



*Société Phytochimique de
L'Amérique du Nord*

*Sociedad Fitoquímica de
América del Norte*

Newsletter

● Volume 40, Number 1 ● March 2000 ●

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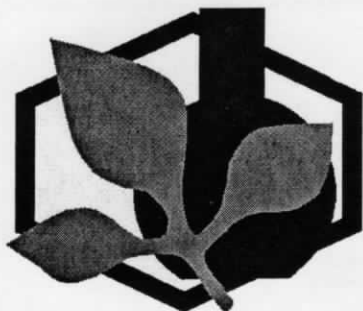
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Dr. Jonathan Poulton (2003)

PSNA Newsletter

Editor: **Dr. W. Dennis Clark**



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 and the role of plant substances in related fields. Annual membership dues are U.S. \$20 for regular members and \$10 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. Still a specialist organization despite its broadened interests, PSNA meetings are small enough to offer informality and intimacy that are conducive to the exchange of ideas. 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 PSNA Secretary. Annual dues and changes in addresses should be sent to the PSNA Treasurer. Also see the PSNA homepage, currently at: <http://ls.la.asu.edu/psna>.

Table of Contents

From the Editor (Book Review)	1
Research Summary: Carlos Céspedes A.	2
1999 Montreal Meeting Financial Report	3
New Publisher for <i>Recent Advances in Phytochemistry</i>	4
PSNA 2000: Announcement and Program Summary.....	5
PSNA 2000 Forms (Registration, Abstracts, Hotel, Guest)	10
Ordering Information, <i>Recent Advances in Phytochemistry</i>	12
PSNA Membership Application	(Inside Back Cover)

From the Editor

The discipline of phytochemistry has always been blessed with an abundance of books devoted to all classes of plant natural products. Only once in a while, however, comes a book that attempts to cover them all at once. Our expanding knowledge base of so many different structures seems to preclude such coverage. Nevertheless, David S. Seigler has accomplished the goal of putting an excellent breadth of all significant classes of natural products into one volume, *Plant Secondary Metabolism* (1998, Kluwer Academic Publishers).

Anyone can tell at first glance that this book contains a higher density of information than most others, if only because the small font size might require special reading glasses (or, as with me, a step up in magnifying power from the ones I already had). Nevertheless, the printed structures are very sharp and well-done overall.

Chapter 1 presents the best introduction that I have seen to

secondary metabolism in any book. Seigler provides nice commentaries on the origin of secondary pathways and several views, both historical and current, on the functions of secondary metabolites.

After the introductory chapter comes an excellent overview of fatty acids (Chapter 2), including the expected information on common examples as well as full discussions about unusual structures. Chapters 3-5 follow logically in subject matter, including coverage of acetylenic compounds, plant waxes, and polyketides. My favorite part of the book comes next, in the coverage of aromatic compounds (Chapters 6-12), highlighted by a full chapter on flavonoids (Chapter 11). I was pleased to see that every single class of flavonoids was included.

The "minor" secondary metabolites (non-protein amino acids, peptides, carbohydrates, cyanogenic compounds, glucosinolates) each occupied a chapter, but the bulk of the book is

devoted appropriately to the most diverse classes, the terpenoids (Chapters 18-26) and the alkaloids (Chapters 27-37). In all, these comprise an excellent primer on both of these extensive groups of natural products.

Throughout the book, one of the most valuable features is the literature cited at the end of each chapter. The value of this resource cannot be overstated, because Seigler has done much of the footwork for the reader in selecting the key papers for each topic.

Seigler's book is already the gold standard, since it is the latest and best effort covering the full subject of phytochemistry at the level of the organic chemistry of natural products. It is a must handbook for everyone. The only obvious criticism that I can think of is its price: \$460! In time, we can only hope that everyone's respective library will buy it (like mine did) or that Kluwer will come to its senses and bring the price down to a reasonable level for everyone else (not likely).

RESEARCH REPORT

Dr. Carlos Céspedes A.
Instituto de Química
Facultad de Química, UNAM
C.P. 04510, MEXICO D.F.
Uaem, Cuernavaca, MEXICO



I graduated from the Pontificia Universidad Católica de Chile with a Bachelor of Science (Chemistry mention) in 1982, then obtained a Masters degree (1988) and Ph.D. degree (1994) from the Universidad de Concepción, Concepción City, Chile. My graduate work was under the guidance of Prof. Mario Silva O. as my major advisor. My first post-graduate position was at the Universidad de La Frontera, Temuco City, Chile. In 1996 I was transferred to Mexico City for a postdoctoral position in the Instituto de Química at the UNAM, where I was named Associated Researcher in 1999.

My general field of interest first included the monoterpene indole alkaloids (specially Aristotelia type) from *Aristotelia* (Elaeocarpaceae), and loline alkaloids from *Festuca* and *Lolium* (Poaceae) genera (Céspedes, et al., *Phytochemistry*, 29, 1354-1356, 1990.; Céspedes, et al., *Phytochemistry*, 34, 881-2, 1993.; Silva, et al., *Rev. Latinoamer. Quím.* 24, 85-92, 1996.; Silva, et

al., *Bol. Soc. Chil. Quím.* 42, 39-47, 1997.).

My current main research interest is in plant-plant and plant-insect interaction. Most recently (1997 to the present), I have undertaken the study of plants belonging to the Meliaceae and Asteraceae families endemic from Mexico, specially from the *Cedrela*, *Swietenia*, *Guarea*, *Trichillia*, *Cosmos*, *Parthenium*, *Ageratina*, *Baccharis*, *Tagetes*, *Titonia*, and *Stevia* genera searching for bioactive secondary metabolites. From *Cedrela spp* (Meliaceae), we have isolated several nortriterpenoids with limonoid skeleton from which we have findings with allelopathic and insecticidal activities (Céspedes et al., *J. Agric. Food Chem.* 46, 2810-2816, 1998; Céspedes et al., *J. Chem. Ecol.* 25 (12), 2665-2676, 1999; Céspedes et al., *Bol. Soc. Chil. Quím.* 44, 173-183, 1999; Céspedes et al., *J. Agric. Food Chem.* (in press), 2000). From *Ageratina spp*, *Cosmos spp* and *Gutierrezia spp*, we have isolated several chromenes which are now under biological evaluation as

