene encodes CAD in loblolly pine. A partial cDNA of pine PAL has been isolated, and efforts to isolate a CAD clone are in progress.

MEETINGS AND PROGRAMS OF INTEREST

EIGHTEENTH ANNUAL MEETING OF THE PLANT GROWTH REGULATOR SOCIETY OF AMERICA: Boston, Massachusetts, July 28-August 1, 1991. The PGRSA provides a forum for scientists from diverse disciplines in academia, government, and industry to exchange ideas and information in the field of plant growth regulation. The Society fosters better understanding and stimulates research in the processes of plant growth and development.

Two symposia are scheduled for the meeting: "Biotransformation and Natural Products" and "Regulation of Growth in Greenhouse Crops". The keynote address will be presented by Dr. Marc Cathey, Director of the U.S. National Arboretum.

For further information contact Dr. A.R. Templeton, Program Chair, Aquatrols Corp. of America, 1423 Union Ave., Pennsauken, NJ 08110, (Tel. 609-665-1130) or Dr. R.M. Devlin, Local Arrangements Chair, Cranberry Experiment Station Univ. Mass., Glen Charlie Rd., East Wareham, MA 02538 (Tel. 508-295-2213).

15TH INTERNATIONAL CONGRESS OF BIOCHEMISTRY: Jerusalem, Israel, August 4-9, 1991. For further information, contact: 1st IUB Congress, P.O. Box 50006, Tel Aviv 61500, Israel (Tel. 972-3654571; fax: 972-365-5674; Bitnet BNLITAUR@WEIZMANN).

THE PYRROLES OF PHOTOSYNTHETIC ORGANISMS: University of California, Davis, August 4-9, 1991. This conference aims to bring together scientists who are studying the pyrroles of photosynthetic organisms from a variety of perspectives. For further information, contact P.A. Castelfranco, University of California, Davis, CA 95616.

THIRD INTERNATIONAL CONGRESS OF PLANT MOLECULAR BIOLOGY: Tucson, Arizona, October 6-12, 1991. The Congress will stress current research in Molecular Aspects of Plant Growth and Development. Plenary sessions, concurrent symposia, poster, discussion sessions, and workshops will cover Advances in Gene Regulation; Differentiation; Seed and Fruit Development; Hormonal Regulation; Cell Biology; Plant Pathogenesis; Nitrogen Fixation; Responses to Environment; Genome Organization and Mapping; Photosynthesis; and Organelle Genomes. For more information, contact: ISPMB, Woo Wester Conference Consultants, 2934 1/2 Beverly Glen Circle, Suite 383, Los Angeles, CA 90077 (Tel. or fax: 213-474-5894).

PHYTOCHEMICAL SOCIETY OF NORTH AMERICA: Miami Beach, FL, August 1-6, 1992. The symposium topic will be "Phytochemical Potential of Tropical Plants." For further information contact Dr. Kelsey R. Downum, Department of Biological Sciences, Florida International University, Miami, FL 33199 (Tel. 305-348-3419; FAX 303-348-1986).

IXTH INTERNATIONAL CONGRESS ON PHOTOSYNTHESIS: Nagoya, Japan, August 30-September 4, 1992. For further information, contact Prof. Noria Murata, Secretariat, IXth International Congress on Photosynthesis, National Institute for Basic Biology, Ozaki 444, Japan. (Phone/Fax 81 (JAPAN) 564-54-4866).

XV INTERNATIONAL BOTANICAL CONGRESS: Tokyo, Japan, August 28-September 3, 1993. The scientific program will include about 240 symposia and more than 1,000 posters in the following divisions: 1. Systematics and Evolution, 2. Structure and its Dynamics, 3. Phytochemistry and Natural Products, 4. Metabolism and Bioenergetics, 5. Developmental Botany, 6. Ecology and Environmental Botany, 7. Genetics, 8. Biotechnology and Breeding. For further information, contact the Congress Secretariat, XV International Botanical Congress Tokyo, c/o Department of Botany, Faculty of Science, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113, Japan.

POSITION AVAILABLE

UNIVERSITY OF KENTUCKY, LEXINGTON. POSTDOCTORAL RESEARCH: PHOTODAMAGE TO THYLAKOID MEMBRANE COMPONENTS. A postdoctorate research specialist position is open to participate in investigations of photodamage to thylakoid membrane components. A Ph.D. degree in biochemistry or biophysics is required. Proficiency in protein/membrane biochemistry, optical and EPR spectroscopy, FPLC chromatography, peptide sequencing and immunoassays also are required. The position ($24,200 per year and forty hours per week) is available immediately. Applicants should send a complete resume and three letters of recommendation to *T. Moore, KY705865, Department for Employment Services, 300 South Upper Street, Lexington, KY 40508.*

PHYTOCHEMICAL SOCIETY OF NORTH AMERICA

Newsletter

Volume 31
Number 2

October 1991

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PSNA Advisory Committee

The **Phytochemical Society of North America** is a nonprofit scientific organization whose membership (currently over 400) is open to anyone with an interest in phytochemistry, the role of plant substances, and related fields. Annual membership dues are $20.00 for regular members and $10.00 for student members. Annual meetings featuring symposium topics of current interest and contributed papers by conference participants are held throughout the United States, Canada, and Mexico. A newsletter is circulated to members several times a year to keep them informed of upcoming meetings and developments within the Society.

If you would like additional information about the PSNA or if you have material to be included in the newsletter, please contact the Society secretary. Annual dues and changes in addresses should be sent to the Society treasurer.

