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PRESIDENT'S LETTER

Invitation to Peoria

In August, our Society will have its annual meeting in the city of Peoria, Illinois. This year's topic is the use of model systems to study secondary metabolism. As in recent years, the organizers chose a hot and important topic for phytochemists. At the beginning of any research project or career questions emerge about the appropriate model system to study a specific problem. In fact, we use several model plants for studies in biochemistry, molecular and cell biology, including *Arabidopsis thaliana, Nicotiana tabacum, Zea mays, Oryza sativa*, and others. The genome of some of these plants has been sequenced and some proteomes are on the way. Choosing a model is not an easy task, particularly in the case of secondary metabolism. During the 1980s and 1990s, several groups developed several models. *Catharanthus roseus*, *Lithospermum erythrorhizon*, *Coptis japonica* and several tropane alkaloid-producing plants, such as *Datura, Atropa*, *Duboisia* were among the most used models. Today many are no longer extensively used. Are there specific criteria one should consider when choosing a model system? Feasibility, of course, is an important one. This is the reason why *Arabidopsis* was adopted as a model. In several cases, choosing the model will depend on who is funding the research. This is not a trivial issue. Today, it is harder than ever to fund and maintain a productive research group. Often, granting agencies expect that the proposal reports *research objectives* as *preliminary results*. Few panels are disposed to fund novel ideas and high-risk projects. Thus, few researchers are able to take this risk. I know several top scientists that are working on *light* projects just to obtain funding and, in parallel, they perform more exciting, *risky* research. As a current member of a grant panel, my major questions are: (a) Is there an important question to answer? (b) Is there a contribution to knowledge? (c) Is the project leader well trained? (d) Does the project leader have a good track record? e) For young scientists, do they have the potential to carry out the proposed research? In reality, there is no single model system to use in the study of living organisms. A genetic approach using Arabidopsis might allow a breakthrough in one area, but a biochemical approach using a lily might make a greater contribution in another. The goal is to bring a diversity of approaches into play to solve fundamental plant problems (see R. Goldberg, Plant Cell, 8: 347, 1996). Plants share their metabolic pathways with many organisms. This is true in secondary metabolism even when the final product is different. Please come to Peoria and share the experience of the model you are working on.

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IN THIS ISSUE

CONTENTS

2003 PSNA Annual Meeting

Secondary Metabolism in Model Systems

August 9 - 13, 2003
Peoria, Illinois

The Phytochemical Society of North America (PSNA) is a nonprofit scientific organization whose membership is open to anyone with an interest in phytochemistry and the role of plant substances in related fields. Annual membership dues are U.S. $40 for regular members and $20 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. PSNA meetings provide participants with exposure to the cutting-edge research of prominent international scientists, but are still small enough to offer informality and intimacy that are conducive to the exchange of ideas. This newsletter is circulated to members to keep them informed of upcoming meetings and developments within the society, and to provide a forum for the exchange of information and ideas. If you would like additional information about the PSNA, or if you have material that you would like included in the newsletter, please contact the PSNA Secretary and Newsletter Editor. Annual dues and changes of address should be sent to the PSNA Treasurer. Also check the PSNA website at www.psna-online.org for regular updates.

PREVIEW OF THE 2003 ANNUAL MEETING

Secondary metabolism in model systems

The increasing pace of genomic data base development for numerous crop species has had an enormous impact on the approaches presently being proposed for doing research on the cell biology, biochemistry, molecular biology and metabolic engineering of natural product pathways. This is based on the realization that there is a uniform message being transmitted from extensive sequencing of genomes from many different species of plants. This involves the repeated identification of identical classes of genes that are responsible for the diverse secondary metabolism pathways within different plant species.

Since information of this type has begun to facilitate the rapid cloning and characterization of related pathways in many more species of plants, the pace of discovery of how plants have evolved to manufacture their amazing diversity of secondary products should increase rapidly in the next few years. This trend has certainly been apparent in the last few meetings held by the PSNA where symposia on diverse themes like *Regulation of Phytochemicals by Molecular Techniques, Phytochemistry in the Genomics and Postgenomics Eras* and most recently *Integrative Phytochemistry: from Ethnobotany to Molecular Ecology* all reported extensively how modern genomics has impacted phytochemistry. In this context, we have decided to turn our attention to *Secondary Metabolism in Model Systems*. This year's meeting will focus on how genomic technology has improved our understanding of secondary metabolism in such model plant systems as Arabidopsis, corn, rice, and soybean. An additional timely symposium will discuss how secondary metabolism in fungal models (*Fusarium* and *Aspergillus*) cause plant disease and related human diseases. In addition, the increasingly popular Art Neish Young Investigator Minisymposium will be animated with 5 presentations on different aspects of phytochemistry and plant-insect interactions.

Arabidopsis thaliana

Over the past ten years, genetic approaches in Arabidopsis have provided insights into aspects of phenylpropanoid and glucosinolate biosynthesis that had eluded investigators using conventional biochemical approaches. Further, the Arabidopsis genome was sequenced and researchers interested in phytochemistry began to realize that it contained a treasure trove of genes involved in natural product biosynthesis. As genes involved in exotic secondary metabolism pathways were being cloned in medicinal plants like *Catharanthus roseus*, *Atropa belladonna*, *Papaver somniferum* and *Taxus canadensis*, several homologues of mostly unknown function were being discovered in the growing Arabidopsis database. Recent attempts to functionally characterize the biosynthetic roles of these homologues have revealed that Arabidopsis displays a much greater diversity in secondary metabolites than had previously been imagined. This fact has prompted much more intense efforts to study the secondary metabolite chemistry and biochemistry of this plant. The symposium, being organized by Clint Chapple (Purdue University), will focus on the biochemistry and molecular biology of three interesting classes of secondary metabolites found in Arabidopsis. The remarkable ability of Arabidopsis to manufacture volatile terpenoids (Dorothea Tholl; Max-Planck-Institute for Chemical Ecology), complex glucosinolates (Jim Tokuhisa; Max-Planck-Institute for Chemical Ecology) and phenyl-propanoids (Clint Chapple) will be explored. Since many of these pathways also exist in the other model crops being considered in this meeting, it will be interesting to see how the Arabidopsis model will continue to impact commercially important field crops like corn, rice and soybean.

Legumes

Legumes are a rich source of protein, carbohydrate, and fat together with vitamins and minerals that have made them ideal vegetable sources for human and animal nutrition. The rich and varied secondary product chemistry of legumes like soybeans are also extremely important since they may help prevent human diseases. In the case of forage legumes the presence or absence of different secondary metabolites appears to be required to improve their forage quality. The symposium being organized by Mark Gijzen from the Agriculture Canada Research Station in London, Ontario will include presentations by Richard Dixon from the Noble Foundation on the use of the model legume species *Medicago truncatula*, for investigating natural product biosynthesis in relation to forage quality, by Lila Vodkin from the University of Illinois, who will present her studies on the genetic and molecular control of the flavonoid pathway in soybean and by Brian McGonigle from Dupont Company, who will provide an industrial perspective on engineering the phenylpropanoid pathway in soybeans for enhancing flavor and health. This symposium should provide fascinat-

continued on page 4

ing discussions in relation to manipulating secondary metabolism in other crop species.

Corn

The development of genomic tools for corn and rice are allowing major new developments in our knowledge to further improve corn yields and nutritional value, to increase disease, pest, cold and drought resistance, and to use corn as a factory for production of a large diversity of products tailor made to fit industrial and medical uses. In addition to its role as a primary source of starch, oil and protein, corn has been studied extensively to elucidate flavonoid chemistry, biochemistry and molecular biology. The symposium organized by Erich Grotewold from Ohio State University will focus on advances made in the biosynthesis of three other classes of natural products. The symposium will include a series of presentations by Eleanore Wurtzel from Lehman College in New York on the use of genomics to study the genetics and biochemistry of carotenoid biosynthesis in maize, by Alfons Gierl from the Technische Universitaet Muenchen who will speak about the evolution of DIMBOA biosynthesis and indole production in corn, and by Basil Nikolau from Iowa State University who will discuss epicuticular wax biosynthesis using a combination of genomic and metabolomic approaches.

Rice

The complete sequencing of the rice genome has generated intense interest in using it for improvement of rice and other cereals with respect to nutritional value and environmental adaptability to biotic and abiotic factors. This promising new tool has generated intense efforts to produce associated computing capabilities for rational analysis of the large amounts of information being generated from microarray, proteomic and metabolomic experiments. The rice symposium being organized by Tom Okita from Washington State University will focus on how these tools are being used to investigate metabolic pathways in rice (Mark Lange from Diversa Inc.), on the use of this information to create a rice cell *in silico* and the use of such a computerized cell to do experiments that will predict how a living cell would behave under a given set of parameters (Masuru Tomita from Keio University). Predictable results obtained in a set of in silico experiments can then be tested in vivo to see how such a computerized could be used in practical improvement of rice.

Fungi

The fungal symposium will focus on two model systems, *Aspergillus* and *Fusarium*, whose genetics are well characterized and that cause important plant and human diseases, respectively. It has been established that many of the secondary metabolism genes for the biosynthesis of mycotoxins such as aflatoxins, fumonisins and trichothecenes are clustered in *Aspergillus* and *Fusarium*. *Aspergillus nidulans* has been a useful model organism for studies of cell biology and gene regulation. Plasmid, cosmid, EST and BAC genomic libraries are publicly available. It has a well-characterized, conventional genetic system. It undergoes DNA mediated transformation and genes from other Aspergilli as well as some mammalian genes function in *A. nidulans*. In addition it is closely related to other species with medical, agricultural and industrial significance such as *A. flavus, A. niger, A. oryzae*, and *A. fumigatus*. It has been used as a model for penicillin and aflatoxin biosynthesis, sharing most of the aflatoxin gene cluster with *A. flavus* and *A. parasticus*. *Fusarium graminearum* causes wheat and barley head blight and diseases of corn and rice. *F. graminearum* produces a group of sesquiterpene mycotoxins, the trichothecenes which are inhibitors of eukaryotic protein synthesis, estrogenic compounds the zearalenones and cyclic peptides enniatins. Cosmid and BAC, EST libraries have been available. Susan McCormick (USDA) has invited Deepak Bhatnagar (USDA), Nancy Keller (Texas A&M) and Frances Trail (Michigan State University) to speak about genomics in *Aspergillus flavus, Aspergillus nidulans, and Fusareum graminearum*, respectively.

Art Neish Young Investigator Minisymposium

This year the minisymposium will focus on the chemistry of insect control and how secondary metabolites affect plant-insect interactions. With the slowly increasing number of banned pesticides, the comprehensive understanding of how insects interact with plant chemicals and the mode of action of plant phytochemicals in deterring insect predation has become more important. The research advances in this field promise to greatly increase commercial demand for natural insect controls. Mark Berhow (USDA, Peoria, Illinois) with advice from collaborators, May Berenbaum (University of Illinois) and Renee Wagner (USDA Biocontrol Lab in Columbia, Missouri), has assembled an excellent list of young investigators who will report their studies on phytochemicals and plant-insect interactions. Several interesting subjects will be covered, including the roles played by secondary metabolites as inducible defenses in Arabidopsis (Brian Taw, University of Chicago) and various roles played by

continued on page 17

PHYTOCHEMICAL PIONEERS

Eric Conn - 50 years of plant biochemistry

My career as a biochemist began when I started graduate work at the University of Chicago in September 1946. The subject was not unknown to me as I'd had a course in biochemistry during my last year as a chemistry major at the University of Colorado. I was assigned by the department chair to work with Professor Birgit Vennesland and since her interests were in *carbon dioxide fixation* as mediated by malic enzyme and other such *dark fixation* enzymes, I was quickly introduced to higher plants as experimental material. My first year in her lab was spent attempting to isolate Coenzyme II, or TPN^+, as $NADP^+$ was called in those days, from 50 pounds of hog liver! I followed a procedure published in 1935 by Warburg (the discoverer of TPN^+) in *Biochemische Zeitschrift*. The procedure involved such steps as precipitating the coenzyme as a mercury salt, and then removing the mercury with hydrogen sulfide; further purification as a barium salt, followed by removing the barium with sulfate! Not surprisingly the first attempt failed; the second resulted in about 150 milligrams of TPN^+ that was only 15% pure. Another student and I devised a makeshift *counter current* purification to increase its purity to 77%.

In order to follow the yield of the coenzyme during purification, I had to use the manometric procedure described by Warburg, again from *Biochemische Zeitschrift*, involving glucose-6-phosphte dehydrogenase and *old yellow enzyme*. Both enzymes were obtained from *spent brewer's yeast*, and this necessitated visits to a brewery on Halsted Street behind the Chicago stockyards to collect the yeast we needed. When the coenzyme was sufficiently pure, it could be easily assayed by the characteristic absorption of the reduced form at 340 nm (Vennesland's lab had a new Beckman DU spectrophotometer, commercially available only after the war; its power supply consisted of two 6-volt car batteries.) I mention all these things because this was a time when much biochemical research involved a lot of time and effort just to obtain the reagents needed for the experiments.

The University of Chicago was an exciting place in those years, and the Biochemistry Department had a distinguished faculty that included Vennesland, Konrad Bloch and Albert Lehninger, with Frank Westheimer

and Henry Taube nearby in the Department of Chemistry. The biochemistry graduate students at Chicago considered Vennesland the role model for faculty supervisors, and I was extremely fortunate to have been able to work with her. Her biography can be found on the Web site of the American Society of Plant Biology, where she is listed in section on *Women Pioneers in Plant Biology*. Bloch was deep into his work on cholesterol biosynthesis, for which he later received a Nobel Prize. Lehninger's students were studying the oxidation of pyruvic acid by animal mitochondria, and during that period, discovered that oxidative phosphorylation was coupled to the oxidation of DPNH (i.e. NADH) in animal mitochondria. All of this work was performed in a cold room in the basement of Abbot Hall that contained a tabletop Serval centrifuge that was enclosed inside a metal cage. On one occasion, the head came off that centrifuge while running and nearly demolished the interior of the cold room. Fortunately no one was injured as we were warned not to remain in the cold room when the fuge was operating. Lehninger was an outstanding lecturer and later wrote a classic text in biochemistry. His lecturing skills were just as good as his writing.

