FOUNDED 1898
NORTHEASTERN SECTION • AMERICAN CHEMICAL SOCIETY
NESACS

THE NUCLEUS

January 2002 *Vol. LXXX, No. 5*

Monthly Meeting

David M. Lemal on Fluorocarbons

Meeting Report

Toward Better Teaching– Norris Award Address by Dennis G. Peters

Book Review

Travels to the Nanoworld by Michael Grass

Summer Scholar Report

Synthetic Routes to Retinoids, by Matthew S. Tremblay

Cover: *Dr. Morton Z. Hoffman, 2002 NESACS Chair (photo by Boston University Photo Services)*

Deadlines: *March 2002 issue: January 17*
April 2002 issue: February 21

THE NUCLEUS

The Nucleus is distributed to the members of the Northeastern Section of the American Chemical Society, to the secretaries of the Local Sections, and to editors of all local A.C.S. Section publications. Forms close for advertising on the 1st of the month of the preceding issue. Text must be received by the editor six weeks before the date of issue.

Editor:	Arno Heyn, 21 Alexander Rd., Newton, MA 02461, Tel: 617-969-5712, FAX: 617-527-2032; e-mail:arnoheyn@juno.com
Associate Editor:	Myron S. Simon, 20 Somerset Rd., W. Newton, MA 02465, Tel: 617-332-5273
Board of Publications:	Patrick M. Gordon (Chair), Frank R. Gorga, Marietta H. Schwartz, E. Joseph Billo (Consultant)
Business Manager:	Karen Piper, 19 Mill Rd., Harvard, MA 01451, Tel: 978-456-8622
Advertising Manager:	Vincent J. Gale, P.O. Box 1150, Marshfield, MA 02050, Tel: 781-837-0424; FAX: 781-837-8792
Contributing Editors:	Mukund Chorghade, Patricia Hamm, Features; Edward Atkinson, History of Chemistry; Maryann Solstad, Health; Dennis Sardella, Book Reviews; Marietta H. Schwartz, Software Reviews; E. Joseph Billo, Puzzles.
Calendar Coordinator:	Donald O. Rickter, e-mail: 72133.3015@compuserve.com
Proofreaders:	E. Joseph Billo, Donald O. Rickter, M.S. Simon
Webpage:	Webmaster: Frank R. Gorga, fgorga@bridgew.edu Asst. Webmasters: Terry Brush, tbrush@mediaone.net Kurt Heinselman, heinslmn@earthlink.net

Directions

Since the MIT Lot is likely to be full and on-street parking is tight, use the T, if possible.

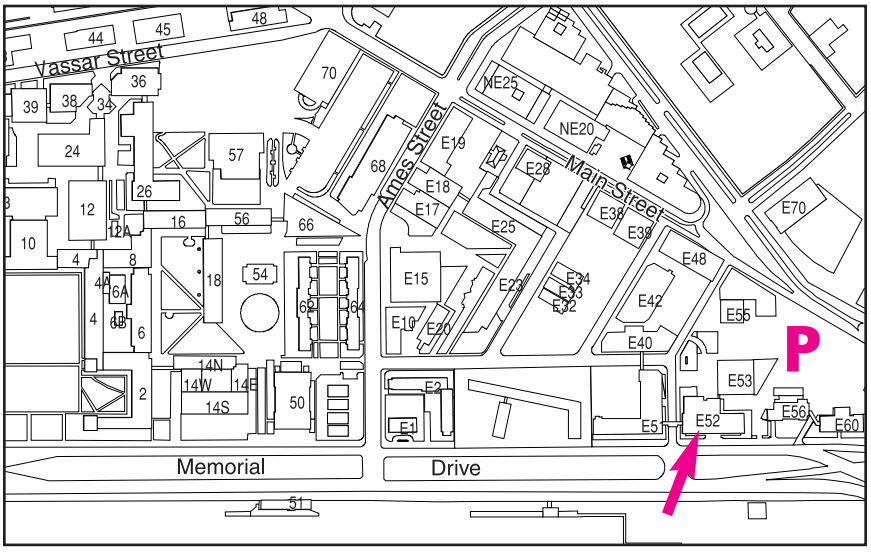
Red Line: Exit at Kendall, walk towards Boston on Main St., turn right into Wadsworth St. The large building on the left at the corner of Wadsworth and Memorial Drive is the Sloan Ctr. (less than 500 feet from the T).