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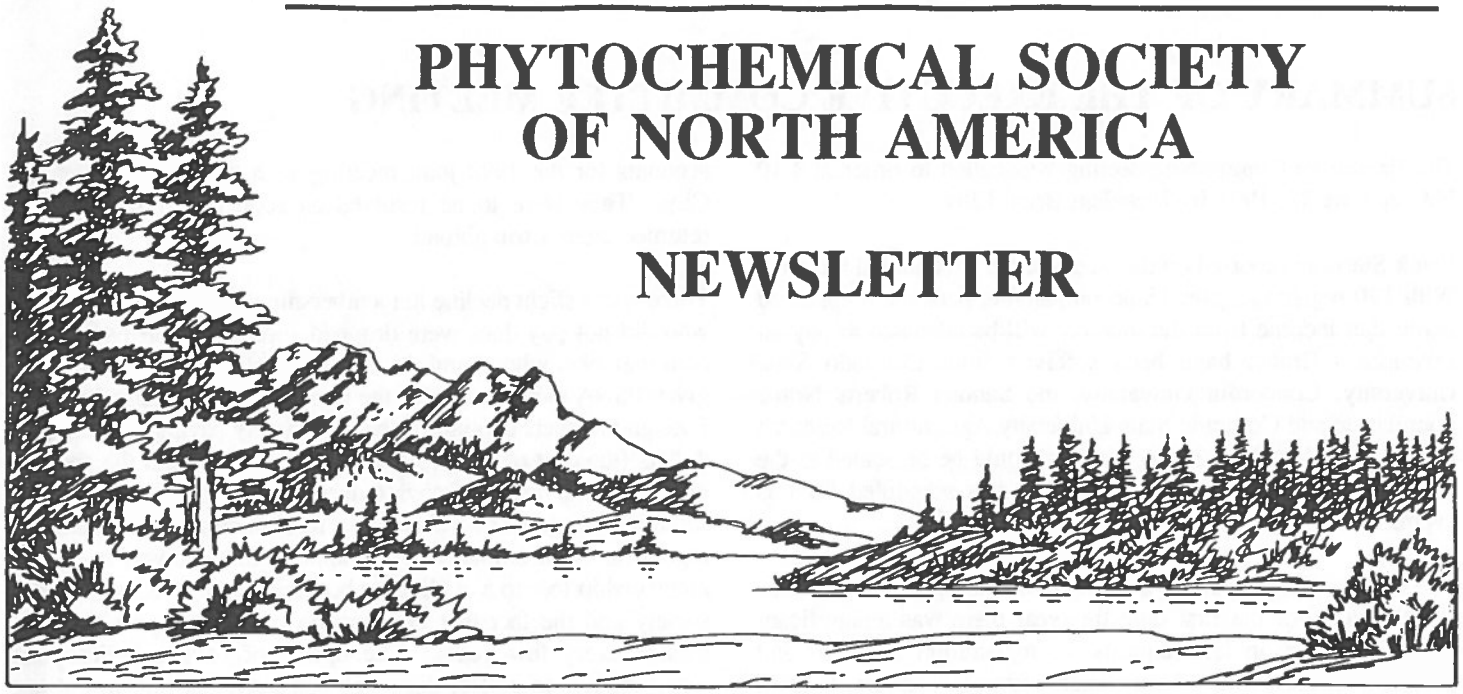


PHYTOCHEMICAL SOCIETY OF NORTH AMERICA

NEWSLETTER

OCTOBER, 1991 **VOLUME 31, NUMBER 2**

CONTENTS

SUMMARY OF THE EXECUTIVE COMMITTEE MEETING

The Executive Committee Meeting was called to order at 4:10 PM on June 22, 1991 by President Brian Ellis.

Frank Stermitz reported on the status of the 31st annual meeting. With 120 registrants plus 15 accompanying persons, it appeared likely that income from the meeting will be adequate to pay all expenses. Grants have been received from Colorado State University, Concordia University, the Samuel Roberts Noble Foundation and Colorado State University Agricultural Research Station. Student Best Paper Awards would be presented at the Banquet but no other society business was scheduled for this event.

The secretary reported that printing and mailing costs continued to escalate. For the first time this year there was a significant traffic via FAX in late requests for registration materials and program information. Many such requests (especially from overseas) are justified because postal systems are so slow. The summer issue of the Newsletter is usually forwarded to members at least four weeks prior to each meeting. The exact date of mailing depends on when program and abstracts are received form the meeting organizer(s). If information is needed earlier, a member may request the secretary or meeting organizer to FAX a copy of the program. However, the cost of Faxing is considerable ($2.00 per page in the U.S.). The executive committee approved a motion that in the future faxed programs be accompanied by a bill.

The PSNA brochures will be revised again this year because of the change in the office of Treasurer. This provides an opportunity to change color, format and graphics as well as the information on the form to be returned by new members. Suggestions for changes were requested.

The new format of the ballot mailing caused serious delays because of time needed to obtain biographical information and photographs. The quality of the photographs that appeared on the ballot mailing this year was poor because they were reproduced by xeroxing instead of being sent to the printer (which would have required an extra two weeks). Now that a format has been established, it is hoped that all those agreeing to run for office in the future will use the 1991 mailing as a model. Biographical information should be concise and a black and white photograph should be forwarded to the secretary as soon as possible.

Treasurer Kelsey Downum presented an interim report on PSNA finances and membership for 1990 and through 6/14/91. Figures for 1990 were audited by Jonathan Poulton and Murray Isman. Because of personnel changes at Plenum Press there was a delay in receipt of the 1991 royalty check for volumes of the *Recent Advances in Phytochemistry*. Statements arrived on time but a tax I.D. number had not been supplied. This difficulty had been resolved. There were still some questions concerning the accounts for the 1990 joint meeting with the ISCE at Quebec City. They were to be resolved as soon as Jeremy McNeil returned from a trip abroad.

There was a slight decline in membership this year because those who did not pay dues were dropped sooner than in past years. Non members who attend the annual meeting are automatically given PSNA membership for the remainder of the calendar year. Foreign members continue to have difficulty paying dues in U.S. dollars (the cost of the check is usually greater than the amount of dues). The option of paying dues for multiple years provides some savings (cost of a check in a foreign currency is the same regardless of the amount). There appears to be no way to charge membership fees to a credit card because of the small size of the society and the fact that the location of the treasurer tends to change every few years. The option of having a European representative to collect dues was discussed but this would not completely resolve the problem because of the many currencies involved. It was suggested that the treasurers of the PSE and the PSNA might collect dues from their own members for both societies and transfer the appropriate balance due once each year. This would make it easier and less expensive to join both societies. Members of PSE may subscribe to *Phytochemistry* at a reduced rate and the possibility of making this journal available to members of PSNA at a comparable rate was discussed. Kelsey Downum will investigate these options by contacting the PSE and Pergamon Press.

Kelsey pointed out that the society appears to be coming closer each year to expending all the $3000 that has been budgeted for student travel and raised the question of whether the amount budgeted for the joint meeting in Miami in 1992 should be increased. With $5000 already committed for travel from Europe (with special consideration for students) it was proposed that European graduate students request travel funds from the PSE while North and South American students send their requests to the meeting organizer. It was agreed to honor reasonable requests for up to 50% of economy class travel and to increase the size of the student travel budget as needed.