My thesis research was not particularly distinguished; it was entitled *Triphosphopyridine Nucleotide Enzymes in Higher Plants*, and mainly concerned the properties of malic enzyme in several species. The thesis also described the enzymatic reduction of oxidized glutathione in wheat germ extracts by TPNH. Since I had the only supply of TPN^+ in the United States, I was probably the first to learn that plant homogenates contain enzymes (nucleotidases) that degrade TPN^+ as well as oxidases that oxidize the reduced form, TPNH. This is not surprising now, but in those days we had little experience with this cofactor. While a crude preparation of Coenzyme I or DPN^+ (i.e. NAD^+) was commercially available from Pabst Brewing, I recall little published work on that cofactor at that time.

Vennesland's laboratory attracted many visitors at that time, and she arranged for them to meet her students. I recall in particular Hans Krebs, Severo Ochoa and his young post-doc Arthur Kornberg, Alexander

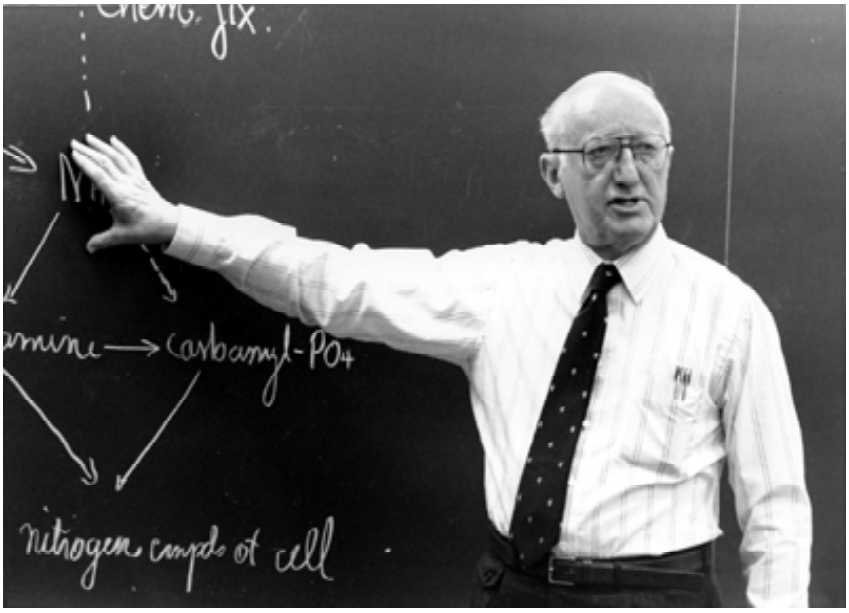
continued on page 6

Todd, Robert Burris and Rutherford Ness (Bob) Robertson. I learned many things from Vennesland, the most important being open, not secretive, about one's research, and being generous in collaboration with others. She stressed that one usually advances a project by collaborating with others who have different but applicable skills and knowledge.

After finishing my Ph. D. I stayed on at Chicago for two years at the urging of Vennesland who wanted me to co-supervise her graduate students while she met other commitments. This allowed me to acquire some valuable experience, and I also taught the introductory biochemistry course in the Biological Sciences Survey, an integrated biology sequence of five courses in the University College. Helen Stafford, who came to Chicago in 1951 as a post-doc to work with Vennesland, also taught botany in that sequence. This gave us valuable teaching experience that was important later when we applied for faculty positions. It also was the start of a long friendship with Helen, another *Woman Pioneer in Plant Biology*.

During those two postdoc years in Vennesland's lab, I was privileged to participate at the beginning of a research problem that has become textbook material. This was the demonstration of the direct enzymatic transfer of hydrogen atoms between substrates and pyridine nucleotides catalyzed by alcohol dehydrogenase (ADH). This was Harvey Fisher's research project initiated under Vennesland. Fisher had to synthesize dideuteroethanol (CH_3CD_2OH) to use as a substrate, and sought Frank Westheimer's advice concerning its synthesis. I provided the crystalline ADH and helped Harvey with the MS measurements. The results were unambiguous (*J. Biol. Chem.* 202, 687 (1953)) and initiated a decade of collaboration between Westheimer and Vennesland that has significantly impacted our knowledge of the stereochemistry of pyridine nucleotide dehydrogenases. Frank Loewus, who came to Chicago just as I was leaving, joined that project and contributed a major share of the experimental design.

I went to the Soils and Plant Nutrition Department in the College of Agriculture at UC Berkeley as an Instructor on September 1, 1992. My biochemical interests were welcomed in that department, made famous for studies on plant nutrition by Dennis Hoagland. However, two years later, an exchange suggested by Paul Stumpf, chair of the small Plant Biochemistry Department in the same College resulted in my moving into that department. I had met Paul when he visited Vennesland in Chicago, and he warmly welcomed me to the Berkeley campus where our relationship developed into a life-long personal friendship. We collaborated in writing the *Outlines of Biochemistry*, and editing the *Biochemistry of Plants* treatise, but never collaborated in research because of our different research interests.



In Berkeley, I initially continued with work involving pyridine nucleotide enzymes and in one project demonstrated that lupine mitochondria could carry out oxidative phosphorylation with the same efficiency (i.e. same P:O ratios) as animal mitochondria. I also had the great good fortune to have, as my first graduate student, Tsune Kosuge, who had a master's degree in plant pathology from Washington State, and sought training in plant biochemistry in order to apply that discipline to plant pathology. Tsune was familiar with the role of coumarin as a precursor of dicoumarol in spoiled sweet clover hay, studied by the legendary K. P. Link at Wisconsin, and proposed investigating the enzymes involved in the biosynthesis of coumarin. Kosuge's thesis research, and papers resulting from it, together with work carried out after he joined the Plant Pathology Department at UC Davis, is probably the first example of a multi-step biosynthetic pathway for a plant natural product described at the enzymatic level. A series of Kosuge's papers documents the evidence that coumarin is formed in sweet clover as follows: phenylalanine → *trans*-cinnamic acid → *ortho*-coumaric acid → *trans-ortho*-coumaroyl-β-glucoside → *cis-ortho*-coumaroyl-β-glucoside → *cis-ortho*-coumaric acid (coumarinic acid) →

coumarin.

The first evidence for PAL, to my knowledge, is Kosuge's thesis research when he observed formation of *trans*-cinnamic acid from phenylalanine in *dialyzed* extracts of sweet clover. These experiments eventually were discussed with Arthur Neish, a distinguished Canadian plant biochemist who, in the 1950s, had already completed an impressive body of work on the biosynthesis of lignin from phenylalanine and tyrosine. In his 1960 review in *Annual Review of Plant Physiology* (11:55 (1960)), Art proposed that *trans*-cinnamic acid might be formed by transamination of phenylalanine, reduction of the keto acid to phenyllactic acid, and dehydration to form cinnamic acid. The first two reactions presumably would require stoichiometric amounts of keto acids and reducing agents (DPNH or TPNH) to accomplish the over-all conversion. Since Tsune's dialyzed extracts catalyzed detectable amounts of cinnamic acid formed from phenylalanine, we believed there had to be another reaction, and proposed a single enzyme catalyzing the deamination, analogous to bacterial aspartase. In 1958 I visited Art at the Prairie Regional Lab (PRL) in Saskatoon and we had a good discussion. I also met Stewart Brown, who did some of the early labeling experiments on coumarins at PRL, and has contributed greatly to the literature in that subject.

One result of this visit was Art coming to Davis in September, 1959 on study leave to look for the deamination of tyrosine in grasses and phenylalanine in a wider range of species. Art brought his supply of labeled compounds as standards, and we provided our new lab facilities for enzyme work, as well as Kosuge, who was located in an adjacent department. Art started looking for TAL in rice, and other grasses, and Jane Koukol, a postdoc from Vennesland, arrived and started working on PAL in sweet clover. Eventually their work on TAL and PAL was published in *Phytochemistry* 1:1 (1961)) and *J. Biol. Chem.* 236: 2692 (1962)) respectively. An amusing problem of nomenclature should be mentioned. We had decided to call these enzymes tyrase and phenylalanase, after the enzyme aspartase. However, the editors at JBC insisted that Jane and I use the newly agreed-upon nomenclature of *phenylalanine ammonia-lyase* for PAL.

I've been queried occasionally about our lack of follow-up on the discovery of PAL as the enzyme gained prominence in plant secondary metabolism. Because it was Tsune's finding initially, I urged that he continue with PAL. However, he was keen to wind up his work on coumarin and start looking at problems in plant pathology that might be amenable to biochemical approaches. He did just that, in such quantity and quality, that he was elected to our National Academy of Sciences in 1988. Tragically, this was shortly before he died prematurely from colon cancer. Later I learned that he was told a few days before his death that both of us were elected that year.

As Tsune took leadership on the coumarin problem, my interests turned to the biosynthesis of cyanogenic glycosides and I concentrated my efforts and limited resources studying those compounds. With the help of Takashi Akazawa, a young graduate student from Uritani's lab in Japan, we soon showed that sorghum seedlings should be an ideal tissue to study the biosynthesis of dhurrin, the β-glucoside of *p*-hydroxy-(*S*)-mandelonitrile, the cyanogen in sorghum. While sorghum seed contains only traces of dhurrin, the 3-5 day old etiolated seedlings contain about 5-10% (dry weight) dhurrin. Since tyrosine was the obvious precursor, we fed C^{14} tyrosine to such seedlings overnight and observed a relatively large incorporation (5-10% of the activity fed) into the glycoside.

We reported these results at the Federation Meetings in April 1998, and were surprised, and somewhat chagrined, to hear John Gander, University of Minnesota, describe almost the same experiments in the following paper. Since John had the following summer free, I invited him out to Berkeley where we worked hard to identify intermediates between the amino acid fed and the cyanogen. With that large amount of incorporation, we both thought that it would be a simple matter to find a few spots on chromatograms, identify them and sort out the pathway. Such was not the case, and it eventually took another decade to establish such intermediates. At the end of the summer John returned home and continued to work on the problem for a few months. But, as success was slow and he had other interests, he stopped working on the problem.

At this point, I decided on a dual approach, namely (a) to determine whether the tyrosine molecule was incorporated intact except for loss of the carboxyl carbon into dhurrin, and (b) to postulate possible intermediates, label them with C^{14} and feed them to seedlings. However, progress was delayed by my move to the Davis campus that fall and a delayed sab-

continued on page 8

batical in England in 1960.

I'd applied for and received a 3-yeaar USPHS grant in 1957 (for $12,000 per year) entitled *Metabolism of Aromatic Compounds in Plants*. It was subsequently renewed in 5-year intervals for a total of 29 years; the final year was $120,000, some of which had to accommodate inflation over those 3 decades. About 15 years into those years, when NIH decided that it would no longer fund plant research, someone at NIH deleted the last two words in the grant title. I wanted to complain about that action, but since I had some people on salary in that grant, I took the coward's way out, and accepted the renewal. In 1973 NSF started funding our research usually in 3-year grants.

In the mid 1950s, the University regents approved a major expansion of the university system that included conversion of Davis to a general campus. Paul Stumpf was asked to set up a general biochemistry department in Davis, and I was invited to go with him. The prominence of plant sciences at Davis, and the fact that the campus was entering a rapid period of growth was very attractive to us. So, in September 1958, Paul and I moved to Davis to initiate our teaching program. We left our students in Berkeley, since the department's facilities would not be ready until the following summer. That fall I had about 60 students in the introductory course. The following fall, there were over 100. By the end of that decade, we were lecturing to classes approaching 400. I describe this increase because it was primarily responsible for allowing us to hire 8 or 9 additional faculty and offer a well-rounded selection of courses. The students and postdocs moved up from Berkeley in July 1959. Art Neish and his family arrived in August, and he and Jane Koukol initiated work on TAL and PAL.

My sabbatical leave was spent in the Low Temperature Research Station in Cambridge with Tony Swain, hoping to learn more about plant phenolics. I did a few experiments on a project of Swain's and we published a brief note indicating that gallic acid can also be formed without phenylalanine as an intermediate. I met Tony's boss, the fabled E. C. Bate Smith, Jeff Harborne, Arthur Bell, Leslie Fowden, and Trevor Goodwin, among others, and attended an early meeting of the Phytochemical Society. These contacts resulted eventually in visits by Fowden and Goodwin to Davis where they taught in our graduate course in plant biochemistry when either Stumpf or myself was absent on sabbatical. Another fortuitous event in Tony's lab was a visit from Alan Johns, a New Zealander I had met in Chicago years earlier. I invited Alan to our flat for dinner and learned that evening that Graham Butler was working on cyanogenesis in flax seedlings in Johns' department in Palmerston North. I immediately initiated correspondence with Graham, and this resulted in his spending a year's leave in Davis with us in 1961-1962, and my taking my next sabbatical in his lab.

My wife and I left England in June 1960 to spend the summer vacation on the continent, visiting friends she made while working in Paris during the 4 years preceding our marriage in 1959. In Germany I called on Hans Grisebach in Freiburg; this was the first of numerous visits in later years to that beautiful city. I'd met Hans in Berkeley when he was a post-doc with Melvin Calvin getting experience in the use of radiotracers in metabolism. He often attended seminars in our Department and was aware of Kosuge's enzyme work on coumarin. When he returned to Freiburg he suggested that we keep in touch. In 1960, he was still a docent in the Chemistry Institute, but soon had his own institute where he trained an entire generation of plant biochemists. I've often lectured in our graduate plant biochemistry course on the elegant research done in Hans' Institute, and am sad that he did not live to see the many current applications of molecular biology to his field. I'm also indebted to Hans for advising some of his students to obtain some experience with enzymes in our group. The first person to do so was Klaus Hahlbrock who came to Davis in 1967.

Back in Davis, I was eager to continue with my teaching and research. Although I performed my share of service on university committees, my primary commitment was to the students and post-docs in my lab, and the undergraduates in my courses. Progress was made on the cyanogen problem; Jane Koukol showed that the carbon bond between the α and β carbons in the side chain of tyrosine was not severed during the conversion of the amino acid to the cyanogen. She also showed that the α carbon atom of tyrosine, labeled with C^{14}, gave rise to labeled HCN, while the β carbon remained in the *p*-hydroxybenzaldehyde moiety of the cyanogen. Several years later, my graduate student Ernie Uribe, using tyrosine labeled with C^{14} in the α position and N^{15} in the amino nitrogen, showed that the bond between those two atoms was not severed during the synthesis. This important result of course meant that all intermediates in the pathway had to contain nitrogen. However, we still did not know their nature. A later

experiment by Harold Zilg from Freiburg showed that the oxygen atom involved in the glucosyl linkage was derived from molecular O_2. This early result implicated a mixed function oxidase.