Driving:

From Downtown Boston:* Cross to Cambridge on the Longfellow Bridge and at the end of the bridge take the right turns into Memorial Drive (westbound). Take the first right, into Wadsworth St. and at the end of Wadsworth Street, turn right into Main Street. The entrance to the MIT Sloan parking lot is 1/2 block on the right. Parking free after 3:30 pm.

From Back Bay, Brookline, etc.: Take Storrow Drive to the Cambridge St. Exit, stay left and cross the Charles River on Longfellow Bridge, follow * above.

From Cambridge: Take Main St. eastbound. The MIT Sloan parking lot is on the right shortly after the Kendall Square T-stop, just beyond Wadsworth St. Parking free after 3:30 pm. ◇



Nominations

Philip L. Levins Memorial Prize

Nominations for the Philip L. Levins Memorial Prize for outstanding performance by a graduate student on the way to a career in chemical science should be sent to the

Executive Secretary,
NESACS,
23 Cottage St.
Natick, MA 01760

by **March 1, 2002**. The graduate student's research should be in the area of organic analytical chemistry and may include other areas of organic analytical chemistry such as environmental analysis, biochemical analysis, or polymer analysis.

Nominations may be made by a faculty member, or the student may submit an application. A biographical sketch, transcripts of graduate and undergraduate grades, a description of present research activity and three references must be included. The nomination should be specific concerning the contribution the student has made to the research and publications (if any) with multiple authors.

The award will be presented at the May 2002 Section Meeting. ◇

Corporate Patrons
Alfa Aesar, a Johnson Matthey Company
Hoechst Marion Roussel Co.
Pharm-Eco Laboratories, Inc.
Physical Sciences, Inc.
Polaroid Corporation
Strem Chemicals, Inc.

Corporate Sponsors
Aerodyne Research, Inc.
AstraZeneca R&D
Borregaard Synthesis, Inc.
Bristol-Myers Squibb
Cambridge Isotope Labs
Consulting Resources Corporation
Dike, Bronstein, Roberts & Cushman, LLP
Houghton Chemical Corp.
JEOL, USA, Inc.
MassTrace, Inc.
New England Biolabs
Organix, Inc.
Pfizer, Inc.
Research Biochemicals Int'l
Zymark Corporation

New Members

Invitation to attend a Section meeting

You are invited to attend one of our upcoming Section meetings, usually held on the second Thursday each month, September through May.

You will be a guest of the Section at both the social hour (5:30 pm) and dinner (6:30 pm), preceding the meeting (7:45 or 8:00pm). Career Services Aids will be available.

Please call Marilou Cashman at 1-800-872-2054 or 1-508-653-6329 or e-mail: mcash0953@aol.com, by noon of the first Thursday of the month for a dinner reservation and let her know that you are a new member.

We will love to see you at future meetings, as well. NESACS meetings are a great way to get acquainted with other chemical science professionals in this area.

Michaeline Chen, Chair, Membership Committee, NESACS ◇

Monthly Meeting

The 830th Meeting of the Northeastern Section of the American Chemical Society

Thursday, January 10, 2002

MIT Faculty Club, 50 Memorial Drive, Cambridge, MA

5:30 pm Social Hour; a table of Career Services Literature and Aids will be available

6:30 pm Dinner

7:45 pm Evening Meeting, Morton Z. Hoffman, Chair, presiding
David M. Lemal, Dartmouth College: *What is Different about Fluorocarbons?*

Dinner reservations should be made no later than noon, January 3. Please call or fax Marilou Cashman at (800) 872-2054 or e-mail at MCash0953@aol.com. Reservations not cancelled at least 24 hours in adv ance must be paid. Members, $25.00; Non-members, $28.00; Retirees, $15.00; Students, $ 8.00.

THE PUBLIC IS INVITED.

Anyone who needs special services or transportation, please call Marilou Cashman a few days in advance so that suitable arrangements can be made.