A new directory will be prepared in 1992. It will list editors-in-chief and advisory committee members in addition to PSNA officers. A constitutional change has been proposed to change the time for soliciting dues from members to the beginning of the fourth quarter for the next calendar year. Those who have not paid dues on time will be sent a single reminder at the end of the following first quarter. Details of this constitutional change will appear in the Newsletter and members will be able to vote on the change next spring. There was a discussion of the need for increased dues. All members of the executive committee agreed that the recent large increases in postal rates and printing costs and the probability that the joint meeting in Miami will run a sizeable deficit might jeopardize the continued financial health of the society. A modest increase in dues to $20 (regular) and $10

(student) would over several years provide the additional income to make up the projected deficit in the 1992 meeting. All agreed that this increase in dues be discussed at the Business meeting.

Editor-in chief Helen Stafford reported that the *Recent Advances in Phytochemistry Vol. 25, Modern Phytochemical Methods* went to press in early March, before the 15th deadline. This was accomplished in spite of a late (August) annual meeting and the delayed arrival (December 24) of one manuscript. All volume 25 manuscripts were submitted on disks. The cost of formatting manuscripts has increased with the change in minimum wage. Formatting requires as much time as retyping and costs are now paid by the hour rather than by the page. The possibility of renegotiating the contract with Plenum to insure an equitable reimbursement for editorial costs was discussed. Manuscripts submitted after the annual meeting remain a significant problem. Symposium speakers are informed that their transportation costs will be paid and that manuscripts are due at the time of the meeting. We urge speakers to order airline tickets early to obtain the best fares. Program organizers are informed about the manuscript deadline. Helen Stafford raised the possibility of withholding reimbursement for travel until the manuscript is delivered and questioned whether the program organizers or the PSNA treasurer should be responsible for reminding speakers of the relationship between manuscript delivery and travel reimbursement.

A further complication for this year's symposium was the threatened withdrawal of two symposium papers. Helen Stafford asked whether it would be appropriate to solicit additional manuscripts for the *Recent Advances in Phytochemistry* (perhaps from individuals giving papers on topics related to the symposium) to compensate for symposium speakers who cancel or do not submit manuscripts on time.

President Brian Ellis reminded the Executive committee that Geza Hrazdina will complete his term on the Advisory Committee this year and questioned whether there was support for continuation of this committee. All agreed that the Advisory Committee should be retained. Brian Ellis proposed that Jonathan Poulton be appointed to a four year term ending in 1995 and that Richard Mansell be appointed chairman of the Advisory Committee for the next year (both proposals were unanimously approved).

Kelsey Downum, organizer of the 1992 annual meeting at Miami, reported that accommodations would cost $55 per night per double room and that up to three persons per room would be accommodated for this price. The format of the August 8 to 13 meeting will be somewhat different from what has ordinarily been scheduled with symposium talks in the mornings, free afternoons and presented papers/posters in the evenings. A one day trip to Fairchild Tropical Gardens will include a catered lunch and two symposium talks in the auditorium at the gardens. A total of twelve speakers have accepted invitations to participate in the symposium.

Brian Ellis reported on plans for the 1993 annual meeting. It was not possible to arrange for a meeting at Banff (facilities were already booked). Asilomar was chosen as an alternative and Eric Conn has been asked to work with the Asilomar staff to arrange for on site organization and to initiate plans for the symposium. No symposium topic has yet been selected but several have been proposed. Brian Ellis suggested "Genetic engineering of secondary metabolism" but it was pointed out that this topic has already been chosen by the PSE for their 1993 spring meeting. Connie Nozzolillo proposed "Secondary metabolites as growth regulators" and Helen Stafford proposed "Alkaloids" as possible topics. Other suggestions would be appreciated and it was agreed that this be announced at the business meeting.

Possible locations and symposium topics for future meetings were discussed. Murray Isman suggested that it would be appropriate to again meet in Mexico and Helen Habermann suggested that Hershey, PA has excellent conference facilities and a major industry involved in aspects of the only suggested symposium topic: "Phytochemistry of foods and beverages". Jonathan Poulton reiterated his preference to return to Banff.

Brian Ellis reported that there had been no progress on the proposed Phytochemical Repository.

Jonathan Poulton reported on the PSNA election. There were only three responses to the call for nominations in the newsletter, a very disappointing lack of participation in the election process. However, 172 ballots were returned (albeit one blank). This participation of 43% of current members is considerably higher than in recent national elections in the US!. Jim Saunders is our new President-elect and Susan McCormick our new Treasurer.

There was no new business to discuss and the meeting was adjourned at 6 PM.

Respectfully submitted,

Helen M. Habermann, Secretary

MINUTES OF THE 31ST ANNUAL BUSINESS MEETING

The 1991 PSNA business meeting was called to order at 4:20 P.M. on June 25, 1991. President Brian Ellis called for approval of the minutes of the 1990 business meeting. Geza Hrazdina moved that the minutes be approved as published in the November, 1990 PSNA newsletter.

Secretary Helen Habermann reported the costs of printing increased moderately last year but postal rates went up considerably. The new format of the newsletter with smaller type resulted in considerable savings because fewer pages reduced both printing and mailing costs. She again reminded members that announcements of positions wanted and positions available are free. Information should be forwarded to the secretary by the beginning of October for the fall newsletter, January for the winter and June for the spring newsletter.

News about PSNA members can be included in the newsletter only if information is forwarded to the secretary. Input is needed for obituaries, reports of retirements, awards, overseas meetings attended or anything else of concern to members. If you learn of meetings that would be of interest to other phytochemists, please send information to the secretary so that they can be listed in the newsletter.

The use of FAX messages has increased this year. This has been helpful in providing last minute registration material for those coming from abroad. One telephone request for the meeting program to be sent via FAX was received on the same day that the summer newsletter was being prepared for mailing. The program was faxed at a cost of $16.00. The executive committee has recommended that in the future members requesting this service be billed for the costs.

New PSNA brochures will be printed again this year because of the change in Treasurer. Suggested changes in format, color and graphics would be welcome and should be forwarded to the secretary.