Graham Butler made several important contributions during his study leave. Since Gander had shown that dhurrin undergoes metabolic turnover in sorghum seedlings, we wondered whether this involved the release of HCN in the atmosphere. In an off-the–wall experiment, Graham and Shula Blumenthal fed C^{14} HCN to sorghum seedlings in a closed system for several hours and then examined extracts for any labeled products. To our great surprise, a single, heavily labeled compound, quickly identified as asparagine, was observed. Later work by Heinz Floss, Lee Hadwiger and Jackie Miller showed that many (and probably all) plants contain a mitochondrial synthase that catalyzes the replacement of the –SH group of cysteine with –CN to form β-cyanoalanine. While it was easy to understand why cyanogenic species might have this enzyme, it was surprising to find that non-cyanogenic species contained lower amounts of the enzyme. This anomaly was probably solved when Shang-fa Yang and his student Galen Peiser showed that one molecule of HCN is formed in the last step of ethylene biosynthesis when ACC (1-aminocyclopropyl-1-carboxylic acid) is oxidized by ACC oxidase. In their experiments, they could not detect HCN, but showed the C^{14} labeled carbon atom bearing the nitrogen atom in ACC was converted to labeled asparagine in nearly stoichiometric amounts (70% yield).

While in Davis, Graham demonstrated the remarkable efficiency of tops of flax seedlings in converting labeled valine to the cyanogenic glucoside linamarin. The tops could convert 35% of the labeled valine fed in experiments lasting only 7 hours! (Intact seedlings converted at most 5% under similar conditions.) Various experiments were also designed to detect conversion intermediates, but none were found. Experiments with N^{15} showed that the nitrogen atom in valine is retained as valine is converted to linamarin. Since sorghum shoots were also more effective in dhurrin biosynthesis, the two experimental systems were relatively equivalent, and when I was in Graham's group (1965-1966), we worked exclusively on flax.

Butler's student, Brian Tapper, was the first to show that oximes are intermediates in the biosynthesis of cyanogenic glucosides. A labeled compound that had the properties of an oxime glycoside accumulated in flax seedlings fed C^{14}-valine and O-methylthreonine, a metabolic inhibitor of valine. He prepared the oxime of C^{14} labeled isobutyraldehyde, administered it to flax shoots and found that it was converted to linamarin nearly as efficiently as labeled valine; isobutyraldehyde itself was not converted. (*Arch. Biochem. Biophys.* 119:593 (1967). Because oximes can be dehydrated to form nitriles, and the latter might be oxygenated to form cyanohydrins, Brian's results suggested this biosynthetic sequence: amino acid → aldoxime → nitrile → α-hydroxynitrile (i.e. cyanohydrin) → cyanogenic glycoside.

When Klaus Hahlbrock arrived in Davis, he prepared the nitriles and cyanohydrins corresponding to possible intermediates in the biosynthesis of linamarin and prunasin, the cyanogen derived from phenylalanine. When fed to appropriate tissues (flax shoots and petioles of cherry laurel leaves, respectively) Klaus found that the nitriles were incorporated, although not as efficiently as the amino acids. The aliphatic cyanohydrin was readily converted to linamarin, but the aromatic cyanohydrin was toxic to leaves. In a joint note with Tapper and Butler (*Arch. Biochem. Biophys.* 125: 1013 (1968)), the plausible biosynthetic pathway cited above was put in writing.

Hahlbrock soon demonstrated the last step in the pathway. He detected a UDPG-ketone cyanohydrin glucosyltransferase in flax seedlings and purified it 120 fold free from β-glucosidase activity. It was equally active on the cyanohydrins of acetone and butanone, forming linamarin and lotaustralin respectively. In subsequent work, he concluded that the flax enzyme is responsible for formation of both cyanogenic glucosides in flax, a fact confirmed years later using cloned enzyme. Later Peter Reay purified and characterized the glucosyltransferase in sorghum seedlings.

From 1966 on, my research centered on several different aspects of cyanogenesis, with two important exceptions. The first was work performed on cinnamic-4-hydroxylase (C4H) by David Russell. In his thesis research with Arthur Galston, David had studied the increase in kaemperferol derivatives mediated by phytochrome in pea seedlings. He proposed using microsomes from such tissue to look for C4H, and was quickly successful (*Arch. Biochem. Biophys.* 122:256 (1967). In an important but seldom cited paper (*J. Biol. Chem.* 246:3870(1971)), David reported numerous properties of the enzyme including its light-reversible inhibition by carbon monoxide (CO), and feed-back inhibition of its activity by the product formed, *p*-coumaric acid. David concluded that his enzyme had all the properties of a P-450 type of cytochrome but that this required studies of the action spectrum for light reversal of the CO-inhibition. My graduate student Rowell Potts subsequently measured the spectrum (*J. Biol. Chem.* 249:5019 (1975)). His spectrum, together with action spectra obtained in Charles West's laboratory in 1969 for two enzymes

continued on page 10

involved in gibberellin biosynthesis are the only such data concerning the many P-450s now described in plants. Although I co-authored the original note in *Archives* with David, I insisted that he be the sole author on the JBC paper, as he had originally proposed the research and had been completely self-sufficient in his work in the lab.

A major advance in the cyanogen biosynthetic work occurred when Ian McFarlane arrived from Michael Slaytor's lab in Sydney. By that time, aldoximes, nitriles and α-hydroxynitriles were considered likely intermediates because of feeding experiments. Since numerous studies in animal tissues, and some in plants, had shown that microsomal enzyme systems catalyzed C-hydroxylation reactions, I suggested to Ian that he see if sorghum microsomes could catalyze the oxidation of *p*-hydroxyphenylacetonitrile to p-hydroxymandelonitrile in the presence of NADPH and oxygen. He isolated microsomes from etiolated seedlings in the presence of thiol reagents, and in an early experiment included tyrosine as a control, not expecting it to be acted upon. Astonishingly, he found that tyrosine was oxidized by the particles to form *p*-hydroxybenzaldehyde and HCN. Moreover, this reaction was more rapid than oxidation of *p*-hydroxyphenylacetonitrile. The particles also utilized the aldoxime as a substrate about as well as the amino acid. The properties of this microsomal system were then extensively studied by Ian and Edith Lees, a faculty member on study leave from Sydney (*J. Biol. Chem.* 250:4708 (1975)).

Since the conversion of tyrosine to p-hydroxyphenylacetaldoxime constitutes a 4-electron oxidative decarboxylation, an intermediate in that conversion was likely. Earlier work on glucosinolate biosynthesis in Ted Underhill's group in Saskatoon had indicated *N*-hydroxyaminoacids as intermediates between amino acids and aldoximes in the biosynthesis of glucosinolates. The next step was the synthesis of N-hydroxytyrosine (NHT).

Birger Moller arrived from Copenhagen, just as Ian and Edith were finishing up this work, and decided to work on this problem. He perfected a synthesis of NHT initiated by Ian, and prepared the C^{14}-labeled compound. Its efficacy as a substrate was compared with five other compounds that, on paper, could be intermediates between tyrosine and its aldoxime (e.g. tyramine, *N*-hydroxytyramine, *p*-hydroxyphenylpyruvic acid oxime). Only NHT was metabolized to *p*-hydroxymandelo-nitrile by the particles. Moreover, NHT was produced from [UC^{14}-C]-tyrosine in tracer experiments when unlabeled NHT was added as a trap (*J. Biol. Chem.* 254: 8575 (1979)).

Another major contribution Birger made to the problem while in Davis was to show that the biosynthetic sequence catalyzed by the microsomes is highly channeled (*J. Biol. Chem.* 255:3059 (1980)). His experiments explain why, in the early work done both in Butler's and our labs, we never easily detected any intermediates. Helen Stafford was among the first to propose metabolic channeling in the synthesis of natural products, and she has discussed the criteria that need to be met in her chapter in Volume 7 of *The Biochemistry of Plants*. While this first paper met many of those criteria, recent research from Birger's group in Copenhagen has gone on to show that the three enzymes involved in the biosynthesis form an organized complex. Recently, Meinhart Zenk told me he was skeptical of that early paper until Birger presented his recent work on channeling at a seminar in Munich twenty years later.

Birger returned to Denmark after two years and initially worked at the Carlsberg Institute on aspects of photosynthesis. In 1985, when he was appointed to the chair in Plant Biochemistry at the Royal Agricultural and Veterinary University, he proposed returning to the cyanogenesis field, and I strongly encouraged him to continue with his biosynthetic work. Applying the tools of molecular biology to that and related problems, he and his group have greatly advanced our understanding of the subject. He reviewed their progress at the PSNA meeting in Montreal (*Rec. Advan. Phytochem.* 34:191(2002)), and numerous other papers have appeared since then.

Other problems, usually related to cyanogenesis, attracted the interest of workers in my lab from 1970 until I retired in 1993. Harold Zilg, Kevin Farnden and Mark Rosen, an undergraduate student, studied various stereochemical aspects of cyanogen biosynthesis. Adrian Cutler examined metabolic channeling during biosynthesis in arrow grass and flax. Wendy Swenson and Joe Olechno described new cyanogens from *Acacia sutherlandin* and *Nandina.* Mary Seely, Gary Kuroki and Lang-lai Xu studied the properties of α-hydroxynitrile lyases in several species while Dirk Selmar concentrated on the physiological role of that enzyme. The β-cyanoalanine synthase of lupine was studied by Harland Hendrickson, and Peter Castric and Kevin Farnden discovered a new enzyme that hydrolyzes β-cyanoalanine to asparagine, thereby explaining how the nitrogen in cyanogens is retained by plants rather than being lost as HCN. Compartmentation of cyanogenic glycosides and their catabolic enzymes attracted the interest of Jim Saunders, Jonathan Poulton, Susan Thayer, Eve Wurtele, Mineo Kojima and Marco Frehner. Poulton, Kazuko Oba and Alain Boudet extended such work to enzymes and intermediates of coumarin biosynthesis in sweet clover. Wolfgang Hosel and Ingrid Tober characterized β-glucosidases in sorghum, and Hosel emphasized the

specificity of plant β-glucosidases in a review in *TIBS*.

Another study, not involving cyanogenesis, examined the role of the non-aromatic amino acid, arogenic acid, in the biosynthesis of tyrosine and phenylalanine in sorghum. Earlier studies by Roy Jensen had shown that tyrosine is formed in mung bean, maize and tobacco by transamination of prephenic acid to form arogenic acid (*pre-tyrosine*), followed by oxidative *aromatization* of the 6-membered ring to form tyrosine. Jim Connelly and Dan Siehl showed that sorghum contains prephenic transaminase that utilizes glutamate as amino donor forming arogenate, together with arogenate dehydratase and dehydrogenase required for aromatization of arogenate and formation of phenylalanine and tyrosine. They could not detect the dehydratase and dehydrogenase that aromatize prephenic acid. Bijay Singh and Gary Kuroki examined the regulatory properties of chorismate mutase in several species.

Starting in 1974, my research interests broadened because of collaboration with David Seigler. I told David at the 1972 PSNA meeting of older literature showing that some South African species of acacia contained cyanogens derived from valine and isoleucine, while those in Australian species are derived from phenylalanine. This was the only example at that time of aliphatic and aromatic cyanogens occurring in the same genus. David, who teaches plant taxonomy at Illinois although his Ph. D. is in physical organic chemistry, informed me of the taxonomic complexity of the genus, and we decided to check out the earlier work. After confirming those studies, I started testing acacias in the UCD arboretum for cyanogenesis, as well as herbarium specimens. Leaf material of any positive species were then obtained, extracted and worked up to identify the cyanogen. This project resulted in several new cyanogenic glycosides being reported.

While testing acacias in California gardens, I also started looking at eucalyptus. Because there was only one documented report of cyanogenesis in that large genus - prunasin in *E. cladocalyx* - I reasoned there should be some additional cyanogenic species. Initially I found two additional cyanogenic species in California, and this led to my last sabbatical in Australia in 1981-1982.

My family and I flatted in Adelaide where I had space in the laboratory of Brian Coombe at the Waite Institute. (I'd met Brian in 1955 when he was getting his Ph. D. in plant physiology at Davis.) The Waite has over 300 species of eucalyptus in their botanic garden and that kept me occupied for several weeks. We then started visiting botanic gardens in Adelaide, Brisbane, Canberra, Melbourne, Hobart, Sydney and Perth where I arranged permission to examine both eucalyptus and acacias. Except for Canberra and Perth, it was surprising to see that the other gardens usually had more specimens of northern hemispheric plants than Australian species. However, Canberra's National Botanic Garden is restricted to Australian species and proved especially useful.

While in Perth, I met Bruce Maslin, an expert on the 800-plus Australian species of acacia, many of which are native to Western Australia. Bruce was interested in my project, and I mentioned one species I'd decided was cyanogenic after testing it in several gardens earlier. Because of his taxonomic knowledge, he quickly named several related species and produced herbarium specimens that we tested. During that first afternoon, we identified more cyanogenic species than I had managed to find during several months of work in gardens. Such results from herbaria require that live specimens be located in the field, tested for cyanogenesis, and if positive, sampled and processed for identification of the cyanogen. This led to several collecting trips with Bruce in subsequent years.

Papers in *Phytochemistry, Kingia,* and the *Western Australian Herbarium Research Notes*, present results of tests on 96% of the described species of the genus. This work showed that cyanogenic species in subgenus *Acacia* contain only aliphatic cyanogens, while cyanogenic species in the two other subgenera *Phyllodineae* and *Aculeiferum* contain aromatic cyanogens. These data support traditional taxonomic evidence that subgenus *Aculeiferum*, distributed mainly in Africa and Asia, is more closely related to the predominantly Australian subgenus *Phyllodineae* than to the pan-tropical subgenus *Acacia*. The work on eucalyptus involved testing about 1400 individual plants representing 348 species, 22 of which were cyanogenic. (*R*)-prunasin, derived from phenylalanine, was identified as the cyanogen in 10 of those species.

I appreciate the invitation to prepare a description of my research career. I've intentionally overemphasized the early part to let younger phytochemists know how different research was then without the techniques, equipment and biochemicals available now. As always, it's a great pleasure to acknowledge the essential contributions of all who have worked with me.

Eric Conn
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Editor's note: We are priviledged to have the opportunity to read about the personal and professional events that shaped the lives and careers of eminent scholars, such as Eric Conn. Nominations are still welcome for Phytochemical Pioneers who have made an outstanding impact on their field. Please contact the Editor.