Parking: *Limited free parking after 3:30 pm in the MIT lot, entering from Main Street. Meter parking on side streets is free after 6:00 pm*

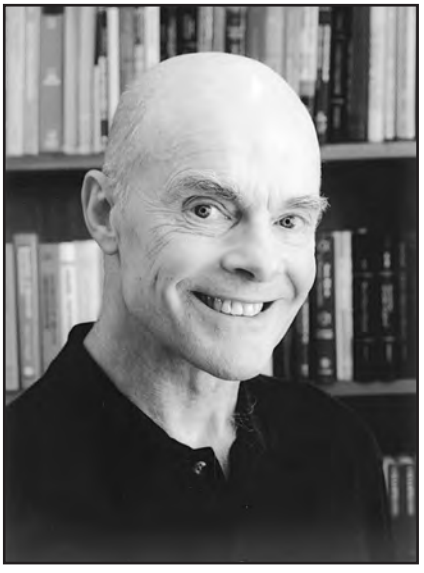
Next Meeting: *February 14, 2002, Joint Meeting with YCC and NOBCChE, Brookline Holiday Inn, 1200 Beacon St. Social hour and dinner 5:30 pm, Evening Meeting 7:45 p.m.: Dr. Willie E. May, National Institute of Standards and Technology, Gaithersburg, MD*

Biography

David M. Lemal received an A.B. degree from Amherst College in 1955 and a Ph.D. from Harvard University in 1959, working with R.B. Woodward. He spent seven years at the University of Wisconsin in Madison, first as instructor (1958-60), then as assistant professor (1960-65). In 1965 he joined the Dartmouth Chemistry Department and became a full professor in 1969. After serving as chair of the department from 1976-79, he was appointed the Albert W. Smith Professor of Chemistry in 1981.

At Wisconsin Lemal developed an abiding interest in highly strained molecules, short-lived species and concerted reactions. His first foray into fluorocarbon chemistry (1969) intrigued him enough that this field became the major focus of his research group.

Lemal has been active in the Gordon Research Conferences, as chair of the conferences on Hydrocarbon Chemistry (1970) and Heterocyclic Compounds (1971), and as a member of the Board of Trustees (1973-79; chair, 1977-78). In 1990 he chaired the Fluorine Division of the American Chemical Society. He was a National Science Foundation Fellow (1955-58) and an Alfred P. Sloan Foundation Research Fellow (1968-70). Lemal received the Chemical Manufacturers Association Catalyst Award in 1987 and the Council for Advancement and Support of Education's named him New Hampshire Professor of the Year in 1989. In 1991 he recei ved the Dartmouth President's Award for Outstanding Leadership and Achievement. He is to be awarded the 2002 American Chemical Society Award for Creative Work in Fluorine Chemistry. ◇



David S. Lemal

Abstract

What is Different about Fluorocarbons

Fluorine is the only element in the Periodic Table that can fully replace the hydrogens in virtually all types of organic molecules. The result is a dramatic change in a molecule's properties and chemical reactivity. Because of their unusual nature, fluorocarbons and their derivatives enjoy a broad spectrum of uses, for many of which they are unrivaled. This talk will focus not on the applications but on fundamental aspects of fluorocarbon chemistry. These features will be highlighted through comparison of the nature and beha vior of selected organofluorine compounds with those of their hydrocarbon counterparts. ◇

CHICKENS AND EGGS

Membership surveys show that you want more articles in the Nucleus. If you tell our advertisers that you saw their ad in the Nucleus, they will provide more financial support and this will allow us to add articles.

From the New Chair

By Dr. Morton Hoffman, 2002 NESACS Chair

Dear Friends. It was an honor to have been elected to the leadership succession of NESACS in 2000 and to have served our Section as Chair-Elect in 2001. During that time, I met with the Immediate Past Chair, Tim Frigo, and the other executive officers regularly, and received wonderful guidance from them. I hope I will be able to apply their wisdom and experience to my term as your Chair during 2002.