This year's new format in the election ballot delayed the election mailing. Members were reminded that biographical information should be brief and photographs should be in black and white. Biographical information and photographs should be forwarded to the secretary as soon as possible after candidates agree to run for office. The the speed of delivery of newsletters has been estimated by the time it takes for return of the few undeliverable copies from each mailing. They appear to be delivered in the U.S. within a few days. Please inform the secretary of problems with delivery. Suggestions for changes and improvements in the newsletter are always welcome.

Treasurer Kelsey Downum distributed copies of the PSNA 1991 interim financial report. Income from dues was down slightly for 1991 compared to 1990. The royalty check from Plennum has not been received because of a delay in forwarding the tax I.D. number, but when the check arrives it will add approximately $4600 to income. In 1991, 35 advance orders for *Recent Advances in Phytochemistry* Volume 25 were placed at the time of membership renewal. The price for these early orders turned out to be a real bargain--significantly less than the discounted cost to members after publication. Rental of the PSNA mailing list now costs $50 and produced several hundred dollars of income in the past year. Several items in the statement of accounts for the 1990 joint PSNA/ISCE meeting in Quebec City included in the interim financial report still had to be resolved and would be as soon as Jeremy McNeil returns from overseas. Half of the balance of funds remaining had been forwarded to the PSNA treasury. Jim Saunders questioned whether all royalties from the symposium volume would come to PSNA. John Romeo pointed out that a letter on file since the meeting was originally planned indicates that all royalties would come to the PSNA.

In the past year PSNA membership has decreased to approximately 400. The number of foreign members is up, but all other categories are down slightly. Usually new members are added from annual meeting registrants. This was not done automatically at the Quebec meeting because of the complications of two societies at the meeting. Geza Hrazdina suggested that the Tannin Society might be a source of new members for the PSNA because of common interests. It was agreed that PSNA brochures would be mailed to members of the Tannin Society if Geza could obtain their membership list.

Kelsey next listed a series of large expenses faced by the PSNA: In 1990 there was a net loss of $6800 because of the 1989 Vancouver meeting. In 1992 the joint meeting with PSE in Miami will have unusually high expenses: $5000 for travel expenses of PSE members; expenses for symposium speakers (1/3 from Europe, 1/3 North American, 1/3 Latin American); increased printing and mailing costs. In order that these unusual costs could be offset over several years, Kelsey proposed that the PSNA annual dues be increased to $20 (regular) and $10 (student). The motion was seconded by Jonathan Poulton. Jim Saunders stated that he could see no need for increased dues when there is a $50,000 balance in the treasury. Helen Stafford pointed out that it has become increasingly difficult to raise money for annual meetings. She had applied to almost 50 possible sources with no response. Ragai Ibrahim pointed out that the society's assets are not substantial enough to permit consumption of capital resources. Jonathan Poulton pointed out that although the balance in the treasury has increased gradually over the past years, its buying power has not changed. Geza Hrazdina stated that it is hard to justify raising PSNA dues to help another society (PSE). Norman Lewis pointed out that our dues are exceptionally low and approved the proposed increases to cover anticipated expenses. Kelsey emphasized that the increased dues would act as a cushion, offsetting anticipated costs over several years. The proposed increase will only slow the

anticipated drain on the treasury and it is a reasonable increase. Harold Nordby proposed that the PSNA should raise money by increasing the number of members and could see no purpose in raising dues. Jim Saunders stated that according to the constitution, PSNA dues are set by the Executive Committee and do not have to be discussed at the Annual Business Meeting. Kelsey stated that a minimum $50,000 cushion is essential for the financial survival of the society. Interest on this capital helps fund the PSNA and as interest rates decrease, amounts of annual interest will probably decrease as well. Jerry McClure moved that a straw vote would provide a sense of the opinions of at least a small number of the members. A show of hands indicated 17 in favor, 10 opposed and 3 abstentions.

Kelsey Downum, organizer of the 1992 meeting, reported that arrangements have been completed with the Hotel Duval in Miami Beach. The room rate will be $55 per night for up to three people. This rate will be honored for the time of the meeting plus three days before and three days after. Amenities include a salt water pool, 1000 feet of beach, tennis and golf. One free room for PSNA use will be provided for each 50 rooms booked. There will be no charge for meeting rooms and the hotel will cater the banquet. Most of those invited to participate in the symposium have accepted and there will be an international representation from Europe, North and South America. The dates of the meeting, August 8th to 13th, are one week later than originally announced to avoid conflict with the ASPP. Harold Norbly requested that the scheduling of registration for next year's meeting be changed so that late arrivals can be registered during the time of the reception.

Brian Ellis announced that the 1993 PSNA meeting would be held in June at Asilomar with Eric Conn acting as local organizer. Suggested topics for the symposium are "Plant secondary metabolites as plant growth factors" and "Genetic engineering of plant secondary metabolites." Brian suggested that other suggestions be sent to him. Vernon Singleton proposed that an aspect of "Applied Agriculture" or "Secondary Metabolites and Food" be selected as the symposium topic.

Brian Ellis said that this had been suggested as a topic for 1994. Norman Lewis proposed the topic of "Plant Signaling".

Brian Ellis announced changes in the PSNA Advisory Committee. Geza Hrazdina's term is ending and this position will be filled for the next five years by Jonathan Poulton.

Jonathan Poulton announced the 1991 election results: James Saunder is the new President-Elect and Susan McCormick our new Treasurer.

Brian Ellis thanked Frank Stermitz and Susan Martin for their excellent job in organizing the Fort Collins meeting. He then turned over the office of President of the PSNA to Murray Isman. Murray thanked Brian for his excellent job as president of the society.

In response to the call for new business, J.T. Arnason reported that closure of the Natural Products Section, Health and Welfare Canada had resulted in loss of work for 15 scientists. He requested a letter be sent by the PSNA president to the Canadian government protesting this move. Jim Saunders expressed his sympathy about the situation but was apprehensive about getting involved in a political situation and proposed that a note be included in the PSNA newsletter. Arnason questioned whether the society shouldn't be more politically involved. Eric Conn thought that involvement is appropriate. Saunders again moved that information about the laboratory closure be included in the newsletter. Arnason stated that the decision about this laboratory is final but that letters could embarrass the Canadian Government into not closing additional laboratories.

At 5:25 P.M. it was moved and seconded that the meeting be adjourned.