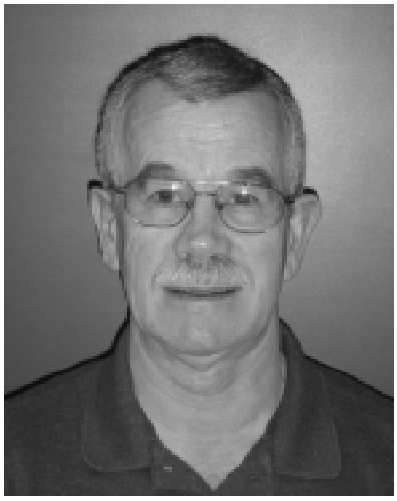
I DON'T GET NO RESPECT! NO RESPECT, I TELL YOU!

Ever wish you knew a little more about the next PSNA President? Do you wonder who collects your hard-earned cash for the priviledge of belonging to this esteemed society? Most of all, wouldn't you like to get inside the mind of the crazy dude responsible for this newsletter? Now's your chance, kids. Read on!

Daneel Ferreira - PSNA President-Elect

Daneel Ferreira graduated from the University of Pretoria, South Africa in 1964. He completed the B.Sc. (Hons.) and M.Sc. programs in Chemistry at the University of the Orange Free State, Bloemfontein through part time studies, while teaching Mathematics and Physical Sciences at a local high school. In 1969 he was appointed as Technical Assistant in the Chemistry Department at UOFS, obtained the D.Sc. degree in Organic Chemistry in 1973 and progressed through the ranks to Professor of Organic Chemistry in 1985, serving as chairperson of the Chemistry Department from 1994 - 1997. He spent 1977 as a Visiting Lecturer at Imperial College, London where he worked under the supervision of the Nobel laureate, the late Sir Derek Barton, and was awarded the Diploma of Imperial College for his work on aminoglycoside antibiotic synthesis. While at UOFS he served as supervisor/co-supervisor for 42 M.Sc. and 27 Ph.D. students. He is a recipient of the Gold Medal of the South African Chemical Institute, and the Havenga Prize of the South African Academy for Arts and Sciences for longterm, sustained excellence in Organic Chemistry.

Daneel has worked on the chemistry of flavonoids and proanthocyanidins focusing on structure elucidation via physical methods, especially NMR and circular dichroism, semisynthesis of oligomers, stereoselective syntheses of monomeric precursors, and the development of general methodologies to manipulate the C6-C3-C6 molecular backbone. He established a research unit for polyphenol- and synthetic chemistry at UOFS by the Foundation for Research Development in South Africa, and was appointed Director in 1990. In 1999 he joined the Thad Cochran National Center for Natural Products Research as a Visiting Scholar.

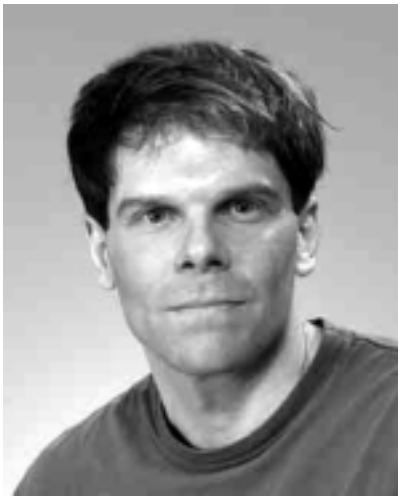


He is currently a Principal Scientist in the Center, where he continues with the synthetic and semisynthetic work on proanthocyanidins, focusing in part on solutions toward the many unsolved problems in this complex field of study. He collaborates with Dr. Rick Dixon of the Noble Foundation, Ardmore, Oklahoma in an effort to establish the biosynthetic sequence to proanthocyanidins (condensed tannins). In addition he works on the structure elucidation and synthesis of biologically active natural products, with special emphasis on structure/activity relationships and selected radio labeling synthetic sequences. He is the author/co-author of more than 220 papers in leading international journals. Besides serving on the editorial board of *Phytochemistry*, he regularly reviews manuscripts for a variety of scientific journals, and also research proposals for several federal funding agencies.

Peter Facchini - PSNA Secretary and Newsletter Editor

Peter Facchini was born and raised in the great city of Toronto, Canada. He obtained a B.Sc. in Biology in 1987 and a Ph.D. in Plant Biochemistry in 1991 from the University of Toronto. During the course of his doctoral research, he began to cultivate an interest in plant natural product metabolism. Peter pursued his first postdoctoral research followship under the supervision of Joe Chappell at the University of Kentucky. In 1992, they reported, for the first time, the cloning and characterization of a plant terpene synthase, *5-epi*-aristolochene synthase from tobacco. Peter continued his postdoctoral research with Vincenzo De Luca at the Université de Montréal where they reported the cloning of tyrosine/dopa decarboxylase from opium poppy in 1994. Peter headed to Western Canada in 1995 and was appointed a Professor in the Department of Biological Sciences at the University of Calgary. In 2002, he was awarded the Canada Research Chair in Plant Biotechnology. His research program is focused on understanding the regulation of alkaloid biosynthesis in

opium poppy and related species at the biochemical, molecular and cellular levels. A major interest is the relationship between cellular differentiation and secondary metabolism. He is also actively engaged in the application of genomics technologies to the study of alkaloid biosynthesis in plants. He has been honoured over the past few years with invitations to contribute chapters to the *Annual Review of Plant Physiology and Plant Molecular Biology* as well as the *Recent Advances in Phytochemistry* series offered through the PSNA. He currently supervises five graduate students, two postdoctoral fellows and a research assistant in his laboratory. He teaches a number of undergraduate and graduate courses including everything from first year plant biology (to ~700 students) to junior-level plant physiology and



senior-level plant biochemistry and plant molecular biology. He is also an associate editor for the *Canadian Journal of Botany*. As if he didn't have enough to do, Peter has served as your PSNA Secretary and Newsletter Editor for the last three years. Peter is a life-long and avid hockey player although, due to his somewhat average size, *in-yo'-face* style and cocky on-ice attitude, he tends to get beat up a lot. He also enjoys various outdoor activities in the nearby Rocky Mountains especially now that he can distinguish between a black bear and a grizzly. As he enters adulthood, Peter is learning to appreciate the finer things in life. Like most Canadians, he is particularly fond of whale blubber, carribou jerky, and snow cones. His greatest ambition is to have enough money to buy some new clothes. Although he knows this is *pie-in-the-sky* on a professor's salary, he takes comfort in the fact that all his old pairs of acid-washed jeans, high-top runners, and Van Halen T-shirts are finally back in fashion.

Charles Cantrell - PSNA Treasurer

Charles Cantrell is currently a Senior Chemist with Hauser, Inc. in Longmont, Colorado. He was born in Baton Rouge, Louisiana and received a B.S. in Zoology and Physiology with a minor in Chemistry from Louisiana State University in 1994. He obtained a Ph.D. in Chemistry from LSU in 1998 under the direction of Nikolaus Fischer. His thesis work focused on investigations of crude plant extracts possessing potent activity against *Mycobacterium tuberculosis*, the gram-positive bacterium species responsible for the disease tuberculosis. This research led to the isolation of numerous terpenoids possessing remarkable activity against *M. tuberculosis*. From 1998 to 2000 he conducted postdoctoral research in the Laboratory of Drug Discovery Research and Development, National Cancer Institute, in Frederick, MD. His research consisted of the isolation and structure elucidation of cytotoxic constituents isolated from marine plants and animals. This research led to the discovery of the chondropsins, a new class of cytotoxic macrolides from the marine sponge *Chondropsis* sp. After this short postdoctoral position, he spent two years as a Research Chemist with the Agricultural Research Service in Peoria, Illinois where his research focused on investigations of crude extracts from plant seeds housed within the NCAUR Oilseed

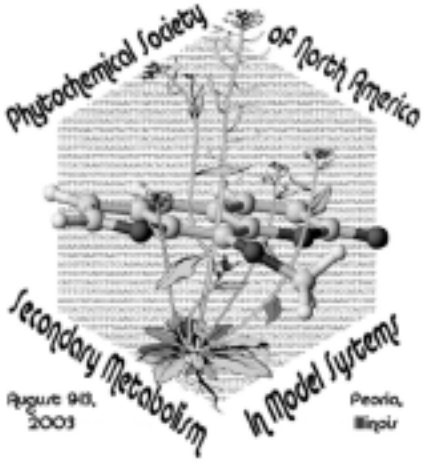
Repository. Charles left ARS in 2001 to pursue a career in the private sector as Associate Director of Research and Development for Tanical Therapeutics, Inc. His research at Tanical focused on the identification of small molecule drug candidates from plants with a history of traditional usage against such diseases as cancer, rheumatoid arthritis, and benign prostate hyperplasia. As is true of so many start-up companies, Charles's tenure was cut short when Tanical was unable to find additional venture capital. Within a few months of leaving Tanical, he settled into a Senior Chemist position at Hauser, Inc. He has been PSNA Treasurer since 2002 and will serve a three-year term. He also serves as editor of *The Cornucopia*, the newsletter for the American Chemical Society (ACS) Division of Agricultural and Food Chemistry (AGFD). He was the recipient of the James G. Traynham Award for Excellence in Teaching and Research in Chemistry in 1998.

PHYTOCHEMICAL SOCIETY OF NORTH AMERICA

2003 ANNUAL MEETING

August 9-13, 2003
The Hotel Pere Marquette/Peoria Convention Center
Peoria, Illinois, USA

"Secondary Metabolism in Model Systems"



Organized Symposiums

Rice Symposium
  Symposium Organizer: Dr Tom Okita
Arabidopsis thaliana Symposium
  Organizer: Dr Clint Chapple
Legumes Symposium
  Organizer: Dr Mark Gijzen
Maize Symposium
  Organizer: Dr Erich Grotewald
Fungi Symposium
  Organizer: Dr Susan McCormick
Niesh Young Investigator Minisymposium on Plant Insect Interactions
  Organizer: Dr Mark Berhow

Submission of abstracts for posters on all phytochemical subjects are encouraged.

Poster Abstracts must be received by June 1, 2003. Send by email to **PSNA2003@ncaur.usda.gov,** or send two copies of the abstract and a copy on diskette (MS-Word or WordPefect format) by post to:

PSNA 2003 Meeting
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1815 N. University Street
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The symposia proceedings will be published in the ***Recent Advances in Phytochemistry*** series—order at the meeting at a 50% discount.

The Hotel Pere Marquette
www.hotelperemarquette.com

Peoria in the Summer of 2003

I know what you are thinking. I thought the same things (and worse) some eight years ago when I first moved to the mid-west. Peoria? Flat landscapes, corn and soy fields, and some big company that makes yellow earthmoving equipment. Hot and humid in the summer and cold and windy in the winter. Why would anybody go there on purpose!?

But, it did not take long for me to grow to really appreciate the town and its people. Of all the places I have lived in my life, this was the one place where the majority of people I have met have lived most of their lives here. Sure some left for a while, but often they come back.

There really is something to the place. Peoria is the second largest metropolitan area in the state after Chicago. The City of Peoria is located in central Illinois—within three hours driving time of both Chicago and St. Louis. Peoria is located on the Illinois River, a major waterway connecting the Great Lakes with the Mississippi River. It has a rich history, sophistication, and diversity. While heavy industry and agriculture are key parts of the commercial hub that surrounds the area, there are other reasons that people come and stay here. Peoria has all the amenities of the larger cities, but few of the hassles—no traffic jams and accessible parking. Local and Broadway theater, a symphony orchestra, ballet, and all types of live music. For the evening out, Peoria offers everything from fine dining to local pubs and everything in between. The Peoria area has a gambling casino, a superb collection of public golf courses, and several nearby parks. I ask that you come, visit, and find out for yourself what plays in Peoria. I think you'll have a wonderful time.

Peoria has a major regional airport and transportation can be easily arranged from the airport to the hotel. The meeting hotel is the Hotel Pere Marquette, a historic hotel located in heart of downtown Peoria. Just one block from the hotel is the Peoria Convention Center where the symposia, poster sessions, and banquet will be held. Within easy walking distance of the hotel are a number of restaurants and night clubs for lunch and evening entertainment. Four blocks from the hotel is the waterfront area—with a newly developed park and food and entertainment complex. We have a full schedule of symposia for this meeting, and ample space for poster displays—hopefully all posters can be displayed for the entire meeting. A tentative schedule includes a mixer on Saturday night, scheduled poster sessions on Sunday evening and Monday afternoon with the banquet on Monday evening. We are going to arrange some activities for the afternoon off—tours to local sites as we get volunteers in place.

Oh, and by the way, what about heading out to the old (new actually) ballpark with the PSNA? The City of Peoria has just built a new state of the art minor league baseball stadium for the hometown Peoria Chiefs a mere five blocks from the hotel. The Pepsi Picnic Plaza has been reserved for the PSNA for the Tuesday August 12th game at 7PM. Eat, drink, socialize, and watch the game with your fellow conference attendees, as well as the folks from the USDA Lab (or the Ag Lab as the locals call it). We have got plenty of room.

So, now I hope you are thinking, "why not!" Come and enjoy the meeting, relax and take in some midwest hospitality.

Mark Berhow
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PHYTOCHEMICAL SOCIETY OF NORTH AMERICA
2003 ANNUAL MEETING

August 9-13, 2003

The Hotel Pere Marquette and Peoria Convention Center, PEORIA, ILLINOIS, USA

Secondary Metabolism in Model Systems

Symposium Speakers

Maize Symposium

Dr. Eleanore Wurtzel
Department of Biological Sciences
Lehman College CUNY
Bronx, NY, USA
Title: Genomics, genetics, and biochemistry of maize carotenoid biosynthesis.

Dr. Alfons Gierl
Lehrstuhl fuer Genetik
Wissenschaftszentrum Weihenstephan
Technische Universitaet Muenchen
Freising, Germany
Title: Evolution of DIMBOA Biosynthesis and Indole Production in Zea mays.

Dr. Basil J. Nikolau
Department of Biochemistry, Biophysics and Molecular Biology,
Iowa State University,
Ames, IA, USA
Title: Genetic and metabolomic analysis of epicuticular wax biosynthesis in maize

Rice Symposium

Dr. Mark Lange
Torrey Mesa Research Institute
San Diego, CA, USA
Title: A genomic survey of metabolic pathways in rice

Dr. Masuru Tomita
Institute of Advanced Biosciences
Keio University
Japan
Title: Rice E-cells

Speaker TBA

Arabidopsis Symposium

Dr. Dorothea Tholl
Max-Planck-Institute for Chemical Ecology
Jena, Germany
Title: Terpenoid metabolism

Dr. Jim Tokuhisa
Max Planck Inst for Chemical Ecology
Jena, Germany
Title: Glucosinolate biosynthesis

Dr. Clint Chapple
Department Of Biochemistry
Purdue University,
West Lafayette, IN, USA
Title: Phenylpropanoid metabolism

Fungi Symposium

Jiujiang Yu
Food and Feed Safety Research Unit,
USDA/ARS, Southern Regional Research Center
New Orleans, LA, USA
Title: *Aspergillus flavus* EST library

Dr. Nancy Keller
University of Wisconsin-Madison
Department of Plant Pathology
Madison, WI, USA
Title: Aflatoxin biosynthesis gene cluster in *Aspergillus*

Dr Frances Trail
Department of Plant Biology
Michigan State University
East Lansing, MI, USA
Title: *Fusarium graminearum* genome project.