insect antifeedants and as allelopathic compounds ("Allelopathic activity of endemic *Cosmos spp* (Asteraceae) from Mexico; Céspedes et al., Keystone Symposia, Taos, NM, February 2000). From *Parthenium argentatum* we isolated argentatins with triterpenoids structures, which have been shown to have insecticidal activity (Céspedes et al., *J. Agric. Food Chem.*, (Submitted), 1999). I am also working on the isolation and structural determination of secondary metabolites from various genera of South American origin, specifically from the Celastraceae and Podocarpaceae families (Céspedes et al., *Rev Latinoamer. Quím.*, 27 (2), 41-50, 1999; "Insecticidal activities of agarofurans from *Maytenus disticha* (Celastraceae)," Céspedes et al. Spring 2000 ACS National meeting, San Francisco, March 2000). Finally, another research area is involves the antioxidant activities of natural products. In this regard I am interested in the Asteraceae family, some species of which are used as food or in Mexican traditional medicine.

1999 Montreal Meeting Financial Report

condensed from detailed report submitted to C. McIntosh by R. Ibrahim

Receipts:

Advance from PSNA	\$ 5000.00
Registration and dues	13530.00
Sponsorships	7400.00

TOTAL	\$25930.00
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Expenditures:

Speaker Travel	\$ 4700.00
Speaker Hotel	3823.00
Student Travel Awards	1000.00
Meeting Room Rent	429.00
Supplies	260.00
Programs	609.00
Wages (temp. workers)	250.00
Banquet/meals/refreshments	8678.00
Misc.	430.00
Dues forwarded to PSNA	330.00
Refund to PSNA	5421.00

TOTAL	\$25930.00
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COST TO PSNA:

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Best Paper/Poster Awards	\$ 500.00

Expenditure total:	\$ 5500.00
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New Publisher for *Recent Advances in Phytochemistry*

Volume 34 of *Recent Advances in Phytochemistry - Evolution of Metabolic Pathways* - and the next 4 volumes of our series will be published by Elsevier Science Ltd. Our long-term publisher, Plenum-Kluwer, presented the Executive Committee with a proposed contract that was unfavorable on several fronts. When we were unable to reach agreement by compromising on many issues, we entered serious negotiations with Elsevier. In addition to publishing our official journal *Phytochemistry*, Elsevier is associated with many other prestigious scientific series that include *Alkaloids, Chemical and Biological Perspectives; Comprehensive Natural Products Chemistry*; and the journals *Heterocycles, Carbohydrate Research*, and *Il Farmaco*.

The world of publishing has changed considerably. In order to assure publication of symposium volumes, essentially all publishers now require "up front" bulk orders that guarantee a certain number of sales. In-house formatting, a fairly recent development, has reverted to "copy-ready" material. This means more work for editors. Royalty percentages have dropped. Volume prices have risen sharply. Many libraries have cut their budgets for Symposium volumes.

Elsevier's terms are generous to the Society. They were happy to associate with us, have assigned an experienced publishing editor to our volumes, and anticipate a long-term relationship. PSNA members retain generous discounts on all our volumes (40%). Please consider ordering Volume 34 in advance now by

mailing the order form below to our Treasurer, Cecilia McIntosh, as soon as possible. In this way you help the Society by assuring that we meet our bulk order obligation. If your library does not subscribe to *Recent Advances in Phytochemistry*, perhaps you can suggest that they do.

It is a major accomplishment for a group of our size to have published for 34 years now a major scientific contribution on an annual basis. We are looking forward to continuing this tradition with Elsevier. Do what you can to help us market our books.

John Romeo
Editor-in-Chief
Recent Advanced in Phytochemistry

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PSNA 2000

Regulation of Phytochemicals
by
Molecular Techniques

A joint meeting of the Phytochemical Society of North America
and the Mid-Atlantic Plant Molecular Biology Society

August 6-10, 2000

Beltsville Agricultural Research Center
Beltsville, MD U.S.A.

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SYMPOSIUM PRESENTATIONS

- KEYNOTE SPEAKER: Virginia Walbot
Stanford University, Stanford, CA -U.S.A.
Genomics: Tools for Maize Gene Discovery
- Birger Moller, Royal Veterinary & Agricultural University, Copenhagen, Denmark
Acyanogenic cassava.
- Sheila McCormick, USDA/ARS, Albany, CA U.S.A.
Pollen-pistil interactions.
- Nancy Paiva, S.R. Nobel Foundation, Ardmore, OK U.S.A.
Resveratrol glucoside engineering: Plant and human health benefits.
- Stephen Duke, USDA, ARS, NPURU Natural Products Center, University, MS U.S.A.
Crop allelopathy enhancement through biotechnology.
- Vidadi Yusibov, Thomas Jefferson University, Philadelphia, PA U.S.A.
Pharmaceuticals production in plants.
- Donald Nuss, Ctr. for Agricultural Biotechnology, Univ. of Maryland, College Park, MD U.S.A.
Attenuating fungal virulence (Chestnut blight) with hypoviruses.
- Richard Dixon, Samuel R. Noble Foundation, Ardmore, OK
Metabolic engineering of phenylpropanoid biosynthesis.
- Jonathan Arias, CAB, University of Maryland, College Park, MD U.S.A.
Modified transcription factors
- Joseph Boothe, SemBioSys Genetics Inc., Calgary, ALBERTA, Canada
Production of recombinant proteins in plants
- Kathleen Danna, University of Colorado, Boulder, CO U.S.A.
Modifications of cellulases in plants for biomass conversion
- Cathie Martin, John Innes Institute, U.K.
Transcriptional control of phenylpropanoids
- Dan O'Keefe, DuPont Central Research, Biochemical Science & Engr., Wilmington, DE U.S.A.
Cytochrome p450 transformation herbicides
- Frank J. Turano, George Washington University, Washington DC U.S.A.
Glutamate and GABA like receptors in Arabidopsis.
- Mark Schoenbeck, University of Kentucky, Lexington, KY U.S.A.
Evolution of cyclase gene family in tobacco.
- Frederique Hilliou, Leiden University,
Molecular regulation of monoterpenoid indole alkaloid biosynthesis.
- Edward Braun, Ohio State University, Athens, OH U.S.A.
Metabolic regulation of flavonoid metabolism by MYB genes.
- Lukas Mueller, Stanford University, CA U.S.A.
Models for anthocyanin sequestration in plants.
- John Quackenbush, TIGR, Gaithersburg, MD, U.S.A.
Use of microarrays and EST's in Plant Biotechnology.
- Anne Simon, University of Maryland, College Park, MD U.S.A.
Kill or cure: enigma of plant virus satellite RNAs
- Malla Padidam, Rohm and Haas Company, Spring House, PA U.S.A.
Ecdysone receptor-based gene switch for plants.