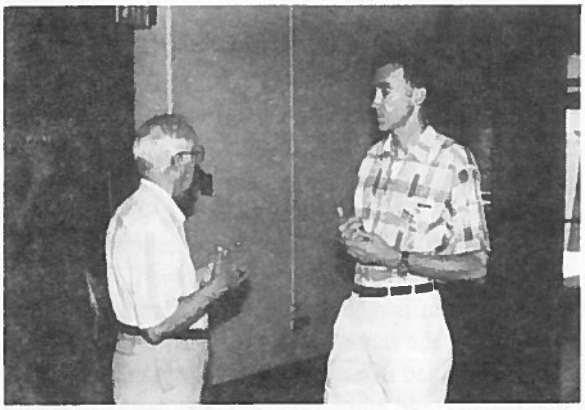
Respectfully submitted,

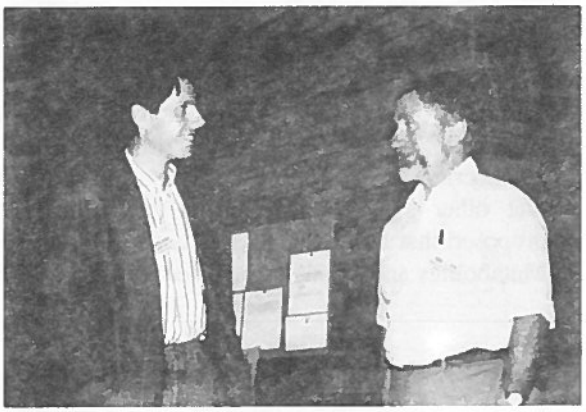
Helen M. Habermann

ROYALTIES - *Recent Advances in Phytochemistry* Volumes 13-24

Volume	1986	1987	1988	1989	1990	#Sold	Total Royalty
13 Swain/Waller	24.79	24.48	9.08	2.70	3.00	838	2010.31
14 Swain/Kleiman	33.21	46.82	19.29	7.51	6.59	760	1904.17
15 Loewus/Ryan	59.50	91.30	53.08	13.62	3.56	895	3377.10
16 Creasy/Hrazdina.	45.46	78.97	59.35	15.05	34.23	851	3101.51
17 Nozzolillo et al.	124.45	182.23	95.11	45.17	22.43	753	3156.51
18 Timmermann et al.	355.90	329.84	183.15	42.72	76.10	808	3866.32
19 Cooper-Driver et al.	404.34	347.30	194.17	80.20	84.51	757	3220.29
20 Conn	2640.23	280.77	234.50	114.53	85.58	636	3491.39
21 Saunders et al.		2287.89	135.60	102.36	49.56	515	2574.41
22 Conn			2236.98	339.61	158.14	571	2734.73
23 Poulton et al.				3566.17	683.34	534	4249.51
24 Towers et al.					2898.08	437	2898.08

PSNA ANNUAL MEETING CENTERFOLD





FORT COLLINS, CO. JUNE 22-26, 1991

TRAVEL AWARD WINNERS

During the PSNA banquet at the University Park Holiday Inn on Tuesday, June 25, 1991, the following 15 graduate students and post-docs received travel awards. Amounts ranged from $150 to $287 and a total of $2,759 was spent of the $3,000 allocated for such awards to encourage participation of young phytochemists to participate in our annual meeting.

Mark A. Bernards
Institute of Biological Chemistry
Washington State University
Pullman, WA 99164

Malcolm M. Campbell
Dept. of Chemistry and Biochemistry
University of Guelph
Guelph, Ontario N1H 2W1, Canada

Thomas L. Eberhardt
Institute of Biological Chemistry
Washington State University
Pullman, WA 99164

Mark Gijzen
Institute of Biological Chemistry
Washington State University
Pullman, WA 99164

Langfang He
Institute of Biological Chemistry
Washington State University
Pullman, WA 99164

Maria Estela Inciong
Department of Forest Products
Virginia Polytechnic Inst.& State Univ.
Blacksburg, VA 24061

Chun-Ping Li
Department of Botany
University of Iowa
Iowa City, IA 52242

Eric S. McCloud
Department of Entomology
University of Illinois
Urbana, IL 61801

Timothy C. Morton
Department of Biology
University of South Florida
Tampa, FL 33620

Karin E. Readel
Department of Plant Biology
University of Illinois
Urbana, IL 61801

Brett J. Savary
313 Wartik Laboratory
Pennsylvania State University
University Park, PA 37802

Yuejin Sun
Department of Food Science
Cornell University
Geneva, NY 14456

Elisabeth Swain
Department of Botany
University of Iowa
Iowa City, IA 52242

Lee Swain
Department of Biological Sciences
Florida International University
Miami, FL 33199

Sally Van Wert
USDA, ARS
Biotechnology Laboratory
Beltsville, MD 20705

REPORT ON THE STATUS OF THE PSNA ARCHIVES

The PSNA archives, a collection of symposium volumes, newsletters, directories, annual meeting programs, correspondence, and miscellaneous documents was begun several years ago by George Wagner. It is in the possession of the PSNA secretary and an effort has been made to complete the collection. After recent donations from Eric Conn our set of the *Recent Advances in Phytochemistry* series lacks only volume 6 on *Terpenoid Chemistry and Biochemistry*, Academic Press, based on the symposium held in Monterey, Mexico in 1971. Of the earlier un-numbered, spiral-bound, soft cover volumes, only the last, *Phenolic compounds and metabolic regulation* based on the 1965 meeting in Albany, California is missing. There appear to be many more gaps in the newsletter collection. The earliest is a single page issue of *The Phytogram* dated April, 1970. The complete file of newsletters begins with the January, 1972 issue.

Anyone who has either of the two missing symposium volumes or copies of early newsletters is urged to donate them to the archives. We have considered the possibility of collecting a second set of symposium volumes (perhaps kept by the editor-in-chief) so that there can be some assurance that these scientifically and historically valuable documents will not be lost because of some local disaster. With more than one copy in the society's possession, the symposium volumes could also be borrowed, possibly an important use of the archives when many of the earlier symposium volumes are out of print. Recently, newsletters from the archives were used by Stewart Brown to write a history of PSNA's first 30 years. Stewart was able to borrow a set of newsletters because a second (almost as complete) set was in reserve.