Art Niesh Young Investigator Minisymposium

Dr. Eva Casells
Department of Entomology
University of Illinois at Urbana-Champaign
Urbana, IL, USA
Title: Secondary chemistry of Poison Hemlock and its associate herbivores

John Tooker
Department of Entomology
University of Illinois at Urbana-Champaign
Plant defensive compounds as host plant and mate recognition cues of gall wasps

Dr. Brian Traw
Dept. Ecology and Evolution
University of Chicago
Chicago, IL, USA
Title: Glucosinolates as an induced defense in Arabidopsis

Dr. Eric Johnson
USDA, ARS, NCAUR
Peoria, IL, USA
Title: Plant phenolic insect feeding deterrents

Dr. Benedict Hollister
USDA, ARS
Beltsville Agricultural Research Center
Beltsville, MD, USA
Title: TBA

Legume Symposium

Dr. Richard Dixon
Noble Foundation
Ardmore, OK, USA
Title: *Medicago truncatula*: A model legume for the study of natural products and forage quality

Dr. Lila Vodkin
Department of Crop Sciences
University of Illinois at Urbana-Champaign
Urbana, IL, USA
Title: Genetic and molecular control of the flavonoid pathway in soybean

Dr. Brian McGonigle
Nutrition and Health, The DuPont Co.
Wilmington, DE, USA
Title: Engineering of the soybean phenylpropanoid pathway for improved flavor and health benefits

Annual meeting preview

continued from page 4

certain classes of secondary metabolites that defend plants against insects (Eric Johnson, USDA, Peoria) or that affect insect behaviour in systems like poison hemlock (Eva Cassels, University of Illinois) and in insect galls (Larry Hanks, University of Illinois).

Summary

With an original theme and impressive list of speakers, we are sure this year's meeting will be interesting and successful. Young scientists in all areas of plant biology who wish to learn about the functional side of genomics should be encouraged to attend. What you learn here may help you develop new ideas to define the function of the numerous plant genes that remain to be characterized. The Phytochemical Society of North America invites you to join us in Peoria, Illinois from August 9 - 13, 2003 for an interesting and productive gathering.

Vincenzo De Luca
Brock University
St. Catharines, Ontario, Canada
vdeluca@spartan.ac.brocku.ca

Susan McCormick
and Mark Berhow
USDA. ARS, NCAUR
Peoria, Illinois, USA
mccormsp@ncaur.usda.gov
berhowma@ncaur.usda.gov

Hey Pussygato!

Don't Be Loco

Write for PSNA News

For more information contact the Editor

PHYTOCHEMICAL SOCIETY OF NORTH AMERICA 2003 ANNUAL MEETING
August 9-13, 2003 The Hotel Pere Marquette/Peoria Convention Center Peoria , Illinois , USA

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PART A:

The above named registrant is a graduate student working under my supervision.

Supervisor's Printed Name: _____ Supervisor's Signature: _____

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PHYTOCHEMICAL SOCIETY OF NORTH AMERICA 2003 ANNUAL MEETING
August 9-13, 2003 The Hotel Pere Marquette/Peoria Convention Center Peoria , Illinois , USA

Abstract Submission Form (Please Type or Print Clearly)

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Country:_____ Zip or Postal Code: _____

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Please check if you wish to be considered for a Best Student Paper or Poster Award.

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Abstracts must be received by June 1, 2003. Send two hard copies of the abstract and a copy on diskette (MS-Word) by post to:

PSNA 2003 Meeting
Attention: Mark Berhow
USDA. ARS, NCAUR
1815 North University Street
Peoria, IL 61604 USA
Phone: (309) 681-6347
Fax: (309) 681-6524
email: berhowma@ncaur.usda.gov

or e-mail (Microsoft Word or WordPerfect format) to: PSNA2003@ncaur.usda.gov

ABSTRACT FORMAT: Typed on plain paper in 12 point Times New Roman font and not exceeding 16.5 cm x 7.5 cm (6.5 in x 3.0 in).

INVITED SPEAKERS: (Symposia and Plenary talks): Typed on plain paper in 12 point Times New Roman font and not exceeding 16.5 cm x 12.5 cm (6.5 in x 5.0 in). Please submit abstracts by **June 1, 2003.**

PHYTOCHEMICAL SOCIETY OF NORTH AMERICA 2003 ANNUAL MEETING
August 9-13, 2003 The Hotel Pere Marquette/Peoria Convention Center Peoria , Illinois , USA

Lodging Information

Participants are requested to contact the hotel directly for all room reservations.

All rooms must be guaranteed with a credit card or deposit for at least the first night by July 1st, 2003 to qualify for the block rate. Rooms are subject to availability.

HOTEL RATE: $83 for double or single, plus applicable taxes and fees. Please mention you are attending the **Phytochemical Society of North America Meeting** to get the block room rate.

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Other Hotels within walking distance of meeting site:

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Fax: 309-674-8705

Mark Twain Hotel
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Peoria, Illinois 61602
Telephone: 309-676-3600
Fax: 309-676-3159

There are several other hotels located with in a short commute to the downtown area.

The City of Peoria is located in central Illinois, with a major regional airport and it is within three hours driving time of both Chicago and St. Louis. Peoria is located on the Illinois River, a major waterway connecting the Great Lakes with the Mississippi River, it is home to the USDA National Center for Agricultural Utilization Research and Caterpillar, Inc. Peoria has a gambling casino, a supurb collection of public golf courses, and several nearby parks with restored prairies. Downtown Peoria has a number of restaurants, a newly developed river waterfront park and entertainment complex, and a new minor league baseball park for evening entertainment. The meeting will be co-sponsored by the Peoria Regional BioCollaborative (PRB), whose objective is to build a strong biological research park in Peoria over the next few years.

HOLY SESQUITERPENE LACTONE, BATMAN!

Its the amazing phytochemistry word find - for the chronically bored

Circle each of the letters in each word as you find them.

The uncircled letters reveal the secret message:

_ _

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E H C M M A M I N O A C I D E L
E P Y U P E P T I D E E S I N A
P I L T R E T O M O R P O O E B
Y P O A O N D S A C L S R M N A
T R A N S C R I P T I O N I A N
O O O T L M H Y R S G A T C H T
N T M O A E I E I E N T N R P H
E E A N T C G D M R I E A O O O
H I D I L O C E E I N B L A T C
P N P O L Y M E R O S L P R P Y
G E N O M I C S T B E T O R Y A
L E M Y Z N E S I C L S R A R N
T O C I D M I E N I S O R Y T I
H E A T S H O C K P R O T E I N

AMINO ACID
ANTHOCYANIN
BLOT
CELL
CLONE
CODON
DICOT
DNA
E COLI
ENZYME
GEL
GENE
GENOMICS
HEAT SHOCK PROTEIN
HISTONE
HOMOLOG
ION
LAB
LIGNIN
MEIOSIS
MICROARRAY
MUTANT
PEPTIDE
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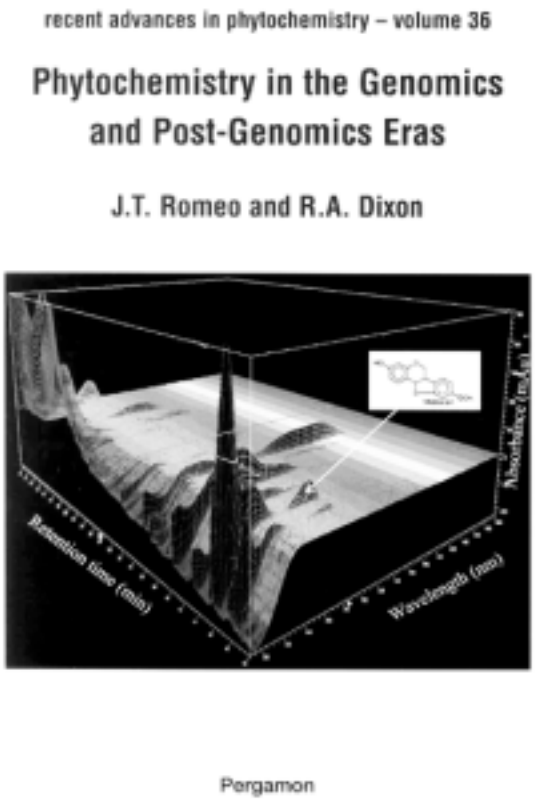
PHYTOCHEMISTRY
PLANT
PLASMID
POLYMER
PRIMER
PROMOTER
PROTEIN
RNA
ROOT
SEED (X2)
STEM
TRANSCRIPTION
TRYPTOPHAN
TYROSINE

Elsevier Publishes Volume 36 of Recent Advances in Phytochemistry

Volume 36 of Recent Advances in Phytochemistry - *Phytochemistry in the Genomics and Post-Genomics Eras*, the symposium volume resulting from the 2001 PSNA Annual Meeting in Oklahoma City, OK is the third volume in this series published by Elsevier. Volume 36 centers on the role of phytochemistry in the rapid developments in biology brought about by the application of large-scale genomics approaches.

Genomics has altered the way in which we view plant biology by providing a global view of cellular processes. Sequencing programs are documenting expressed genes in many species, but we must still identify the function of most genes. Several functional genomic approaches can address plant gene function on a large scale. Plants are combinatorial chemists par excellence, and understanding the principles that relate enzyme structure to function will create unlimited possibilities to generate novel biologically active natural products. Knowledge of the molecular genetics of plant natural product biosynthesis will also facilitate pathway engineering for plant improvement and human benefit. Phytochemistry truly has a great future in the genomics and post-genomics eras.



Contributors to this timely volume explore a wide range of topics that include:

- Bioinformatics and computational biology
- Metabolomics as a component in functional genomic studies
- Metabolite profiling
- Biopanning by activation tagging
- Functional genomics of Cytochromes P450 and their role in biosynthesis
- Sequence-based approaches to alkaloid biosynthesis gene identification
- Structurally guided alteration of biosyntheses

The PSNA, under terms of our contract, can sell this volume at almost a **50% discount**. To purchase Volume 36 please contact the Treasurer, Charles Cantrell.

Recent Advances in Phytochemistry Series

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**Volumes 34, 35, and 36 are available from our new publisher, Elsevier. Please contact the PSNA Treasurer, Charles Cantrell, for information on ordering these volumes.

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Phytochemical Society of North America

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Please make check or money order payable to the **Phytochemical Society of North America.** Payment must be made in U.S. dollars, drawn on a U.S. bank. Traveler's Checks or Canadian Postal Money Orders, payable in U.S. dollars, are also acceptable. We are unable to accept payment via credit card.

Dues schedule:

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May we include/link your directory/homepage information on the PSNA website? Yes/No

Research Interests (circle up to 4 items):

A. Acetylenes
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C. Amino acids/proteins
D. Coumarins
E. Cyanogenics
F. Flavonoids
G. Glucosinolates
H. Lignans
I. Lipids
J Nitrogen compounds
K. Nucleic acids
L. Organic acids
M. Phenolics
N. Pigments
O. Quinones
P. Stilbenes
Q. Sugars/polysaccharides
R. Sulfur compounds
S. Terpenoids
T. Vitamins
aa. Biochemistry/physiology of herbicides
bb. Enzymology
cc. Cell wall chemistry
dd. Chemotaxonomy
ee. Biotechnology
ff. Plant-insect interactions
gg. Plant-microbe interactions
hh. Plant-plant interactions
ii. Chemical reactions/organic synthesis
jj. Biochemistry of secondary metabolism
kk. Fungal metabolism
ll. Growth regulators
mm. Biochemistry/physiology of stress
nn. Industrial applications
oo. Structure identification
pp. Marine natural compounds
qq. Medicinal chemistry
rr. Membrane structure/function
ss. Molecular/immunological techniques
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uu. Pharmacology/pharmacognosy
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ww. Plant genetics
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PSNA NEWS

Phytochemical Society of North America
Sociedad Fitoquímica de América del Norte
Société Phytochimique de L'Amerique du Nord

Volume 43, Number 2 December 2003

PRESIDENT'S LETTER

The Changing Face of Phytochemistry

It is indeed a great honor to address our members as President of PSNA for 2003-2004. I am privileged and grateful for the opportunity to serve not only the PSNA membership but also the larger communities of phytochemists and plant biologists during this short period of the exciting and challenging timeframe that we work in.

Our annual meeting (August 9-13, 2003) in Peoria – Secondary Metabolism in Model Systems – was a resounding success. The program was divided into several symposia, each focusing on fundamental issues related to important agricultural areas of research, *i.e*., legumes, rice, maize, Arabidopsis, and fungi. In addition, time slots were reserved for an extremely useful "new techniques" symposium as well as the popular Arthur Neish young investigator symposium. As a traditional Phytochemist I was truly amazed to experience how the fundamental principles of Molecular Biology may be utilized not only to enhance the beneficial characteristics of certain crops but indeed also to eliminate some of the unwanted properties, *e.g*. to improve the flavor and health benefits of soybean products. As usual it was a very rewarding experience to witness the enthusiasm of our five young investigators in the Neish symposium. Their supervisors can be proud of the contributions they have made to the scientific development of these bright young individuals. We as a Society are indeed privileged to have such talented young members who have the added responsibility to launch us into the future. May we again use this opportunity to thank the individual symposia organizers for bringing together such a strong scientific contingent, and also to Mark Berhow for superbly organizing a first class meeting.