PROGRAM SUMMARY

Sunday, Aug. 6, 2000

1:00-4:00 PM	PSNA Executive Meeting, USDA, Bldg. 003, Rm. 20
4:00-8:00 PM	Registration, Holiday Inn, 10000 Baltimore Ave
6:00-9:00 PM	Welcome Reception - Holiday Inn, 10000 Baltimore Ave

Monday, Aug. 7, 2000

USDA, Bldg. 003, Auditorium

Symposium Session I

Plant/Environmental Interactions

8:00-8:30 AM	Registration	
8:30-9:15 AM	Overview on Agriculture using Biotechnology	TBA
9:15-9:55 AM	Crop allelopathy enhancement through biotechnology.	<i>Stephen Duke</i>
9:55-10:35 AM	Attenuating fungal virulence (Chestnut blight) with hypoviruses.	<i>Donald Nuss</i>
10:35-11:00 AM	Coffee Break	
11:00-11:40 AM	Cytochrome P450 transformation herbicides.	<i>Daniel O'Keefe</i>
11:40-1:00 PM	Lunch	

Monday, Aug. 7, 2000

USDA, Bldg. 003, Auditorium

Symposium Session II

Energy and Nutrition

1:00-1:40 PM	Modifications of cellulases in plants for biomass conversion.	<i>Kathleen Danna</i>
1:40-2:40 PM	Poster Session Oral Introductions.	<i>All persons presenting posters can present a one minute introduction of their poster topic (one slide maximum).</i>
2:40-4:00 PM	Poster Session I and Break	<i>Rm. 20, Bldg. 003</i>
4:00-4:40 PM	Acyanogenic cassava.	<i>Birger L. Moller</i>

4:40-5:00 PM	Oral Session	<i>Contributed speaker</i>
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Tuesday, Aug. 8, 2000

USDA, Bldg. 003, Auditorium

Symposium Session III

Arthur Neish Young Investigators' Minisymposium:

Molecular Manipulation of Alkaloids, Flavonoids, and Cyclases

9:00-9:35 AM	Molecular regulation of monoterpenoid indole alkaloid biosynthesis.	<i>Frederique Hilliou</i>
9:35-10:10 AM	Metabolic regulation of flavonoid metabolism by MYB genes.	<i>Edward Braun</i>
10:10-10:45 AM	Models for anthocyanin sequestration in plants.	<i>Lukas Mueller</i>
10:45-11:10 AM	Coffee Break	
11:10-11:45 AM	Evolution of cyclase gene family in tobacco	<i>Mark Schoenbeck</i>

Tuesday, August 8, 2000

USDA, Bldg. 003, Auditorium

Symposium Session IV

Pharmaceuticals and Health Benefits from Bioengineering

1:00-1:40 PM	Resveratrol glucoside engineering: Plant and human health benefits.	<i>Nancy Paiva</i>
1:40-2:20 PM	Production of recombinant proteins in plants.	<i>Joseph Boothe</i>
2:20-3:30 PM	Poster Session II and Break	
3:30-4:10 PM	Pharmaceutical productions in plants.	<i>Vidadi Yusibov</i>
4:10-4:50 PM	Oral Contributed Presentations	<i>Contributed speaker</i>

Wednesday, August 9, 2000

USDA, Bldg. 003, Auditorium

Symposium Session V

Current Advances in Molecular Tools

8:40-9:20 AM	EST and Microarray Technology	<i>John Quackenbush</i>
9:20-10:00 AM	Glutamate and GABA like receptors in Arabidopsis	<i>Frank Turano</i>

10:00-10:40 AM	BREAK	
10:40-12:00 PM	Oral contributed Presentations	
12:00-1:15 PM	LUNCH	

Wednesday, August 9, 2000

USDA, Bldg. 003, Auditorium

Symposium VI

Molecular modifications of the Phenylpropanoid pathway

1:15-1:55 PM	Transcriptional control of phenylpropanoids	<i>Cathie Martin</i>
1:55-2:35 PM	Metabolic engineering of phenylpropanoid biosynthesis.	<i>Richard Dixon</i>
2:35-3:00 PM	BREAK	
3:00-3:35 PM	Ecdysone receptor-based gene switch for plants.	<i>Malla Padidam</i>
3:35-4:35 PM	PSNA Annual General Meeting	

Wednesday, August 9, 2000

Holiday Inn, 10000 Baltimore Blvd., College Park, MD

6:30-10:00 PM	Banquet and Dinner Speaker, Genomics: Tools for Maize Gene Discovery.	<i>Virginia Walbot</i>
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Thursday, August 10, 2000

USDA, Bldg. 003, Auditorium

Symposium VII

Regulation of Expression and Transcriptional Factors

8:50-9:30 AM	Pollen-pistil interactions.	<i>Sheila McCormick</i>
9:30-10:10 AM	Modified transcription factors.	<i>Jonathan Arias</i>
10:10-11:00 AM	Virus Satellite RNA's	<i>Anne Simon</i>
11:00-11:50 AM	Contributed Oral Presentations	

REGISTRATION FORM

PSNA/MID-ATLANTIC Plant Molecular Biology Society
August 6-10, 2000

Regulation of Phytochemicals by Molecular Techniques

US DEPARTMENT OF AGRICULTURE - AGRICULTURAL RESEARCH SERVICE
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*Symposium Vol 35. "Recent Advances in Phytochemistry," if purchased at the conference is 50% off.