Anyone nearing retirement or clearing out bookshelves who finds early PSNA symposium volumes (especially the last of the spiral bound volumes and Volume 6 from Academic Press), or early newsletters (prior to 1972) is urged to contact the secretary to arrange transfer. Anyone in possession of the above symposium volumes who is unwilling to part with them but agrees to will them to the society should inform the secretary of his or her intent.

INDIAN SOCIETY OF ALLELOPATHY REQUESTS REPRINTS AND INVITES ACTIVE ALLELOPATHY SCIENTISTS TO JOIN ISAL

An allelopathy Data Base has been established at the Haryana Agricultural University, India. Members of the PSNA who have published work on allelochemicals or have reprints of work by other investigators are asked to donate originals or photocopies. This collection will be made available at cost to ISAL members. Scientists in many undeveloped and developing countries do not have access to the literature in their fields and the Data Base will make publications available at minimal cost.

The Indian Society of Allelopathy, formed in July, 1990, intends to launch two publications in the near future, a research journal and a newsletter. Its first national symposium, "Allelopathy in Agrosystems (Agriculture and Forestry)" will be held at Haryana University, February 12-14, 1992 (see Meetings and Programs of Interest). The ISAL membership is open to all scientists and students of allolopathy. Membership for those from countries other than India is U.S. $15.00. Those wishing to donate reprints to the ISAL allelopathy data base or to join the ISAL should contact Prof. S.S. Narwal, Secretary, Indian Society of Allelopathy, Department of Agronomy, Haryana Agricultural University, Hisar - 125004, INDIA.

POSITIONS AVAILABLE

THE AGRICULTURE CANADA RESEARCH STATION, SASKATOON. VISITING FELLOWSHIP IN PLANT CELL AND MOLECULAR BIOLOGY. A Visiting Fellowship to characterize vacuolar membranes responsible for the expression of flavonoid gene products in plants is available immediately. The successful candidate will join a multidisciplinary team focused on the genetic engineering of forage legumes for quality and pest resistance. We require a highly motivated individual with a recent PhD (within 5 years), and strong experience in plant cell biology and biochemistry. Annual stipend is $32,239 Cdn. The Agriculture Canada Research Station is located on the University of Saskatchewan campus, together with other federal and provincial research establishments. Saskatoon is a major centre for plant biotechnology and agricultural research in Canada. Interested candidates must fill out a "Visiting Fellowship in Government of Canada Laboratories" application form (available at Canadian university graduates offices or from Visiting Fellowships Office, NSERC, 200 Kent Street, Ottawa, Canada K1A 1H5). Candidates should indicate their skills and publications in a covering letter or curriculum vitae, and submit 2 letters of reference to: *Dr. Margaret Y. Gruber, Agriculture Canada, Research Station, 107 Science Crescent, Saskatoon, Saskatchewan S7N 0X2, Tel (306) 975-7014, FAX (306)242-1839*

UNIVERSITY OF KENTUCKY, LEXINGTON. POSTDOCTORAL FELLOWSHIP OR VISITING SCIENTIST IN PLANT PHYSIOLOGY/BIOCHEMISTRY/MOLECULAR BIOLOGY. A position is available to isolate and study enzymes associated with formation and secretion of diterpene and sugar ester compontents of trichome exudate. Our focus is to understand the metabolic potential of secretory glands and identify metabolic steps which might be manipulated to increase pest resistance properties of exudate. Send letter of application, vitae, and names of three references to *G. Wagner, Department of Agronomy, University of Kentucky, Lexington, KY 40546-0091. Phone 606-257-5974.*

CLOSURE OF THE NATURAL PRODUCTS SECTION, HEALTH AND WELFARE CANADA

Health and Welfare Canada has decided to close its natural products section (at the Banting Research Centre, Ottawa) as a cost-cutting measure, resulting in the loss of employment for 15 scientific staff. This research group headed by Dr. D.V.C. Awang was internationally recognized for its work on the phytochemistry and regulation of medicinal plants. Those of you who would like to protest the closure of this research group should address letters to:

The Honorable Benoit Bouchard
Minister of Health & Welfare Canada
House of Commons
Ottawa, Ontario, CANADA K1A OC3

ERIC E. CONN HONORED BY ASPP

At the 1991 Annual Meeting, of the American Society of Plant Physiologists, the Charles Reid Barnes Life Membership Award was presented to Eric Conn, University of California, Davis, for meritorious work in plant physiology. Dr. Conn is a past president of both the ASPP and the PSNA. He has also been elected to life membership in the PSNA and served as Editor-in-Chief for volumes 19-23 of the *Recent Advances in Phytochemistry.*

NEW PSNA MEMBERS

The following are new members of the society. We welcome your participation in society business and at PSNA meetings.

Abebe, Shewangizaw
Dept. of Biology, Carleton Univ.
Ottawa, ONT K1S 5B6
CANADA

Awang, Dennis
Health and Welfare Canada
Ottawa, ONT K1A 0L2
CANADA

Becard, Guillaume
USDA-ARS
Eastern Regional Research Ctr.
Philadelphia, PA 19118

Bernard, Claude
254 Smyth Rd.
Ottawa, ONT K1H 5A2
CANADA

Bezuidenhoudt, Barend C.B.
Dept. of Chemistry
Univ. of the Orange Free State
Bloemfontein, 9300
SOUTH AFRICA

Borejsza-Wysock, Wlodzimierz
Inst. of Food Science
Cornell University
Geneva, NY 14456

Brandt, E. Vicent
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Bloemfontein, 9300
SOUTH AFRICA

Brodelius, Peter E.
Dept. of Plant Biochemistry
University of Lund
Lund S-22007
SWEDEN

Burton, Jim
Dept. of Hort. Science
North Carolina State University
Raleigh, NC 27695

Cronje, Annemarie
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University of British Columbia
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CANADA

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Johnston, IA 50131

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Washington State University
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Gennity, Ingrid
Analytical Dev. Corp.
Colorado Springs, CO 80907

Goers, Steven
General Foods USA
White Plains, NY 10625

Grandmaison, Jacques
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Montreal, PQ H3G 1M8
CANADA

Hashidoko, Yasuyuki
JRDC Mizutani Plant Eco. Proj.
RPB Bldg. Kita 3, Megumino
Eniwa 061-13
JAPAN

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Herman, Zareb
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Pasadena, CA 91106