Reflecting on the scientific program of the Peoria meeting, however, strongly brings to the fore the issue of the "factionalization" of recent meetings [see President's Letter (Richard A. Dixon), PSNA Newsletter, 2001, **41**(2), 1]. The Peoria meeting clearly catered for the "biological group" within The Society, hence offering considerably less to the "chemical group". This is perhaps the direct result of the necessity to have a "program theme" for our prestige publication, Recent Advances in Phytochemistry. Keeping in mind the importance of this publication to the financial viability of The Society, we need to think very hard of ways to set up and structure a program that will still be acceptable and indeed marketable as an RAP theme. Failure to regularly accommodate both the "chemical" and "biological" factions at all of our meetings can only be detrimental to our Society. Phytochemistry and plant biochemistry should never be viewed as anything but different sides of the same coin. Careful scrutiny and analysis of appropriate journals indeed reveals that the top papers are those where a

continued on page 7

IN THIS ISSUE

CONTENTS

2004 PSNA Annual Meeting

a joint meeting with the

International Society of Chemical Ecology

July 24 - 28, 2004
Ottawa, Ontario

The Phytochemical Society of North America (PSNA) is a nonprofit scientific organization whose membership is open to anyone with an interest in phytochemistry and the role of plant substances in related fields. Annual membership dues are U.S. $40 for regular members and $20 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. PSNA meetings provide participants with exposure to the cutting-edge research of prominent international scientists, but are still small enough to offer informality and intimacy that are conducive to the exchange of ideas. This newsletter is circulated to members to keep them informed of upcoming meetings and developments within the society, and to provide a forum for the exchange of information and ideas. If you would like additional information about the PSNA, or if you have material that you would like included in the newsletter, please contact the PSNA Secretary and Newsletter Editor. Annual dues and changes of address should be sent to the PSNA Treasurer. Also check the PSNA website at www.psna-online.org for regular updates.

PHYTOCHEMICAL PIONEERS

Tom Mabry: From the cotton fields of Texas to the wonderous world of plant chemistry

Born and raised on a farm a few miles from Commerce, Texas, some 60 miles northeast of Dallas, my childhood was filled with many good times even when working in our cotton fields with my three siblings and my parents, farmer/County Commissioner Thomas Lee Mabry and housewife/grade school teacher Grace Creamer Mabry. It was on the farm where I developed a curiosity about the natural world, which led me to study biology and chemistry in high school. Luckily, Commerce had a small college, East Texas State (now Texas A&M University-Commerce), which my mother, my siblings and I all attended at very little cost. One of my proudest moments occurred in June, 1952 when I walked across the graduation stage to receive B.S. and M.S. degrees in Chemistry and a 2nd Lt. commission in the Air Force via an ROTC program.

Following college and six months before reporting for active duty in the Air Force, I worked as a chemist for Chance Vought Aircraft, located near Dallas. My induction into the Air Force began in San Antonio at Lackland Air Force Base, but within two months I was assigned as a Research Scientist to Wright-Patterson Air Development Center, Dayton, Ohio. During my two years in the Air Force, I evaluated new equipment for aerial photography, married my high school sweetheart Myra Butler, and enjoyed private flying lessons; the latter led me to sign up for pilot training for what I envisioned would be a long, exciting military career.

Just after I was notified there would be a one-year delay before I could enter the pilot training program, I visited with one of my college friends Mark Norwood who was completing his two years in the Air Force. Mark mentioned that he had been accepted for graduate study in physics at Rice University in Houston. My disappointment with the delay for pilot training turned to joy when I took steps necessary to leave the Air Force and study chemistry at Rice in a Ph.D. program. Although in college I had been an honor student in chemistry, I

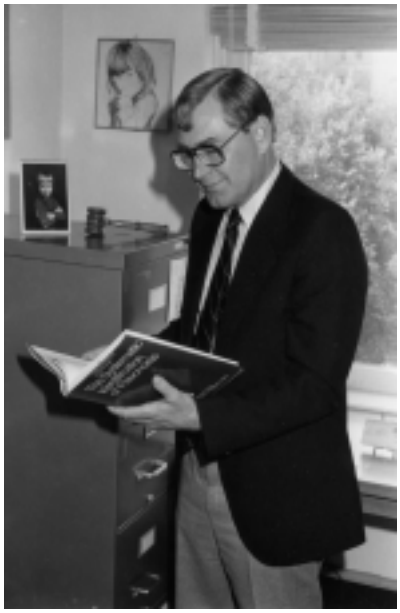
had no knowledge of reaction mechanisms and struggled during my first semester in graduate school. Nevertheless, with the guidance of my outstanding supervisor Prof. Martin Ettlinger, I completed a dissertation on the mode of vitamin action of ascorbic acid. For these studies, I synthesized many analogs of ascorbic acid and compared their vitamin C activity with their structural and enzymatic properties. These studies suggested an enzymatic cofactor role for ascorbate's vitamin activity. For characterization of these carbohydrate-type analogs of ascorbic acid, I often converted them to derivatives that were soluble in organic solvents. Thus, derivatization (under very mild conditions) of various classes of water-soluble natural products for NMR and GC analyses became a powerful analytical procedure I utilized for many of my later phytochemical investigations: for example, studies of the beet pigment betanidin (methylation using diazomethane), flavonoid glycosides (forming trimethylsilyl ethers using hexamethyldisilazane/trimethylchlorosilane), and non-protein amino acids (to N-ethoxycarbonyl ethyl esters using ethylchloroformate/ethanol). My friend Gene Mitch finished his Ph.D. in chemistry at Rice in 1959 and then accepted a post-doctoral position with Professor Andre Dreiding in the Organic Chemistry Institute, The University of Zürich, Switzerland. Gene encouraged me to also join Dreiding's group. With my Ph.D. degree in Organic Chemistry freshly in hand, it was in great anticipation in June 1960 when Myra and I boarded the Queen Mary for our voyage from New York to England, and then by train from London to Paris to pick up a new Renault. Enroute to Zürich from Paris we detoured to Strasbourg, France and there crossed the Rhein River into Germany in order to visit the parents of Rice post-doctorate Dr. Heinz Gänshirt in the small Black Forest city of Lahr. When we crossed the Rhein, we were less than 20 miles from the German village of Lichtenau, the home of my second wife Helga and her mother Elisabeth (Omi) Humm, both of whom I would meet only a few years later.

Thus, in the summer of 1960, Myra and I began our year and a half sojourn in Zürich, and it was here where I became a "natural products chemist." Dreiding, a brilliant, modern organic chemist, suggested that I tackle his only natural products prob-

lem, namely, the elusive pigments in the red beet, compounds whose structures had puzzled his group and others for many, many years. In my last years at Rice I had learned a new (at that time) technique, NMR spectroscopy, and had become an operator of a Varian Associates instrument, the big cumbersome HR-60, as well as a pretty good interpreter of spectra. When I initiated my lab work in Zürich, there was no NMR spectrometer but within a few months Varian opened a European office in Zürich with an HR-60. Soon thereafter, I inquired of the American manager Les Procter if I could use their HR-60 in the evenings and on weekends, and to my delight he replied "okay" and handed me keys to the offices. Within a few months I had stacks of NMR spectra of my newly prepared methylated and acetylated derivatives of neobetanidin, compounds that were not only soluble in organic solvents but that also contained all the carbon atoms of the water-soluble betanidin, the aglycone of the main red beet pigment betanin. When my data were combined with those of Dr. Hugo Wyler, Dreiding's outstanding assistant who had elucidated key fragments of the pigment, the structures of the beet pigments were readily resolved. During the next few years, we determined the biosynthesis and remarkable distribution of these unusual pigments, which Dreiding and I named "betalains" in 1966.

In 1962, I joined the Department of Botany at The University of Texas at Austin to develop a program in phytochemistry determining structures, distribution, and biological roles for flavonoids, terpenoids, and alkaloids as well as other smaller classes of plant secondary compounds, all for biochemical systematics studies being pursued by plant physiologist Ralph Alston and plant systematist Billie Turner. The first key analysis instrument I purchased was an NMR instrument; however, initially I used the spectrometer in the Chemistry Department at Rice University, and recorded there many of the spectra of trimethylsilyl ethers of flavonoids included in my 1970 volume "The Systematic Identification of Flavonoids" (with post-doctorates Ken Markham and Michael Thomas).

By 1968 I was a full Professor and in the 1980s served for several years as Chairman of Botany, and since 1999, following reorganization of Biology at UT-Austin, I have been a member of the Section of Molecular Cell and Developmental Biology in the School of Biological Sciences. A quote from a footnote in my 2001 career review paper in the Journal of Natural Products sums up the sentiments I quickly felt upon starting my new position in Austin. Once at UT-Austin, I soon recognized that I was indeed fortunate to be one of the first chemists in a group of biologists who were excited to study, understand and enjoy the world of plants around us and at the same time were deeply concerned with preserving and protecting this green earth for future generations. Within six years I was a full professor envying no one as I cherished my continually challenging extraordinary position, which was supported by several large fully equipped phytochemistry laboratories (GC, UV, NMR, MS, and GC-MS instruments), all staffed with excellent botany Ph.D. students and remarkable international post-doctorates who were organic chemists and biochemists.



Professor Andre Dreiding and post-doctorate Tom Mabry, 1960.

I recognize Dr. Klaus Fischer as one the excellent post-doctorates in my lab in the 1960s; Klaus recently retired to the Dallas area from the Chairmanship of the Department of Pharmacognosy, University of Mississippi. Of course, when Klaus and

his wife Helga first arrived from Germany in 1965, little did I expect Helga to become my second wife. Helga had been trained as a Chemical Technician at the Science Academy in Isny (in southeastern Germany) and then worked as a chemistry laboratory assistant at the University of Tübingen, as well as in German industry. With such a rigorous laboratory background, including many invaluable analytical skills, Helga easily became one of my best lab assistants and co-edited with me and Jeffrey Harborne the 1975 volume "The Flavonoids." Since our marriage in 1971, Helga has been a terrific partner not only for our home life but also in most of my scientific adventures in almost all countries in the expanded European Union, from the Canary Islands to Warsaw, from London to Athens. In addition, we spent almost a year in Freiberg, Germany during my tenure as a Guggenheim Fellow in the labs of Prof. Wolfgang Barz; here I learned techniques for manipulating and analyzing plant cell cultures. We also had a half-dozen enormously stimulating stays in Heidelberg in the period 1983-2001 when Prof. Dietmar Behnke hosted me during my Alexander von Humboldt Senior Scientist visits. Moreover, the village home of Helga's mother has served every summer since 1971 as our quiet Rhein valley retreat. Since his birth in 1974, our son Patrick has also spent all his vacations in Germany. Still today, a special summer pleasure for me is to bicycle from Lichtenau to the Rhein River where I take a ferry across to France to experience another culture, really another world, in the Alsatian countryside. However, our greatest joy is to have Helga's mother with us in Austin every year from December to April.

1962 to mid-1960's Mabry research group (from left): Dr. Heinz Rösler (German, later American); Dr. Henri Kagan (French); Dr. Peter Seeligmann (Argentinean); Ph.D. students Walter Renold (Swiss), Gene Miller (American) and Al Wohlpart (German-American); Dr. Jacques Kagan (French, later American); American Ph.D. students Morris Cranmer and Jim Pipkin; Mabry.

Mid to late 1960's Mabry research group (from left); Christina Chang (Ph.D. student); Dr. Iain Taylor (Canadian); Dr. Ken Markham (New Zealander); Ph.D. students Al Wohlpart, Gene Miller and Julius "Bud" Kroschewsky; Mabry; Dr. Michael Thomas (English); lab assistant Helga Fischer (German, later American); Dr. Klaus Fischer (German, later American); lab assistant Hanspeter Rüesch (Swiss).

In my 2001 review paper, I commented on only four of dozens of research projects: 1) establishing the structures, biosynthesis, and distribution of the unique betalain pigments; 2) the development of a chemical-structural basis for a biochemical systematic program; 3) unraveling the mechanism of action of the antiviral proteins in Phytolacca; and 4) showing how a non-protein amino acid from Guam cycad seeds may be involved in causing the Guam neurodisease ALS-PDC (amyotropic lateral sclerosis-Parkinson's dementia complex), findings which support the hypothesis that substances in our diets and in the air we breathe may

cause major neurodiseases including Parkinson's, Alzheimer's, and ALS. To illustrate additional diversity of our program, which has resulted in >600 publications, titles of 27 of more than 60 dissertations and theses supervised from 1965 to 2002 are presented:

"Biochemical and Biosystematic Studies of Baptisia Alkaloids" *(Morris Cranmer, 1965)*
"The Ultraviolet Spectral Analysis of Coumarins" (*Genie Bracken-ridge*, 1968)
"Origin of the Texas Gulf Coast Island Populations of *Ambrosia psilostachya* DC.: a Biochemical and Numerical Systematic Investigation" *(Janet Potter, 1970)*
"The Chemistry and Infraspecific Variation of Sesquiterpene Lactones in *Ambrosia confertiflora* DC. (Compositae): Chemosystematic Study at the Populational Level" (*Walter Renold*, 1970)
"Nucleic Acid Studies among Centrospermae Species" (*Christina Chang*, 1971)
"Betalamic Acid and Other Products of the Biotransformations of L-Dopa in Betalain Biogenesis" (*Linda Kimler*, 1972)
"Biochemical Systematic Investigations of Western Hemisphere Species of the Genus *Vernonia* (Compositae) Emphasizing Flavonoid Chemistry" (*Zeinab Abdel-Baset*, 1973)
"The Chemistry and Distribution of New Germacranolide-type Sesquiterpene Lactones in the North American Taxa of the Genus *Vernonia* (Compositae)" (*William Padolina*, 1973)
"The Distribution of Azoxyglycosides, Amino Acids and Biflavonoids in the Order Cycadales: Their Taxonomic, Phylogenetic, and Toxicological Significance" (*Saifu Dossaji*, 1974)
"The Chemistry and Distribution of Sesquiterpene Lactones and Flavonoids in *Parthenium* (Compositae): Systematic and Ecological Implications" (*Eloy Rodriguez*, 1975)
"Sulfated and Nonsulfated Flavonoids from Flaveria, Sartwellia, and Haploesthes" (*Munira Al-Khubaizi*, 1977)
"Phytochemical Investigations of the Genus *Brickellia* (Compositae) Emphasizing Flavonoids" (*Barbara Timmermann*, 1977)
"Qualitative and Quantitative Natural Products Chemistry of a Desert Plant Community, Andalgala Valley, Argentina: A Chemical-Ecological Study" (*Daniel DiFeo*, 1977)
"Phytochemical Investigations of the Genus *Larrea* (Zygophyllaceae) Emphasizing Volatile Constituents and Sapogenins" (*Charles Bohnstedt*, 1977)
"Biochemical Investigations of Marine Algae of the Texas Gulf Coast Emphasizing Amino Acids" *(Paula Neuman, 1978)*
"The Terpenoid Chemistry of *Helianthus series corona-solis* and its Ecological and Systematic Applications" (*Jonathan Gershenzon*, 1984)
"A Systematic Study of the Genus *Krigia* (Asteraceae Lactuceae), Emphasizing Chloroplast DNA and Nuclear Ribosomal DNA Variations" (*Ki-Joong Kim*, 1989)
"Phytoalexin Aurone Induction in *Cephalocereus senilis* (old-man cactus) Liquid Suspension Culture" (*Paul Paré*, 1991)
"Pokeweed Antiviral Protein Inactivitates Pokeweed Ribosomes; Implications for the Antiviral Mechanism" (*Maureen Bonness,, 1992)*
"Isolation and Biological Properties of *Citrus* Limonoids" (George Mitchell-Tapping, 1992)
"Protoplasts from *Phytolacca dodecandra*" (*Patricia Koch*, 1993)
"Chemical and Enzymological Investigations of the Phenylpropanoid Pathway in Elicited Cultures of *Cephalocereus senilus* ("old man" cactus)" *David Liu*, 1994)
"A Study of Known Excitotoxic Compounds and Isolated Nonprotein Amino Acids from Cycads" (*Delia Brownson*,1996)
"Pigment Dichotomy and Molecular Evolution in the Caryophyllales" (*John Clement*, 1997)
"The Role of Root Exudates in Arbuscular Mycorrhizal Initiation" (*Carol Mandelbaum*, 1997)
"Estrogenic Activity of Flavonoids from *Cyperus alopecuroides* Rottb. (Cyperaceae)" (*Amy Bystrom*, 2002)
"Chitin-Induced Biosynthesis of Phytoalexin 4β-Deoxyaurone in Cell Suspension Cultures of "Old Man" Cactus, *Cephalocereus senilis*" (*Isagani Padolina*, 2002)