**Requires Supervisor's Signature in Part A - below

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August 6-10, 2000

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August 6-10, 2000

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Newsletter

● Volume 40, Number 2 ● July 2000 ●

PSNA Executive Committee 1999-2000

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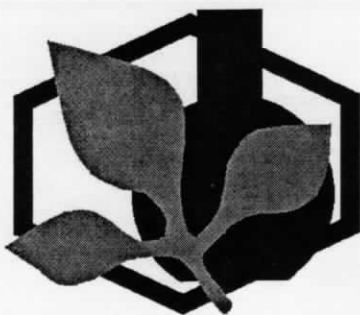
PSNA Advisory Committee

Dr. Kelsey Downum (2000)
Dr. John T. Arnason (2001)

Dr. Nikolaus H. Fischer (2002)
Dr. Jonathan Poulton (2003)

PSNA Newsletter

Editor: **Dr. W. Dennis Clark**



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 and the role of plant substances in related fields. Annual membership dues are U.S. \$20 for regular members and \$10 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. Still a specialist organization despite its broadened interests, PSNA meetings are small enough to offer informality and intimacy that are conducive to the exchange of ideas. 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 PSNA Secretary. Annual dues and changes in addresses should be sent to the PSNA Treasurer. Also see the PSNA homepage, currently at: <http://ls.la.asu.edu/psna>.

Table of Contents

From the Editor	1
Special Editorial by Richard A. Dixon	2
Phytochemistry in the News	5
PSNA Treasurer's Report	7
PSNA 2000	10
Other Meetings and Symposia of Interest	11
Ordering Information, <i>Recent Advances in Phytochemistry</i>	12
PSNA Membership Application	(Inside Back Cover)

From the Editor

In this issue we are graced with contributions and news by and about two of the stars of our discipline, our current President-Elect, Richard A. Dixon, and one of our colleagues from down under, Kenneth R. Markham. These leaders in phytochemistry represent the best of the old and the new, together on the crest of new developments in our discipline. Both also represent how phytochemistry has gained more attention from industry and from the public than perhaps ever in the history of PSNA.

Rick Dixon is especially eloquent in his views on the importance of well-trained phytochemists in leading the way for research in the newest fields of molecular biology. This is a particularly timely editorial for PSNA as we hold this year's annual meeting jointly with the Mid-Atlantic Plant Molecular Biology Society. During the meeting, I am sure that we will see our share of various "directional blots" that typify presentations on

the characterization of genes and their products. These are not new to us - phytochemists have as a group taken advantage of the tools of molecular biology for many years already. On the flip side, this year's meeting is a good opportunity for us to enthusiastically show off our own "trade tools" to our colleagues in molecular biology, including the latest applications of high-tech instrumentation for chromatography and spectroscopy. There is nothing like a sophisticated NMR or mass spectrum to show off the importance of these tools and how much we can benefit from and enjoy them.

The foundation for molecular studies toward plant improvement is represented by the research of Ken Markham and other traditional phytochemists who define the leading edge of their field. It is especially nice to see how the contributions that Ken has made in his academic career have been developed into the basis for a significant industry in New

Zealand. The responses of plants to environmental stresses such as ultraviolet light and many other stimuli consistently look like responses to oxidative stress at the enzymatic and secondary metabolic levels. Ken's work, and that of our own Jerry McClure for that matter, continue to point the direction for research on the metabolic regulation of phytochemicals. I think the phytochemical responses to such treatments lend themselves as excellent candidates for display mapping studies, etc., to find out what happens at the molecular genetic level during all kinds of oxidative stresses (e.g., temperature, nutritional deprivation, herbicides, UV light, ozone and other air pollutants).

Based on what the leaders in our field are doing, it is great to see that phytochemistry is, as it should be, the center of attention in the hottest areas of modern research and technology.

The Editor

SPECIAL EDITORIAL

Phytochemistry in the Genomics and Post-Genomics Eras

Richard A. Dixon, President-Elect, PSNA
Plant Biology Division
Samuel Roberts Noble Foundation, Ardmore, OK.

The discipline of phytochemistry is entering a new era with the coming of the third millennium. During the last 30 years or more, phytochemistry has taken something of a back seat to other branches of plant science, such as developmental biology and physiology, that have somehow appeared to be more glamorous. Over the last 10 years, the rapidly developing "discipline" of plant molecular biology, with its associated "spinning off" of the field of agricultural biotechnology, has tended to further obscure the purpose and potential impact of phytochemistry. This is particularly so for young scientists who have been attracted by the demonstrable power of molecular biology away from more traditional chemical training. It is therefore somewhat ironic that the new developments in molecular biology are now driving renewed interest in phytochemistry.

In the past, successful molecular biology labs working on plant natural product pathways would require at least one lab member to be familiar with the chemistry of the favorite class of

compound worked on by that particular group. Few molecular labs would have the chemical expertise to work on a broad range of natural product classes, or indeed feel a need to do so. That is now changing. Genomics has fundamentally altered the way in which we view plant biology. The pre-genomics reductionist view ("I work on this pathway") is being superceded by a new ability to take a global view of cellular processes. By the end of this year, the complete genome sequence of *Arabidopsis* will be available, to be soon followed by that of rice. Large-scale sequencing programs are rapidly documenting the expressed genes in many other species, including wheat, soybean, *Medicago truncatula* (as a model for alfalfa) and banana. The big question is what all these genes do, and the science that addresses this question has been termed functional genomics. Many companies and institutes engaged in large scale functional genomics programs are beginning to see the relative paucity of graduates trained in chemistry and biochemistry (read phytochemistry in the case of

plant genomics programs) as a major limitation to future progress.

There are several ways of addressing plant gene function on a large scale, but, for most genes, these approaches ultimately lead to some kind of biochemical analysis. In one approach, an attempt is made to sequence all expressed genes, from a range of developmentally or environmentally selected cDNA libraries (Newman et al., 1994). Expressed sequence tags (ESTs) are compared to sequences in existing gene databases, from which function can sometimes be inferred (but always with caution!). If the function is not apparent, analysis of gene expression profiles using microarray technology ("DNA chips") might give clues as to function based on the developmental or environmental control pattern of the candidate genes (Kehoe et al., 1999). However a gene becomes a candidate for a particular function, it is usually necessary to confirm that function by expressing the gene in some heterologous expression system, such as *E. coli*, yeast, or insect cells. Plants

themselves are also becoming vehicles for rapid functional identification of cloned genes, since the development of high throughput transformation systems for some species. Availability of substrates (possibly labeled, and with the correct stereochemistry, of course!) and a specific assay method are then essential. They always were, but the point now is that the speed with which EST programs may lead to candidate genes for plant natural product biosynthesis makes the biochemical assay of enzyme activities the potential rate limiting step.