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Kodama, Osamu
Fac. of Agriculture
Ibaraki University
Ami, Abaraki 300-03
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Iowa State University
Ames, IA 50011

Koupaei, Mahammed R.
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University of West Indies
TRINIDAD, WEST INDIES

Latha, W. Madhu
High Polymer Lab
Central Leather Research Inst.
Adyar, Madras - 600020
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Seattle, WA 98195

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Ardmore, OK 73402

McCallum, John
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McCloud, Eric S.
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Univ. of Illinois
Urbana, IL 61801

Mole, Simon
348 Manter Hall
University of Nebraska/Lincoln
Lincoln, NE 68588-0118

Nevshemal, Tony
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Iowa City, IA 52242

Paiva, Nancy
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Payne, Lori
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Baton Rouge, LA 70803

Peiser, Galen
1SK Mt. View Research Center
Sunnyvale, CA 94087

Phillips, Donald A.
Agronomy/Range Science
University of California
Davis, CA 95616

Rasmussen, James A.
Dept. of Biology
Mount Marty College
Yankon, SD 57078

Robbs, Steven L.
P.O. Box 20861
Baton Rouge, LA 70894

Schroeder, Daniel R.
Bristol-Meyers Squibb Company
Wallingford, CT 06492

Slindee, Kathy
MAF Tech. Hort. Res. Ctr.
Private Bag, Levin
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Steynberg, Jan P.
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Univ. of the Orange Free State
Bloemfontein, 9300
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Strunz, George
Forestry Canada - Maritimes
Fredericton, NB
CANADA E3B 5P7

Tahara, Satoshi
Dept. Ag Chem., Fac. of Agric.
Hokkaido University
Sapporo 060 JAPAN

Varin, Luc
Biology Dept., Concordia Univ.
Montreal, PQ H3G 1M8
CANADA

Vaughn, Steven
USDA,ARS
Natl. Center For Ag. Util. Res.
Peoria, IL 61604

Weaver, Lisa
Los Alamos National Lab.
Los Alamos, NM 87545

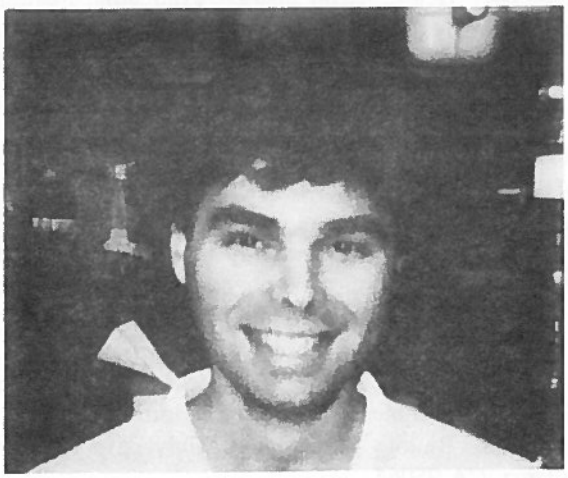
Werenko, Timothy J.
U.S. Air Force Academy
QTRS. 4409B
USAF Academy, CO 80840

Whetten, Ross
Dept. of Forestry
North Carolina State University
Raleigh, NC 27695

Wu, Qindong
666 West North Street
Cornell University
Geneva, NY 14456

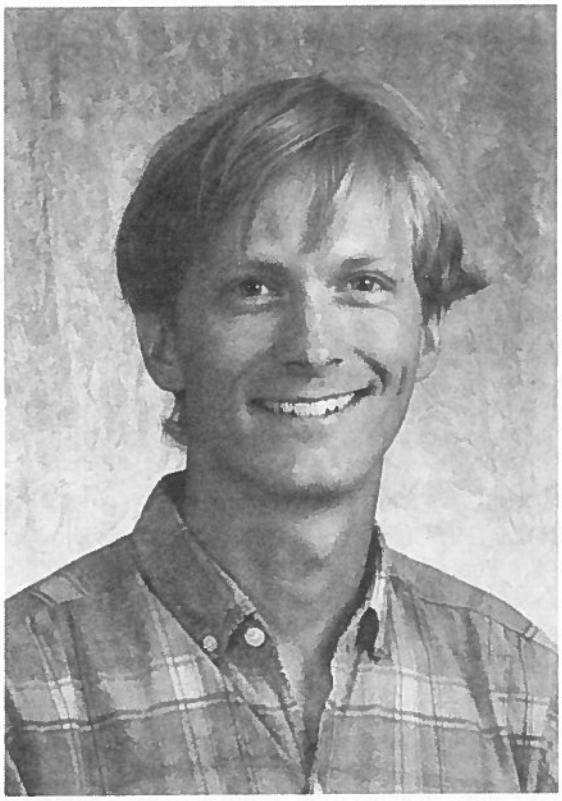
BIOGRAPHIES OF BEST STUDENT PAPER AWARD WINNERS

MARK ANTHONY BERNARDS received his B.Sc. (Agr) from the University of Guelph, Guelph ON, in 1985. Mark continued his studies at the University of Guelph as a graduate student in the lab of Dr. Brian E. Ellis, and received his Ph.D. (Biochemistry) in the spring of 1991. Mark's Ph.D. research



focussed on the establishment and characterization of an *in vitro* co-cultivation system to study the interaction between cell cultures of tomato and the vascular wilt pathogen *Verticullium albo-atrum*. Once the co-cultivation system was established, he demonstrated the de novo synthesis and deposition of cell wall-bound phenolic metabolites in the tomato cell cultures in response to *V. albo-atrum challenge*. The key phenylpropanoid metabolism enzyme phenylalanine ammonia-lyase was shown to be induced in fungal -challenged tomato cell cultures and was subsequently purified and characterized. Mark has recently started his post-doctoral work with Dr. Norman G. Lewis at Washington State University where he continues to pursue his interest in stress induced changes to plant cell wall architecture, and the role of inducible enzymes involved in the process. The focus of his present work is on the biosynthesis of suberin precursors in wounded potato tuber disks.

MARK GIJZEN received both his B.Sc. and M.Sc. degrees in Biochemistry from the University of Saskatchewan, in 1986 and 1988 respectively. His Master's research, under the supervision of Dr. D. Ian McGregor at the Agriculture Canada Research Station in Saskatoon, focused on the accumulation of glucosinolates in rapeseed embryos. Mark is currently completing his Ph.D. in Biochemistry in the laboratory of Dr. Rodney Croteau, at the Institute of Biological Chemistry,



Washington State University, Pullman. His work at WSU on monoterpene biosynthesis in conifer species was the subject of his presentation at the Ft. Collins meeting.