With all its colleges and universities, industrial sites, and government facilities, NESACS, an ACS Local Section of almost 6,000 members, is very rich in resources, which means that it is able to offer a wide range of creative programs for its membership. We can all be very proud that our programming has earned us national recognition. Three NESACS Student Affiliates chapters have been cited by ACS for their activities and will receive awards at the ACS meeting in Orlando next April. Last August, at the ACS meeting in Chicago, our Section was nominated for five ChemLuminary Awards (Best Very Large Section, Grassroots Membership, Best Local Section YCC, Most Creative YCC Event, Local Section Career Program), and walked off with the latter two against stiff competition. Most impressive is the fact that our YCC (Younger Chemists Committee) has won that award two years in a row! I am confident that NESACS will be successful again when the ChemLuminary Awards for the 2001 programs are presented at the ACS meeting in Boston next August.

During the past year, the Section held nine meetings that featured outstanding speakers (including Eli Pearce, the ACS President-Elect) who offered insights into research, education, and the public understanding of chemistry. In addition, NESACS hosted the visit of students from Germany, sponsored continuing education programs and research conferences, provided financial support to undergraduates for research and travel, and organized very exciting National Chemistry Week activities and a half-day workshop for high school teachers, among many, many other events. NESACS joined with the University of New Hampshire to host the Northeast Regional Meeting in June, and reached out to other local chemistry organizations; in March, our meeting was jointly sponsored by the American Institute of Chemical Engineers and the International Society for Pharmaceutical Engineering, and in September we met jointly with the Rhode Island ACS Local Section at Bristol Community College in Fall River. And, of course, we made our annual pilgrimage to Fenway Park to watch our beloved Red Sox.

Our meetings for the coming year have already been well organized, thanks to the efforts of our Chair-Elect, John Neumeyer. This month, David Lemal of Dartmouth College (out on the western edge of our Section), who is the 2002 recipient of the ACS Award for Creative Work in Fluorine Chemistry, will be the speaker. In February, the NESACS meeting will have diversity and leadership as its themes, and will be hosted by our YCC and jointly sponsored by NOBCChE, the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers; the speaker will be Willie May, Chief of the Analytical Chemistry Division, National Institute of Standards and Technology (NIST). The recipients of the Theodore William Richards Medal and the Gustavus John Esselen Award will give their addresses at the March and April meetings, respectively, while in May we will host our annual education meeting where the accomplishments of our outstanding teachers and their students will be recognized. We are planning to hold a meeting jointly with the Maine ACS Local Section at the University of New Hampshire in September, and hope to have a high-ranking

continued on page 7

From the New Chair

Continued from page 6

representative of national ACS as our speaker in October when our 50-year members and the winner of the Henry A. Hill Award are honored. The November meeting will feature the winner of the James Flack Norris Award. The annual meeting of the Medicinal Chemistry Subsection will round out the year in December. If you have not been a regular attendee of NESACS meetings, I hope you will be able to get to one or more of them during 2002. Perhaps you might see f it to bring a friend or colleague with you.

As Chair in 2002, I will work to expand our career programs, maintain the vitality of the Section's infrastructure, and develop further those events that transmit the excitement of science and chemistry to young people and that recognize the achievements of our many undergraduate and graduate students in the chemical sciences. In particular, I would like to see the ACS Scholars who are at our colleges and universities become more closely affiliated with our Section, and have the Student Affiliates chapters of our institutions exhibit unprecedented activity. I would like to see an even greater bond develop between teachers on both sides of the high school/college interface. I would like our Section continue to be a determined adv ocate for enlightened governmental science policy, and a resource for clear science reporting in the media. I will work with our Board of Publications to ensure that The Nucleus continues to be our outstanding flagship publication, and look forward to the time when the NESA CS Web site <www.nesacs.org> is a prime bookmark on our members ' Internet browsers.

Of course, the person who is the Chair of the Section cannot really do very much during his/her term in office without the hard work of all the other volunteers. In fact, the success of the Section's programs is ultimately the result of the ideas and hard work of the leaders of its various components. I invite you to join with them to foster a vision of NESACS and the chemical sciences in Eastern Massachusetts and New Hampshire. This year we will have something extra to do; NESACS is the host section for the national ACS meeting in Boston, and we will need all the help we can get.

If there is something you think NESACS should be doing, or not doing, please do not hesitate to contact me at <hoffman@chem.bu.edu>. I particularly look forward to hearing from you if you would like to translate your suggestions into action.