Alternative approaches to functional genomics further expand the scale of experiments. Thus, several strategies now exist for creating DNA-tagged mutants in which genes may be randomly up-regulated or down-regulated (Weigel et al., 2000; Azpiroz-Leehan and Feldmann, 1997), and the independent transgenic lines may then be directly screened for biochemical phenotype by phytochemical analysis. Such an approach, that has been termed "phytochemical biopanning" in cases where genes are up-regulated, requires the establishment of high throughput metabolic profiling for analysis of gene function, since many thousands of lines may have to be screened before establishing a "hit" on a particular gene or pathway of interest. Phytochemical analysis therefore becomes an essential analytical tool for gene discovery. The only difference from classical metabolite analyses

carried out in labs throughout the world is one of scale (tens of thousands of samples rather than hundreds) with the need for an attendant increase in speed via automation. The currently applied techniques for metabolic profiling are well familiar to phytochemists-liquid or gas chromatography coupled to light absorption, fluorescence or mass detection. Significant opportunities exist for developing improved techniques for metabolic profiling, particularly in the area of nanoscale separations and their automation, and in more efficient mass detection methods, such as Fourier transformation ion cyclotron MS.

For phytochemists with an interest in computer science, a major challenge will be to assemble databases of metabolic profiles that will be able to communicate with gene sequence, protein profile and gene expression databases. This new field of "metabolomics" or "metanomics" will facilitate a far greater understanding of how gene expression regulates the metabolic phenotype of the cell than has been hitherto possible (Trethewey et al., 1999).

The term "structural genomics" was initially applied to large-scale studies of genome structure and organization, but is now also used to describe how the primary sequence of amino acids in a protein relates to the function of that protein. Currently, the core of structural genomics is protein structure determination, primarily by X-ray crystallography, and the

design of computer programs to predict protein fold structures for new proteins based on their amino acid sequences and structural principles derived from those proteins whose 3-dimensional structures have been determined (Skolnick and Fetrow, 2000). Plant natural product pathways are a unique source of information for the structural biologist in view of the almost endless catalytic diversity encountered in the various pathway enzymes, but based on a finite number of reaction types. Plants are combinatorial chemists par excellence, and understanding the principles that relate enzyme structure to function will speed up the gene discovery process for enzymes of plant natural product pathways. It will also open up possibilities for the rational design of new enzymes to generate novel biologically active natural products (Ferrer et al., 1999). The chemical diversity that is currently explored by analyzing natural products from new plants collected in diverse habitats throughout the world may soon be generated *in vitro* by site-directed mutagenesis or shuffling of gene sequences derived from well understood classes of plant natural product biosynthetic enzymes. Phytochemistry will have the same goals as before, but a different source of chemical diversity with which to work.

Structural biology will play an increasing role in the "post-genomics era" after the completion of the major plant genome sequencing initiatives. However,

even when the biochemical functions of all the genes in the plant are known, there is still a major challenge, namely understanding how metabolic networks function within the cell (Huang, 2000). This understanding is necessary for full realization of the potential of metabolic pathway engineering. It is becoming increasingly clear that the enzymes of primary and secondary metabolic pathways, and signal transduction components such as protein kinase cascades, are somehow localized in loosely associated complexes, even if operationally soluble according to classical biochemical criteria. Understanding the subcellular organization of plant metabolism will require the development of new technologies, at the interface of phytochemistry and cell biology, to localize metabolites and their enzymes within the cell, and integration with computational methods for modeling of pathway flux through organized enzyme complexes.

I hope I will not offend any of my colleagues by stating that it is usually easier to train a chemist or biochemist to become a molecular biologist than it is to train someone whose background is in molecular biology or genetics to become a good biochemist or phytochemist. Those enzymes and small molecules all seem to have different properties, and there don't seem to be any expensive kits to

help solve the problems! Phytochemists should therefore be in increasing demand as we move into the genomics and post-genomics eras. It is therefore of critical importance for our field that young scientists with an interest in plant chemistry become familiar with the new fields of functional and structural genomics. They should not, however, forego a rigorous training in all aspects of plant chemistry. The older ones among us should also be looking for new opportunities to apply our knowledge of plant chemistry and biochemistry in the context of the new advances in plant science. I hope the membership of the PSNA will realize the enormous opportunity we all now face, and become increasingly involved in multidisciplinary studies that will ultimately tell us exactly how plants elaborate the fascinating chemical structures that many have spent their careers elucidating.

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BIOGRAPHICAL INFORMATION ON NOMINEES SELECTED BY NOMINATING COMMITTEE

(Please see other side for ballot)

Nominee for President-Elect: Hector Flores. Hector Flores has been a member of PSNA since 1983. He obtained his Ph.D. in biology at Yale University where he worked on the physiology and biochemistry of polyamines in higher plants. He joined ARCO Plant Cell Research Institute to pursue post-doctoral studies from 1983-1985, after which he accepted an assistant professor position in the Dept. Plant Pathology at Louisiana State Univ. In 1988 he joined the Dept. Plant Pathology/Biotechnology at Penn. State Univ. as associate professor and was promoted to full professor in 1994. He accepted a position as director of the Science, Technology and Society program from 1996-1999 and is currently on leave from his position to assume duties as the director of the Metabolic Biochemistry Panel at the National Science Foundation.



Since Hector joined the faculty at Penn State, he has been awarded numerous grants as PI from federal (NSF, USDA) and other competitive programs (private foundations). In addition, he has been co-PI in several competitive grants. His research is multidisciplinary in nature with a wide range of interests that include the production and manipulation of plant cell cultures for secondary metabolite biosynthesis, root secondary metabolism, and biotechnological applications of this technology for producing useful plant products. Hector's leadership in these endeavors has attracted a large number of scientific collaborators including visiting scientists, postdoctoral fellows, graduate students, minority students in summer programs, root biology summer fellows, NSF summer undergraduate trainees, and independent study students. As a result of this, he is the author of over 80 research publications and is in constant demand to present both scientific and general lectures in the annual meetings of professional societies, universities, and industry.