SUMMARY OF PSNA MEMBERSHIP, 1979-1991

Year	Total Membership	USA	CANADA	FOREIGN	STUDENTS
1979	290	241	34	32	17
1980	315	245	36	34	29
1981	344	270	37	37	41
1982	364	278	46	40	46
1983	358	264	49	45	*
1984	367	273	52	42	38
1985	373	282	50	41	31
1986	359	279	40	40	38
1987	334	258	42	34	35
1988	391	297	49	45	51
1989	411	317	43	51	53
1990	425	311	64	50	53
1991	403	294	57	52	45

*Data not available

MEETINGS AND PROGRAMS OF INTEREST

ALLELOPATHY IN AGROSYSTEMS (AGRICULTURE AND FORESTRY): Haryana Agricultural University, Hisar - 125004, India, February 12-14, 1992. The symposium aims to bring together active allelopathy researchers from underdeveloped, developing and developed countries to highlight the status of allelopathy, review progress, project future goals and to identify constraints, so as to provide momentum to this important field or research. Registration forms should be returned by October 15 (contact PSNA secretary for announcement and registration form via FAX). For further information, contact Dr. Shamsher S. Narwal, Organizing Secretary and Secretary ISAL, Department of Agronomy, Haryana Agricultural University, Hisar - 125004, Haryana, India. (Tel. 01662-3721, Ext. 4268; TELEX 346242 HAVIN).

PHYTOCHEMICAL SOCIETY OF NORTH AMERICA: Miami Beach, FL, August 8-13, 1992. The symposium topic will be "Phytochemical Potential of Tropical Plants." For further information contact Dr. Kelsey R. Downum, Department of Biological Sciences, Florida International University, Miami, FL 33199 (Tel. 305-348-3419; FAX 303-348-1986).

FIFTEENTH ANNUAL SYMPOSIUM IN PLANT PHYSIOLOGY: University of California, Riverside. January 9-11, 1992. Perspectives of Plant Carbon and Water Relations from Stable Isotopes. Sessions include: Isotope Effects on Plant Processes; Environmental Effects on Carbon Isotope Discrimination and Water Use Efficiency in C_3 Species; Breeding for Water-Use Efficiency in C_3 Species; Interpreting Plant Hydrogen and Oxygen Isotopic Composition; Concluding Remarks on Interactions between Water Source and Water Use in Desert Plants: Insights from Multiple Stable Isotope Analysis. The symposium is limited to 175 persons. A fee of $25 (non-students) or $10 (students) will cover registration and a luncheon on Saturday, January 11. For more information and application for registration and posters, contact Cindi McKernan, Department of Botany and Plant Sciences, University of California, Riverside, CA 92521. (Tel. 714-787-3423; FAX 714-787-4437).

KEYSTONE SYMPOSIUM ON MOLECULAR AND CELLULAR BIOLOGY: Keystone, Colorado. April 10-16, 1992. This symposium, entitled "Crop Improvement via Biotechnology: An International Perspective" is sponsored by Monsanto Co., Schering Corp. and Warner-Lambert Co. For complete program and application forms, please contact: Keystone Symposia, Drawer 1630, Silverthorns, CO 80498. (Tel. 303-262-1230; FAX 303-262-1525).

SECOND WORKSHOP ON SULFUR NUTRITION AND SULFUR ASSIMILATION IN HIGHER PLANTS: Garmisch-Partenkirchen, Germany. April 21-25, 1992. This workshop will provide an overview of the present understanding of sulfur uptake, assimilation, and metabolism with special emphasis on regulatory aspects, interactions with nitrogen metabolism, agricultural and environmental aspects. For further information contact Dr. Heinz Rennenberg, Fraunhofer-Institute for Atmospheric Environmental Research, Kreuzeckbahnstr. 19, D-1800 Garmisch-Partenkirchen, Germany. (Tel 0-8821-183120; FAX 0-8821-73573).

NINTH INTERNATIONAL WORKSHOP ON PLANT MEMBRANE BIOLOGY: Monterey, California. July 19-24, 1992. This meeting offers workers in the field of plant membrane transport the opportunity to interact and share new results on membrane transport phenomena. Contributions are invited from those working in related areas of membrane biology such as sensory perception and signal transduction. Main sessions will be held in the Steinbeck Forum Theater with housing at an adjoining hotel. For more information contact Dr. Lincoln Taiz, Biology Department, University of California, Santa Cruz, CA 95064.

XV INTERNATIONAL BOTANICAL CONGRESS: Tokyo, Japan, August 28-September 3, 1993. The scientific program will include about 240 symposia and more than 1,000 posters in the following divisions: 1. Systematics and Evolution, 2. Structure and its Dynamics, 3. Phytochemistry and Natural Products, 4. Metabolism and Bioenergetics, 5. Developmental Botany, 6. Ecology and Environmental Botany, 7. Genetics, 8. Biotechnology and Breeding. For further information, contact the Congress Secretariat, XV International Botanical Congress Tokyo, c/o Department of Botany, Faculty of Science, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113, Japan.

IXTH INTERNATIONAL CONGRESS ON PHOTOSYNTHESIS: Nagoya, Japan, August 30-September 4, 1992. For further information, contact Prof. Noria Murata, Secretariat, IXth International Congress on Photosynthesis, National Institute for Basic Biology, Ozaki 444, Japan. (Phone/Fax 81 (JAPAN) 564-54-4866).

ENVIRONMENTAL STRESS AND REGULATION OF CARBON METABOLISM: Kashikojima, Mie, Japan. September 5-7, 1992. This satellite symposium will be held immediately after the 9th International Congress on Photosynthesis at Kashikojima on Ago Bay in Iseshim National Park. Its aim is an intense and informal exchange of information and ideas on the regulation of carbon metabolism in plants both under environmental stress and non-stressed conditions. For information contact Dr. H. Usuda, Laboratory of Chemistry, Faculty of Medicine, Teikyo University, Ohtsuka, Hachioji, Tokyo, Japan 192-03. (Tel. 0426-76-8211, ext. 252; FAX 0426-749190).