I wish you all the best for 2002, and look forward to the opportunity of greeting you at our monthly meetings and at other NESACS activities during the year. ◇

Nominations

Aula Laudis

The Northeastern Section annually honors several teachers of chemistry at the secondary level in our region by election to the honor society, *Aula Laudis*. Election to membership in *Aula Laudis is* a recognition of excellence in the teaching of chemistry at the secondary school level. This recognition is based on an individual's participation in and contribution to the teaching profession. No one criterion for election to *Aula Laudis is* sufficient and no one criterion is necessary. The following criteria, in their broadest sense, will be considered by the Selection Committee:

- Having taught chemistry to students who have won state-wide, regional, or national chemistry competitions, such as the Ashdown Examination Award;
- Having received awards for excellence in teaching from state-wide, regional or national organizations;
- Having advanced the scholarship of chemical education, including curriculum design, laboratory development, and the introduction of pedagogical methods and techniques through publication in recognized chemical education journals and/or through presentations at scientific meetings and continuing education symposia;
- Having served as the adviser of extra-curricular activities, such as clubs, science programs and science talent searches, in which the interest of chemistry students in the subject is advanced and developed;
- Having performed special service to the chemical education community, such as through the organization of continuing education symposia in chemistry;
- Having demonstrated excellence in classroom teaching as evidenced from written in-class evaluations by supervisors;
- Having had a significant personal impact on students as evidenced by letters from alumni/ae on behalf of the nominee.

The Selection Committee will accept nominations on behalf of active and retired secondary school chemistry teachers; the length of teaching service is not a criterion.

Nominations, including a one-page summary of the nominee's relevant accomplishments, are to be sent to: David Olney
PO. Box 559
Mattapoisett, MA 02739
e-mail: djolney@ma.ultranet.com

Nominations are due **February 1, 2002** ◇

Have you looked at the NESACS website?

WWW.NESACS.org

Book Review

Travels to the Nanoworld

by Michael Grass (Perseus Books; 2001) ISBN 073820444, 272 pp.; $16.00 (paperback)

Reviewed by Maryann C. Kenney

Unbelievably tiny robots, infinitesimal levers, wheels and switches producing the microminiature machines of the future — is this the nanoworld? Well — yes, no and maybe. Commonly held visions of this landscape might conjure up a speck of machinery on a fly's wing, or a tiny capsule rocketing through the body on a mission of health. The travels of this book, however, start in a different landscape. Michael Gross first takes us to the smallest units of life's machinery, the molecules that so masterfully run our body processes.

He starts from an appreciation of the accomplishments of biological evolution, and the elegant, compact living "factories" that have been at work for more than a billion years. Intricacies of molecular interactions such as chemical assembly lines, protein folding and molecular transport are laid out in extensive detail in the first several chapters. While the overall concepts are easy to grasp, a reader without a background in biochemistry may find the specifics slow going and difficult to follow. Unfortunately, the drawings presented to accompany key ideas are minimal at best, and fail to clarify the idea or excite the reader.

As Gross moves through the biological concepts, he points out various machine functions these reactions could ultimately fulfill. In one case he describes G-Proteins, which allow signals to be received and translated across membranes by changing the protein between active and inactive forms. The reader is persuaded to think of these molecules as tiny machine on/off switches — in essence, a "nanomachine" component.

Another more complex example is that of the biological protein shredder that disposes of damaged or unneeded proteins, allowing the building blocks to be recycled back to new proteins. The proteins are first labeled with a marker and unfolded before going into the "machine". The marked protein moves through a tiny molecular shredding tube along with a chaperone protein. The chaperone protein is around to be sure that only the mark ed protein is disposed of and the surrounding environment is safe. The analogy to an industrial line with safety guards is quite apparent.

In addition to advances in nanotechnology, throughout the book Gross provides profiles and sidelines on the techniques and, people involved in the underlying fundamental studies that have made progress possible. For example, the determination of molecular structure, so necessary to understand and explain the functioning of these tiny factories, has only resulted from years of dedicated, and often interdisciplinary work.