Nominee for Secretary: Peter Facchini. (3-year term) Peter Facchini obtained his Ph.D. in biology at the Univ. of Toronto in 1990 where he worked in the biological and engineering aspects of secondary metabolite biosynthesis in plant cell suspension cultures. He followed this with postdoctoral studies at the Universities of Kentucky and Montreal where he worked on the biochemistry and molecular biology of tobacco terpenoid and opium poppy alkaloid biosynthesis, respectively. Peter accepted a position as assistant professor in biology at the Univ. of Calgary in 1995 where he has taught courses in Introductory Biology, Cellular Plant Physiology, and Environmental Plant Physiology, as well as directing graduate research projects and independent study research projects. In 1999 he received the Student's Union Undergraduate Award for Teaching Excellence. Peter has

obtained several research grants to support his studies on the cell and molecular biology of alkaloid biosynthesis. He has published 16 research papers since moving to Calgary and has trained many graduate students. Peter was promoted to associate professor in January, 2000.



Peter has recently completed a review on Aromatic Amino Acid Decarboxylases for *Phytochemistry* as well as an invited chapter on Alkaloid Biosynthesis in Plants for *Annual Reviews of Plant Physiology and Plant Molecular Biology*. He has also written an excellent review of the 1999 PSNA annual meeting which recently appeared in the widely read *Trends in Plant Sciences*. His writing expertise should prove to be very useful for production of the PSNA newsletter and maintaining the PSNA website, the primary responsibilities of the society secretary.

Nominee for Treasurer: Cecilia McIntosh. (re-election, 3 year term) Cecilia McIntosh obtained her Ph.D. in biology at the Univ. of South Florida in 1990 where she worked on the isolation and characterization of a flavanone glucosyltransferase in grapefruit and won a USF Sigma Xi Dissertation award. She then pursued postdoctoral studies at the Univ. of Idaho where she studied the biochemistry and molecular biology of plant mitochondrial membrane transporters and NAD-isocitrate dehydrogenase. Cecilia accepted an assistant professor position in biology at East Tenn. State Univ. in 1993 where she has taught courses in General Biology, Biochemistry of Macromolecules, Biochemistry of Metabolism, and Plant Physiology. She has led workshops for children in grades 4-12 and their teachers on how to design experiments for science fair projects, a workshop on Super Science for Girl Scout troop leaders, and has given presentations as part of local programs on Women in Science. She has directed several graduate research projects, served on many advisory committees, and was promoted to associate professor in 1998.

Since 1990, Cecilia has published 8 research articles and three invited reviews on the Production of Limonin and Naringin in Citrus Tissue Culture for *Biotechnology of Medicinal and Aromatic Plants*, the Biochemistry of the Mitochondrial Matrix for *The Molecular Biology of Plant Mitochondria*, and the Quantification of Limonin and A-ring Monolactone during Growth and Development of Citrus for the American Chemical Society Symposium Series. Her work on regulation of flavanone metabolism has been funded by the USDA since 1995. Cecilia has been a member of PSNA since 1985 and has served as treasurer since 1998.

PSNA 2000 - BALLOT

Please mark your choices as indicated and return to the address below by May 30, 2000.

PRESIDENT-ELECT

 Hector Flores

 Other (write-in _____)

SECRETARY

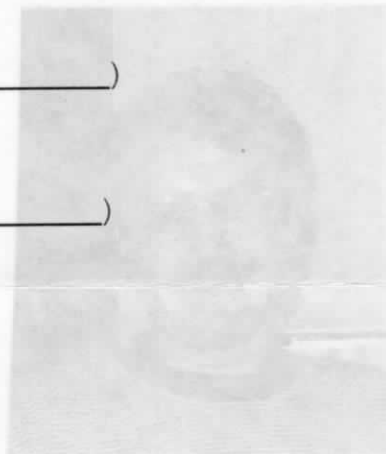
 Peter Facchini

 Other (write-in _____)

TREASURER

 Cecilia McIntosh (re-election)

 Other (write-in _____)



Return to:

Vincenzo De Luca
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PHYTOCHEMISTRY IN THE NEWS

KEN MARKHAM IN THE HEADLINES

Another of our colleagues out of the University of Texas "school of flavonology" has won the Pergamon Phytochemistry Prize for Creativity in Plant Biochemistry. New Zealand phytochemist Kenneth R. Markham, at one time a flavonoid researcher in the laboratory of last year's prize winner, Tom J. Mabry, has won the 1999 prize. The following comments were published in *Phytochemistry* Vol. 53 (7), 2000, regarding the 1999 prize winner:

"Dr. Markham has made outstanding contributions to the chemistry and biochemistry of plant polyphenols. He is particularly distinguished for his studies of the structural elucidation, distribution and function of the flavonoids and related phenolics and is a world leader in this field. He has brilliantly pioneered the application of NMR spectroscopy to flavonoid structures and his 1982 book "Techniques in Flavonoid Identification" is a standard text for students. He has made a unique contribution to our knowledge of the phytochemistry of mosses and liverworts, and applied such data to tracing past ozone levels in Antarctic mosses. His 1969 discovery of flavonoids in the green alga *Nitella* remains to this day the only substantiated

report of flavonoid biosynthesis in the algal kingdom. His more recent research has been devoted to the successful development of new colour forms in the petals of ornamental plants."

In a recent email to the Editor, Dr. Markham comments on the state of the science that he has dedicated his career to: "...we have [become] increasingly commercial, which has not been too difficult as flavonoids have become very trendy these days! In contrast to the era of my post-Doc at UT when flavonoids were seen merely as metabolic waste products which were dumped into the vacuole, flavonoids are now recognised as being of vital importance in nutrition and health, and also in plant reproduction, in nitrogen fixation, in plant UV protection (and thus in evolution), pollination, etc. The field has become a really exciting one to be in, and one in which it is relatively easy to justify research and so attract financial support."