I acknowledge two very bright students, Gani Padolina (listed just above) and his father William Padolina (eighth from the top of the list), as they are my only parent-child graduate student combination. While I cannot individually express my heartfelt gratitude to all my hardworking, technically excellent, and very productive colleagues and co-workers, including the sixty-plus graduate students and well over a hundred post-doctorates, I close with one more quote from a footnote in my 2001 Journal of Natural Products review paper that testifies to the enormous joy I have experienced in my career through them. I proudly report that my role in complex biological chemistry investigations and my stimulating interactions with a large number of fascinating colleagues and special friends continues still today to be a great, exhilarating forty-year ride!

Finally, although I still keep my lab doors open for a few dedicated and highly talented co-workers, I do begin to feel increasing excitement as I expand my personal goals and cultivate my dreams for yet another phase of what has already been over forty "Golden Years." I like the prospect of Helga and spending long-postponed time with numerous kindred spirits and with many family members including Myra and Klaus, our

first spouses, with whom we share many special bonds. We especially relish the idea of finally impersonating grandparents for the adorable twins William Sumner Cooley (left) and Thomas Mabry Cooley (born 05-27-00) of Michele (daughter, far left) and Webb, and the charming Cassandra Caroline Mabry (born 03-02-03) of Patrick (son) and Birgit.

Lastly, I warmly acknowledge the generous support of the NSF, NIH, and several private foundations including especially the Robert A. Welch Foundation, which has funded our program for over 40 years. Also, I express my heartfelt thanks to D.J. Sibley Jr., Theo Weisser, Jimmy Gill, and Feng Gao.

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PRESIDENT'S LETTER

The changing face of phytochemistry

continued from page 1

fine balance has been struck between plant chemistry, plant biochemistry and a strong "molecular" approach. We must always keep in mind that it is the traditional strong chemical component that makes PSNA unique amongst related societies. If our society were to retain its individual identity, it is of paramount importance that the "chemical" component should not be neglected.

The changing face of Phytochemistry? My very first paper, based on research done for a Masters degree, was published more than 30 years ago (Synthesis of pterocarpan analogues: 6α,11α-dehydropterocarpancoumestan conversion. D. Ferreira, C.v.d.M. Brink and D.G. Roux, *Phytochemistry*, 1971, 10, 1141-1144). Even a superficial comparison will demonstrate that contemporary phytochemical research is, no doubt, vastly different from what it was in those early days. The levels of sophistication have been raised to such an extent that one is somewhat embarrassed by the standard of papers like the one cited above, of course, always remembering the primitive status of the techniques we had available at the time. Such quantum leaps in our progress could not have been realized if it were not for the incredible successes that have been achieved at the interface of chemistry and biology. Some of the topics covered at recent meetings had not even been conceived some 10 to 15 years ago, and certainly many of the topics of the 2015 PSNA meeting, if we could peep into the future, would be virtually unrecognizable to us now. The very fact that we are dealing with a changed, and ever changing, discipline exemplifies its dynamic nature. Our members have amply demonstrated that they are up to the challenges of the cutting-edge research that is necessary to ensure our relevance in the broad scientific community and society at large. Let us not regard this dynamic and very powerful momentum towards change as a threat to our own self interest but let us rather embrace it as part and parcel of the mystique that stimulated our initial interest and lured us into this exciting and essential area of research.

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STUDENT AWARD WINNERS

Best Paper Presentations

Nailish Samanani

My interest in the sciences was first kindled when I was forced to review an article in Junior High School entitled "Our Children's Children May Live Forever" from a source that I can no longer recall. My interpretation of the article at that time was that normal human cells have a limited capacity to proliferate. After a finite number of cell divisions, the cells would "age" and stop dividing. Resetting this biological clock could dramatically extend the human lifespan. Until then, science to me had been an endless memorization of dry facts. It was refreshing to realize that little was known about the aging of cells and that research in the area could potentially have a huge impact on our lifestyles and on the treatment of some diseases.

My excitement about the sciences was once again squashed in High School when an aptitude test, designed to uncover my hidden talents, suggested that I was most suited to be a funeral director. New inspiration, however, came from my High School chemistry teacher, Mr. Masaro. His enthusiasm about chemistry and the sciences was contagious and he offset the potentially devastating impact of my uni-browed physics teacher who told me that women were incapable of excelling in science. Mr. Masaro if this article reaches you, I'd like you to know that I still remember fluorine is the most electronegative element because Rudolf Fluorentino is the greatest lover of electrons (whatever works!).

When I first encountered the use of Agrobacterium tumefaciens as a tool for plant transformation during an undergraduate course, I was truly captivated. The premise that any gene from any organism could be transformed into a plant which would then produce the foreign protein sounded like an episode out of a bad science fiction movie. My fascination with plants was magnified by successive realizations of the complexity of plant perceptions and responses: their discernment of day and night and the different seasons, their ability to launch defences against foreign invasions, their ability to "communicate" not only with other parts of themselves but also with other plants (and possibly with insects!) and their ability to produce a mind-boggling variety of

chemical compounds.

Fittingly, I am currently pursuing a doctorate degree in plant biology in Dr. Peter Facchini's lab at the University of Calgary. My research is on the metabolic regulation of protoberberine alkaloid biosynthesis in Thalictrum flavum. In planta, the metabolic regulation of alkaloids is achieved using several different strategies. Along with gene expression, sub-cellular compartmentation of biosynthetic enzymes, tissue- and cell-specific accumulation of alkaloids and cell-specific separation of biosynthetic steps all appear to play an important role in the regulation of alkaloid biosynthetic pathways.

When I first started my program, sparse information existed in the literature about the enzyme that catalyzes the first condensation step in the biosynthesis of all benzylisoquinoline alkaloids, norcoclaurine synthase (NCS). Our data suggests that the purified native protein exhibits a dimeric quanternary structure. Product inhibition kinetics using the purified enzyme indicates an iso-ordered bi-uni mechanism with 4-HPAA binding before dopamine. The latter substrate binds cooperatively to the two subunits of the enzyme. The position of the enzyme as first committed catalytic step in the pathway, along with the displayed cooperative substrate binding kinetics, suggest that NCS plays a regulatory or rate-limiting role in controlling the metabolic flux of benzylisoquinoline alkaloid biosynthesis. NCS displays 35% identity to the enzyme that catalyzes a complex series of reactions following an initial condensation reaction in hypericin biosynthesis in St. John's Wort (hyp-1). It also displays 28 to 38% identity to the Bet v1 allergen and pathogenesis-related (PR)10 protein families. The NCS protein encodes a putative N-terminal signal peptide as well as a C-terminal region that is not found in the other related proteins. NCS and Hyp-1 infer novel enzymatic functions for the Bet v1 group of proteins.

After the condensation of two tyrosine derivatives by NCS to form norcoclaurine, eight additional enzymes convert norcoclaurine to the protoberberine alkaloid berberine. Berberine has potent antimicrobial properties, which suggest it functions

in the defence of plants against pathogen challenge. In *T. flavum*, berberine accumulates in specific tissues as the major alkaloid. In the rhizome, we detected alkaloid accumulation throughout the pith and, to a lesser extent, the cortex. In the roots, we detected alkaloid accumulation only in the endodermis at the onset of secondary growth. Alkaloid accumulation was also detected in the pericycle cells of older roots near the base of the stem. The cell type-specific accumulation of the alkaloid in the roots supports the putative role of berberine in plant defense.

Using in situ RNA hybridization of aerial organs we have localized transcripts for the intermediate biosynthetic steps in the berberine biosynthetic pathway primarily to the epidermis of young leaves. In the roots, transcript accumulation was restricted to the endodermis and adjacent cortical cells. The continuation of our work will include the localization of gene transcripts for the entire berberine biosynthetic pathway.

The realization that the ideas in science are fluid and subject to continuous change is what first attracted me to graduate school. The notion that ultimately the scientific process will expose the "truth" continues to motivate me as I near the completion of my doctorate program

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Anusha Dias

I was born in Colombo, Sri Lanka, and did my undergraduate studies specializing in Botany at the University of Colombo, Sri Lanka. I came to the United States in 1998 to begin my PhD studies in the Department of Plant Biology at the Ohio State University with Dr. Keith Davis. My initial exposure to research and techniques in plant molecular biology came from working with him until he left OSU in the summer of 1999. Soon after I joined Dr. Erich Grotewold's lab, and was very excited in the research project given to me, dissecting the function of a recently duplicated R2R3 MYB transcription factor in maize. My research project involved both molecular and functional characterization of *ZmMyb-IF35* and the main objective was to find the mechanisms by which plant MYB domain transcription factors contribute to metabolic diversity. The functional characterization of *ZmMyb-IF35* made me very much involved in the plant secondary metabolic pathways and the application of a number of different metabolite profiling techniques. Throughout the years, the more I learned about plant metabolites, the more I appreciated the amazing roles played by these small molecules.

As with any scientific endeavor, *ZmMyb-IF35* gave me more questions than answers and working with it for four years made it almost a part of me. Working in a lab like Erich's, with his enormous experience and knowledge on regulation of secondary metabolic pathways, and a group of people with similar interests, always made it a challenge, but exciting in every step of the way. Our findings that *ZmMyb-IF35* might be

regulating novel metabolic pathways opened up new directions in our understanding on the evolution of secondary metabolic pathways. Looking back I feel very fortunate to see how much I have learned working with phytochemicals and the experience gained in facing challenges and the training I got as a graduate student, which I consider to be invaluable.

On August 7, 2003 I had my final thesis defense and two days later I was in Peoria IL attending the Phytochemical Society meeting. It was my first Phytochemical Society meeting and I was excited to be around with all those phytochemists, some I have either heard or read about, finally I got a chance to meet them. The award I won, I believe, was for the passion I had and the struggles I faced in finding what *my gene* does. It came, in a way, as a reward for all my efforts and thoughts I had put in to making *my gene* an important player above thousands of others.

Three weeks later, I was ready to move on, to continue my adventure in the wonderful world of science. This time I took a different path, a path I did not cross before. It was time to leave *my gene* behind, let somebody else take over. As I was cleaning up my bench, my cold room space, my freezer space, emptying those boxes filled with eppendorfs, I felt tears in my eyes. I was amazed to see how much I have got myself attached to these materialistic things - to an eppendorf tube! I guess it shows how much you loved what you did and how difficult it is to be apart from something so close to you. Who would have ever thought it could be a piece of DNA.

Now in a different city with so many new things surrounding me I keep thinking about *my gene*, and my life as a graduate student in Erich's lab, how much I have grown as a person and as a scientist. Although I am leaving plants for now to explore the rest of the world, the experiences I gained as a graduate student working with phytochemicals would surely lead my way as a guiding star throughout my future endeavors.

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2004 Annual PSNA Meeting

July 24 - 28, 2004
Ottawa, Canada

held jointly with the

International Society of Chemical Ecology

Tentative Scientific Program

Chemical Ecology and Phytochemistry in Forests and Forest Ecosystems

Confirmed Speakers

Jorg Bohlmann,Department of Botany, University of British Columbia
Peter Constabel, Department of Biology, University of Victoria,
Johnathan Gershenzon, Max-Plank-Institute for Chemical Ecology
Murray Isman, Department of Plant Science,University of British Columbia
Norman Lewis, Institute of Biological Chemistry, Washington State University
Hanna Mustaparta, Norwegian University of Science and Technology
Erika Plettner, Department of Chemistry, Simon Fraser University
Ken Raffa, Department of Entomology,University of Wisconsin
Claus Tittinger, Department of Biochemistry, University of Nevada Reno
Geraldine Wright, Oxford University
Takashi Yoshida, Faculty of Pharmaceutical Sciences, Okayama University

Mini Symposia

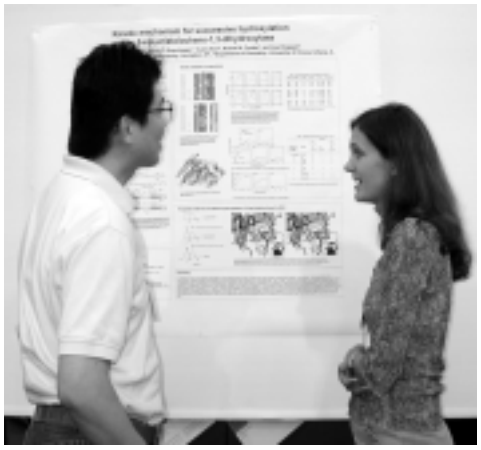
B. Kimball and D.Nolte: Chemically Mediated Behavior in Wildlife
C. Keeling: Hymenoptera Semiochemicals
V. De Luca: Aurthur Niesh Young Investigator Minisymposium
S. MacKinnon: Marine Chemical Ecology
J. McNeill: Pheremones

Posters and Contributed Oral Presentations

Invited in all areas of phytochemistry and chemical ecology. The organizers reserve the right to limit the number of oral presentations due to time constraints.