Indeed, Dr. Markham's view echoes the attention that he and his discipline have received in the public press in New Zealand. It is refreshing to see this kind of publicity given to phytochemistry by no less an institution as the Ministry of Education, in its New Zealand Education Gazette:

"Summer is around the corner and most of us are getting out the shades, togs and sunscreen - ready for the perennial slip slop slap messages. This season's warnings might even sound a little louder as scientists have now confirmed what they suspected for some time: over the past decade or so, the level of ultra-violet radiation burning down on New Zealand has increased by about 12 per cent. While it is easy for us to enjoy summer and protect ourselves from the damaging rays, perhaps it is time to spare a thought for all the shrubbery around us. Plants can't cover up or hide in the shade, yet the effect of UV radiation on their cells can be just as damaging. Ken Markham, a plant chemist at Industrial Research Limited, says the high energy of UV rays can destroy a plant's DNA and photosynthesis system and eventually kill it. So plants have a dilemma: the sun is essential for their survival but at times it becomes a major threat to their life. To get around this problem plants have developed their own very effective sunscreen, and Dr. Markham was one the first people to decipher the chemistry of this protection mechanism. Flavonoids are chemicals which were long considered as nothing more than a useless end product of metabolism.

But Dr. Markham proved that these flavonoids are in fact a permanent sunscreen, lining the outer cell membranes and absorbing the energy of UV radiation. To illustrate the effectiveness of the flavonoids, Dr. Markham's team grew plants under artificially heightened UV radiation, normal UV, and no UV. The plants grew quite happily under any of these conditions, producing more or fewer flavonoids whenever they needed a better screen against UV rays. Dr. Markham has since gone on to prove that flavonoids are not only plants' sun protectors, but also act as their antibiotics against infections, and protect their tissue against ageing. Earlier this year, he was the first New Zealander to take home the prestigious Pergamon Phytochemical Prize, an annual international award for the world's top plant chemist. Dr. Markham is now focusing on extracting the plants' anti-sunburn chemicals to produce a new sunscreen for humans."

Dr. Markham is currently team manager of Plant Chemistry at Industrial Research Ltd. in Wellington. He provides his expertise in the chemistry of plant phenolics, particularly flavonoids, to the fields of plant taxonomy and evolution, crop protection against ultraviolet light and micro organisms, apiary products, and improved marketability by color modification of flowers and fruit. His team's focus is plant chemistry, particularly the chemicals which form the basis of color in plants and plant products.

The benefits of phytochemistry that the team provides sound like some of the best research goals of university laboratories elsewhere in the PSNA realm:

- Assisting the development of new crops or crops with valuable new characteristics such as color or defense mechanisms, which can generate export earnings and employment.
- Understanding in chemical terms why many plants are susceptible to increased ultraviolet radiation so strategies can be devised to protect them.
- Assisting in the correct taxonomic identification of plant taxa and hybrids, and chemical "fingerprinting" of new cultivars and plant products.
- Enhancing the marketability of New Zealand originating pigment based products.
- Studying the response of native and crop plants to increasing ultraviolet light (caused by the thinning of the ozone layer) with the aim of improving their resistance.
- Comparative chemical studies to complement the traditional means of classification of New Zealand and Antarctic plants (e.g., hebe) or plant products (e.g., propolis, pollen).
- Studying the chemical and genetic basis of flower colour in plants, e.g., lisianthus, lathyrus, petunia, sandersonia, chrysanthemum and

pelargonium, etc., in order to better understand color chemistry and to devise strategies for changing the color by genetic engineering and/or plant breeding.

- Analysis of plant pigments.

Dr. Markham's team consists of several able phytochemists. They include Dr. Stephen Bloor, Kevin Mitchell, Dr. Ewald Swinney, and Rosemary Webby. As a team they provide expertise in the isolation, structure determination and synthesis of biologically active constituents of New Zealand plants, in the field of anthocyanin chemistry relevant to flower colour, in flavonoid structure analysis, chemotaxonomy, phenolic antioxidant determination, apiary product chemistry and the defense mechanisms of antarctic phytoplankton to ultraviolet radiation, in the chemistry of phytoestrogens, and in the chemistry of bee-pollens.

With such a diversity of capabilities, it is no surprise that Industrial Research Ltd is the only center in Australasia with specialist expertise in all of these areas.

Dr. Markham has mentioned that he appreciates our attention from so far away. He can be contacted at k.markham@irl.cri.nz; or through his team's website at <http://www.irl.cri.nz/home/npp/plant.htm>.

The Editor

TREASURER'S REPORT

*PHYTOCHEMICAL SOCIETY OF NORTH AMERICA

FINANCIAL REPORT (01 January 1999 - 31 December 1999)

It would appear that we have really made a lot of money this year. There are several accounting practices that provide reasons for this. Explanations and general comments are presented below, and will be included in a report to the membership.

1. We still did not have to file a tax return this year even though our receipts appear to be over the \$25,000 limit. The 1998 and 1999 meeting refunds are internal transfers and therefore do not really count toward receipts as viewed by the IRS. Therefore our gross income for tax purposes was \$20,524.34

2. Receipts were also up due to more donations to the Neish Symposium account, also receipts from dues were up \$1080 for 1999. It definitely is worth the extra postage and expense to send out second and third notices (cost approx. \$100).

3. Expenditures are lower for 1999. The secretary only received \$2000 in 1999; another \$2000 disbursement was made in early January 2000, but will not appear until the 2000 financial report. The directory was not mailed until January 2000, therefore those expenses (around \$1000) will not appear until the 2000 financial report. In addition, the requested 2000 meeting advance was lower than previous years.

4. Overall, our financial status is healthy. The Fortis Advantage Account is performing well and respectable interest is being earned on the other accounts. We should be in good shape for our first year acting as purchasing "middlemen" between members and RAP (Elsevier).

FINANCIAL REPORT (01 January 1999 - 31 December 1999)

RECEIPTS

Membership dues	\$ 5100.00
Plenum Publishing	
royalties & page charges on RAP	6991.91
Interest on Fortis Money Market	3.49
Interest on TN FAIR account	806.74
Dividends Fortis Advantage Account	133.59
1998 meeting refund	4220.21
Art Neish Young Investigator Symposium Fund	6623.11 (NSRC, Pfizer, Mrs. Neish, Ann Oaks, Ragai Ibrahim)
Symposium Fund Interest	965.50
Mailing list rental	200.00
1999 meeting refund	5421.00
	<hr/>
TOTAL RECEIPTS	\$30,465.55

EXPENDITURES

Executive Committee expenses	
Treasurer (dues notices, supplies for directory)	\$ 331.92
Editor, RAP	1500.00
Secretary	2000.00
Travel	380.97
Montreal meeting advance	5000.00
1999 Paper/Poster Awards	500.00
2000 meeting advance	2000.00
Phytochem. Soc. Eur. (1st year share royalties)	1369.92
	<hr/>
TOTAL EXPENDITURES	\$13,082.81



ASSETS

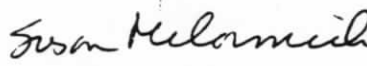
Checking account	\$ 2,703.73
FAIR account (investment reserve)	32,375.93
Young Investigator Symposium Account	24,960.33
Fortis Money Market (opened 2/99 \$100)	103.49
Fortis Advantage Account** (opened 2/99 \$9900)	11,796.32
	<hr/>
TOTAL ASSETS	\$71,939.80

* see attached text

**stock/bond investment account

C. McIntosh



ROBERT A. NORTON


Susan McCormick

Interim Financial Report (Jan. 1-June 15, 2000)

RECEIPTS:*

Dues	\$3000.00 (approx. 51% paid)
Plenum/Kluwer (Royalties & page chgs)	4524.77
Investment Reserve Acct. interest	361.46
Neish Symposium Acct. interest	457.90
Fortis money market dividend	2.18
Fortis Advantage Acct. dividend	35.67
Book sales (RAP - Elsevier bulk order)	2090.60
Anonymous donation to travel awards	100.00

TOTAL	\$10,572.58

EXPENDITURES:**

Executive Committee	
Editor, RAP	\$2500.00
Secretary, newsletter	2000.00
Treasurer, directory, dues notices, meeting/ballot mailing	1405.65

TOTAL	\$5905.65

*Upcoming receipts: Elsevier page charges (\$??)

**Upcoming bills: Elsevier bulk order \$6965.00

ASSETS:

checking account	\$ 3760.88
Investment Reserve	35490.42
Neish Symposium account	25418.23
Fortis Money Market	105.67
Fortis Advantage	12299.82

TOTAL	\$77075.02

PSNA 2000

Regulation of Phytochemicals by Molecular Techniques

A joint meeting of the Phytochemical Society of North America
and the Mid-Atlantic Plant Molecular Biology Society

August 6-10, 2000
Beltsville Agricultural Research Center
Beltsville, MD U.S.A.

Conference Organizing Chairs

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(e-mail) Bmatthew@asrr.arsusda.gov

Organizing Committee

Rose Hammond
John Hammond
Monica Pedroni
B. Sue Mischke
Janet Slovin
Johathan Arias
Cesar Mujer
Kim Lewers
Frank Turano
Emily Steiner

Other Meetings and Symposia of Interest

August 15-19, 2000: International Society of Chemical Ecology (Poços de Caldas, Brazil). More information at: <http://www.isce.ucr.edu/meetings/2000/>

August 21-25, 2000: 12th Congress of the Federation of European Societies of Plant Physiology (Budapest, Hungary). More information at: <http://www.szbk.u-szeged.hu/~hplc/fespp.html>

September 3-7, 2000: Gesellschaft für Arzneimittelforschung/International Society for Ethnopharmacology Congress (Zurich, Switzerland). Contact: Otto Sticher (pharmacognosy@pharma.ethz.ch).

September 3-8, 2000: BIOTECHNOLOGY 2000 - The World Congress on Biotechnology (Berlin, Germany). Contact: German Society of Chemical Apparatus, Chemical Engineering and Biotechnology (biotechnology2000@dechema.de).

September 10-15, 2000: XXth International Conference on Polyphenols (Freising-Weilhenstephen, Germany). Contact: Professor G. Forkman (d.treutter@lrz.tum.de).

September 13 - 17, 2000: International Conference and Exhibition on Functional Foods and Nutraceuticals (Houston, Texas). Contacts: Dr. S. S. Koseoglu or Dr. F. Shahidi (nutra@tca.net).

October 2-3, 2000: Bioactive Molecules - Plant Products for the Pharmaceutical and Healthcare Industries (University of York, England). Contact: Saija Nakari, Help Desk at Alternative Crops Technology Interaction Network (info@actin.co.uk).

October 4-7, 2000: Signals, Sensing and Plant Primary Metabolism (Potsdam University, Germany). Contact: The Collaborative Research Center (eva.hackenberg@rz.hu-berlin.de).

October 11-13, 2000: Third International Congress on Phytomedicine (Munich, Germany). Contact: Prof. Dr. H. Wagner (H.Wagner@cup.uni-muenchen.de).

October 18-20, 2000: Bioproducts from Plants and Microbes (Rothamsted, Harpenden, Herts, England). Contact: Roger Atkin (Roger.Atkin@bbsrc.ac.uk).

April 6-11, 2001: Plant Foods for Human Health - Manipulating Plant Metabolism to Enhance Nutritional Quality (Breckenridge, Colorado). Contact: Keystone Symposia (keystone@symposia.com).

June 10-13, 2001: Plant Biotechnology - Better Products from Plants (Helsinki, Finland). Contact: Kirsi-Marja Oksman-Caldenty (kirsi-marja.oksman@vtt.fi).

July 8-10, 2001: World Congress of Medicinal and Aromatic Plants - Possibilities and limitations of medicinal and aromatic plant production towards the 21st century (Budapest, Hungary). Contact: Oszkár Köck (map.congr@ommi.hu).

July 15-18, 2001: The American Society of Pharmacognosy (Oaxaca City, Mexico). More information at: <http://www.phcog.org/>

July 21-25, 2001: The American Society of Plant Physiologists (Providence, Rhode Island). More information at: <http://aspp.org/meetings/meetings.htm>

September 12-14, 2001: Lead Compounds from Higher Plants (Lausanne, Switzerland). Contact: Dr. Andrew Marston (andrew.marston@ipp.unil.ch).

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