Online registration will be available after January 15 on the meeting website:
http://www.isce-psna2004ottawa.ca/

IMAGES OF PEORIA - PSNA 2003



IMAGES OF PEORIA - PSNA 2003

2003 ANNUAL MEETING - HEY, MY PICTURE'S IN THE NEWSLETTER!

ARTHUR NEISH SYMPOSIUM

Profile of Invited Speakers

Brian Traw

Brian Traw is currently a Dropkin Postdoctoral Fellow working with Joy Bergelson in the Department of Ecology and Evolution at the University of Chicago. He is exploring how plants in the mustard family defend themselves against enemies, such as herbivores and bacterial pathogens. He has focused on leaf trichomes and glucosinolates, which are induced defenses of mustard plants.

His work with Joy Bergelson has yielded the first evidence that application of jasmonic acid increases plant production of trichomes, a defense against herbivores, whereas application of salicylic acid actually inhibits trichome production. Furthermore, he has found that application of salicylic acid increases defenses against a biotrophic pathogen, whereas application of jasmonic acid inhibits defenses against this same pathogen. Collectively, these results suggest that mustards have surprising complexity in their regulation of defenses, including substantial negative crosstalk between the major defense pathways, which is a novel finding for mustards.

Before arriving in Chicago, Brian was a graduate student in the Department of Ecology and Evolutionary Biology at Cornell University under the co-direction of Paul Feeny, a chemical ecologist, and Todd Dawson, a plant ecophysiologist. Brian spent a great deal of time outdoors observing herbivore activity in wild populations of the black mustard, *Brassica nigra*. His dissertation research showed that black mustard responds differently to damage by different herbivores, suggesting that these plants have a nuanced perception of damage. Induced plants supported lower performance of two major herbivores, revealing important benefits of an induction response. However, half-sib families with higher constitutive defense allocation took longer to flower, suggesting important costs of resistance, which may explain why natural populations of black mustard typically lack high constitutive defense.

Brian can trace his interest in natural history and entomology to his childhood, but owes his current fascination with plant defenses to his undergraduate experience in the lab of Fahkri Bazzaz at Harvard University. In collaboration with David Ackerly, a graduate student in the lab, he assessed the relationship between herbivory and leaf nitrogen concentrations in five rainforest pioneer trees. Later, his honors thesis showed that an elevated CO_2 atmosphere would decrease leaf nitrogen concentrations and thereby alter the effects of an economically important pest, the gypsy moth, on two of its host plants.

In the future, Brian hopes to identify broad patterns in the regulation of plant defense and to determine how these patterns have influenced the coevolution of plants and their enemies, particular at the genetic level. In this direction, he is now working with Joy Bergelson to identify novel genes involved in the induction of plant defenses, using a variety of mapping techniques.

John Tooker

John Tooker is currently a post-doctoral scholar in the lab of Consuelo DeMoraes in the Department of Entomology at Pennsylvania State University in State College, PA. His research at Penn State is focusing on the influence of gall-forming insects on the chemistry of their host plants.

He developed his interest in insects while earning his Bachelor's degree in biology from Bates College in Lewiston, ME. After graduating and working in the business world for a couple years, he joined the Department of Entomology at the University of Illinois at Urbana-Champaign to study the behavior and ecology of insect parasitoids. Under the supervision of Dr. Lawrence Hanks, he completed his Master's studying the conservation biological control of a scale insect that is a pest of pine trees in ornamental landscapes and Christmas tree farms.

For his PhD, he continued to work with Larry Hanks but switched to a native prairie system to study the influence of native insect herbivores on their co-evolved host plants. The system he studied was comprised of two prairie perennials, *Silphium laciniatum* L. and *S. terebinthinaceum* Jacquin (Asteraceae), the gall wasp *Antistrophus rufus* Gillette, whose larvae feed in galls formed in the flowering stems of both plant species, and the hymenopteran parasitoids that kill the gall wasp larvae. John determined that these two sibling plant species emit the same five monoterpenes but in different ratios and that subpopulations of *A. rufus* have specialized on each plant species, using characteristic blends of the five monoterpenes to find their preferred host plant. John also found that feeding by gall wasp larvae during the growing season results in a change in the ratios of enantiomers of two of the monoterpenes (alpha- and beta-pinene) that the host plant emits. This change appears significant because it persists into the next spring when male gall wasps use this altered blend of enantiomers on dead stems to assist their search for emerging female

gall wasps. Whether this change is actively caused by the gall wasp larvae or is a response made by the plant is unclear, but an additional trophic level may provide some insight. Plants with gall wasp larvae feeding in their stems produce significantly smaller seeds than ungalled plants and these smaller seeds are much less likely to germinate. However, the dominant hymenopteran parasitoid in the system, *Eurytoma lutea* Bugbee, is able to salvage plant reproductive output by killing larvae of *A. rufus*. Therefore, plants in the population that can attract parasitoids should have a selective fitness advantage. John found support for this theory by determining that *E. lutea* is attracted to galled plants via volatile monoterpenes that act as a synomone.

Eva Castells

Eva Castells is a Fulbright postdoctoral researcher at the University of Illinois at Urbana-Champaign in Dr. May Berenbaum laboratory since May 2002. She is interested in chemical ecology, specifically in the coevolution between plant chemical defenses and their specialist herbivores. At present she is studying the geographical variation of *Conium maculatum* (poison hemlock) piperidine alkaloids under a variety of herbivory exerted by the moth *Agonopterix alstroemeriana* in US and Europe to determine whether the selective pressure exerted by this herbivore can determine changes of *Conium maculatum* chemical defenses. Her project also involves determining the enzymatic mechanisms involved in alkaloid detoxification by *Agonopterix alstroemeriana*.

Eva studied Biology at Universitat de Barcelona (Catalonia, Spain) and in 1996 became a graduate student at the Ecophysiology Unit at CREAF (Center for Ecological Research and Forestry Applications), located at Universitat Autònoma de Barcelona, under the supervision of Dr. Josep Peñuelas. Her dissertation focused on the effects of elevated CO_2 on phenolic compounds from Mediterranean plants growing in a community and competing for water, nutrients and light. During her graduate studies Eva was funded by the European Science Foundation with a short-term fellowship to conduct the project "Genotypic variations in the production of antiherbivore phenolic compounds under elevated CO_2 levels" at Centre d'Ecologie Fonctionelle et Evolutive, CEFE-CNRS (Montpellier, France). She got her Masters degree in 1998. After spending two summers at University of Alaska (Fairbanks, USA) she became highly interested in the role of secondary metabolites in ecological interactions. Eva completed her PhD in April 2002 studying how phenolics released from the plant canopy may regulate the interaction between plant and soil by modifying soil N mineralization and other processes related to N cycling.

Eva was born in Barcelona and although she is excited about working at University of Illinois in such a highly rich intellectual environment, she would like in the future to continue her research career in her favorite city, combining coevolution with the pleasures of a Mediterranean lifestyle.

The 4th Tannin Conference – Plant Polyphenols: Chemistry, Biology, Function

American Chemical Society's Fall Meeting, Philadelphia, 22-26 August, 2004

The 4th Tannin Conference – Plant Polyphenols: Chemistry, Biology, Function - will be organized as part of the 2004 American Chemical Society's (ACS) Fall Meeting (22-26 August, Philadelphia) in the "Cellulose and Renewable Materials" Division. Our objectives are to promote collaboration between chemists, biologists and human health related disciplines in order to improve our understanding of the chemistry and the biological and physiological significance of polyphenols, and to focus on expanded possibilities for their applications in industry and in human health and nutrition. All prospective contributors to The 4th Tannin Conference are requested to submit an abstract describing the work they wish to present at the meeting. Your abstract should be prepared according to ACS instructions (http://oasys.acs.org/acs/228pm/authorinstructions.cgi). This should then be sent electronically to the coordinator of the planning committee, Daneel Ferreira (dferreir@olemiss.edu) no later than January 15, 2004. This abstract will serve as the basis on which selections will be made for oral presentations in each of the topic areas. You will be informed whether your contribution has been accepted as an oral presentation; all other contributions will be presented as posters. At a time that will be announced on the ACS website (http://www.chemistry.org/portal/a/c/s/1/home.html) for the 228th National Meeting in Philadelphia, you may submit your abstract to ACS at the former website. Prospective participants may register and make hotel reservations online once these options become available on the latter website for the Philadelphia meeting. At this time we would also like to probe your interest in attending a conference dinner at a cost of roughly $50/ticket. Please indicate your interest or otherwise when submitting your initial abstract to the coordinator of the planning committee.

I KNOW WHAT YOU DID LAST SUMMER

This sounded like a good idea...

...until I saw the place next door.

This fine establishment was next door to the hotel. If it was good enough for Big Al, it's good enough for me.

I hate when people leave their shopping carts in my parking space. I got the quarter back though.

Note to self...avoid using fire escapes in Peoria. "I'm saved...uhh, no, I'm not!

It was the top of the fifth before anyone noticed the other team hadn't shown up...still no score though.

PHYTOCHEMICAL SOCIETY OF NORTH AMERICA

Financial Report (January 1 - December 31, 2002)

Assets:	(12/31/02)	(12/31/01)	(12/31/00)
Checking account	$ 5850.73	$ 4205.80	$ 2620.09
Business Money Market	36319.58	41316.83	26951.12
Neish Symposium account	23654.99	25258.39	24571.29
Fortis Money Market	114.10	113.50	109.60
Fortis Advantage*	9077.46	10543.00	11476.74
TOTALS	**75016.86**	**$81437.52**	**$65728.84**

* Investment account, subject to fluctuation.

2002 Annual Meeting:

Expenditures:	
Meeting Advance	$ 5000.00
Travel and Awards	$ 7267.70
Expenditure subtotal	$ 12267.70
Receipts:	
Meeting Grant (H. Flores)	$ 4750.00
Receipts subtotal	$ 4750.00
Total cost to PSNA	**$ 7517.70**

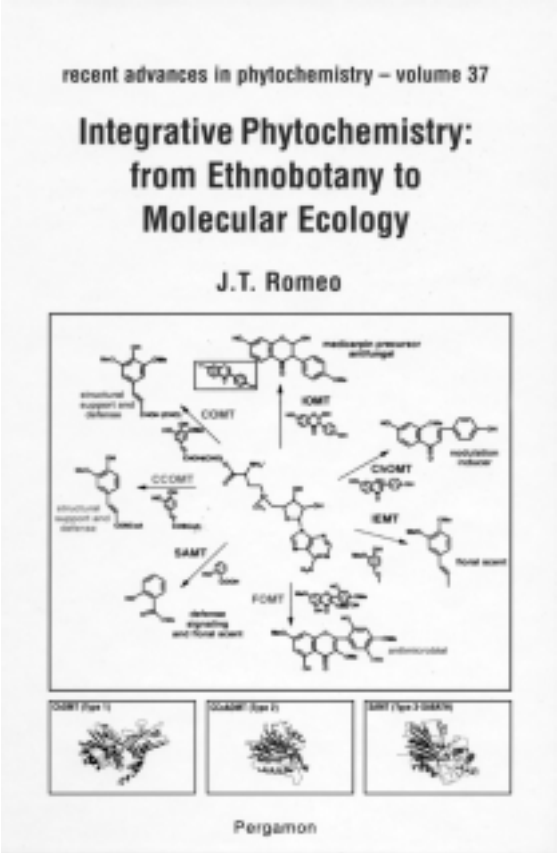
Membership Summary (as of 7/28/03):

Country	2000 Members	2001 Members	2002 Members
USA	227	224	236
Canada	63	46	45
Germany		23	23
Japan		18	16
Mexico	14	9	17
Other	104	51	49
TOTALS	**408**	**371**	**386**

Elsevier Publishes Volume 37 of Recent Advances in Phytochemistry

Volume 37 of Recent Advances in Phytochemistry - *Integrative Phytochemistry: from Ethnobotany to Molecular Ecology*, the symposium volume resulting from the 2002 PSNA Annual Meeting in Mérida, México is the fourth volume in this series published by Elsevier. Volume 37 is founded on the belief that biological complexity can be understood by incorporating many perspectives from a diversity of disciplines.

Integrative biology is the belief that biological complexity can be understood by incorporating perspectives from diverse disciplines. This volume includes chapters on the traditional phytochemical topics of synthesis, enzymology, chemical diversity, and chemical ecology of secondary metabolites. They also include less frequently covered topics, such as the cellular localization of metabolites, levels of regulation, structure/function analyses, molecular genetics, and functional genomics. Papers in the volume cover: what compounds are produced; how they are produced; why they are produced; and the regulation that might lead to more efficient production. The chapters are grouped, as they were in the symposia, according to chemical classes.



Contributors to this timely volume explore a wide range of topics that include:

- Flavonoid biodiversity
- Methylation of small molecules
- Anthocyanin pigmentation
- Myrosinases and glucosinolates
- Regulation of alkaloid biosynthesis
- Chemical ecology of pyrrolizidine alkaloids
- Diversity of isoprenoid metabolism

The PSNA, under terms of our contract, can sell this volume at almost a **50% discount**. To purchase Volume 37 please contact the Treasurer, Charles Cantrell.

Recent Advances in Phytochemistry Series

PSNA members receive a 40% discount on the following titles

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**Volumes 34, 35, and 36 are available from our new publisher, Elsevier. Please contact the PSNA Treasurer, Charles Cantrell, for information on ordering these volumes.

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Phytochemical Society of North America

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Research Interests (circle up to 4 items):

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G. Glucosinolates
H. Lignans
I. Lipids
J Nitrogen compounds
K. Nucleic acids
L. Organic acids
M. Phenolics
N. Pigments
O. Quinones
P. Stilbenes
Q. Sugars/polysaccharides
R. Sulfur compounds
S. Terpenoids
T. Vitamins
aa. Biochemistry/physiology of herbicides
bb. Enzymology
cc. Cell wall chemistry
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ee. Biotechnology
ff. Plant-insect interactions
gg. Plant-microbe interactions
hh. Plant-plant interactions
ii. Chemical reactions/organic synthesis
jj. Biochemistry of secondary metabolism
kk. Fungal metabolism
ll. Growth regulators
mm. Biochemistry/physiology of stress
nn. Industrial applications
oo. Structure identification
pp. Marine natural compounds
qq. Medicinal chemistry
rr. Membrane structure/function
ss. Molecular/immunological techniques
tt. Nitrogen fixation/metabolism
uu. Pharmacology/pharmacognosy
vv. Plant pathology
ww. Plant genetics
xx. Recognition-cell surface interactions
yy. Tissue/cell culture
zz. Toxicology of natural products
OTHER: _____