Gross moves the discussion on to larger molecules — branched polymers, DNA, self-assembling proteins, and perhaps the most commonly referenced nanostructure in the popular press, the nanotube. Here the reader can begin to appreciate some of the current and potential real world applications for these "nanomachines." As the technology advances, many of the first applications will be for nanocomponents within already miniaturized machines. For example, the ability to uniquely tailor the conductive properties of nanotubes, and form these tubes into extremely strong, minute fibers opens opportunities in transistor and wire technology. Additional nanoscale electronic components can lead to faster, more powerful computing.

The book closes with a vie w toward the fixture nanoworld, including the sweeping utopian changes forecast by Eric Drexler, "Mr. Nano", but this discussion seems more: a philosophical diversion, and far less credible in its predictions

Travels to the Nanoworld provides an encompassing tour of this tiny landscape. Some readers will undoubtedly appreciate the broad scope. But, other

continued on page 9

ACS News

New Member Benefit: *Cycling And Walking Tours In Europe*

Imagine yourself in France. You're cycling along the beach in Normandy and Brittany, stopping in tiny harbor towns on your way to Omaha Beach and Mont St. Michel. Or perhaps you'll be walking in Provence, staying in exclusive Provencal villages and exploring the area's rich Roman and pre-Roman antiquities.

The choices don't end there; in fact, that's just the beginning. Because so many people are interested in active vacations, ACS is proud to offer members a 5 percent discount on more than 70 deluxe biking and walking tours with the leading company in active European travel, Euro-Bike and Walking Tours.

Here's a chance to travel on quiet traffic-free roads and pathways known only to the locals, visit Europe's most impressive sights and out-of -the-way treasures, taste fine wines from world-famous vineyards, stay in luxury hotels, dine on fine regional cuisine, and meet the locals. Traveling 25-35 miles per day on bike tours and 6-8 miles per day on walking tours, you'll be encouraged to go at a leisurely pace. There's plenty of time to walk under waterfalls, tour a cave with pre-historic paintings, or visit the colorful shops.

Best of all, the tours are fully supported, so all you need to do is enjoy yourself and let the experienced English-speaking guides transport your luggage and take care of the details. They'll also offer a lift in the van when you want one and provide you with information about the routes, towns, and sights along the way.

These exciting vacations are offered in 14 countries: Austria, Belgium, Denmark, England, France, Germany, Holland, Hungary, Ireland, Italy, Luxembourg, Sweden, Switzerland, and new this year, the Czech Republic.

The company carefully researches each route to offer the best scenery, sightseeing, and local color available. Here's a sampling of their destinations: the Italian Lakes, Bavarian Alps, Islands of Scandinavia, Tuscany, southwest Ireland, Germany's Romantic Road, England's Cotswolds, Burgundy, Loire, and Alsace. All tours feature luxury accommodations and gourmet cuisine from the area. Travel through varying landscapes and terrain: each tour is rated from easy to challenging. People with varying levels of ability are welcome.

Euro-Bike and Walking Tours has been leading active vacations in Europe for 28 years, offering scheduled departures from April to October with specialty tours for beginners, singles and solos, private groups, and families. When you sign up, provide your ACS membership number, and all members of your party will receive 5 percent off the tour price.

For more information or a full-color tour catalog, contact **Euro-Bike and Walking Tours at 1800-321-6060,fax1-815-758-8822**, info@eurobike.com, or www.eurobike.com. ◇

Book Review

Continued from page 8

readers may find the wanderings through the small back roads of biological detail leave them hoping for more of the big city excitement of this emerging technology. Those interested in additional information on applications may also enjoy reading an excellent review, "Nanotech Goes to Work," in the January/February 2001 issue of *Technology Review*. ◇

Attention Younger Chemists

Get Involved with Northeastern Section's Younger Chemists Committee (YCC)

The YCC is open to all chemists under 35 who are not settled in their careers. The 4th annual Northeast Student Chemistry Research Conference Committee (NSCRC) is forming. We need volunteers to organize the event. To learn more about YCC activities, leadership roles, and how to join the NSCRC 2002 committee visit http://people.bu.edu/nsycc. ◇

Connections To Chemistry 2001

On October 17, 2001, NESACS sponsored **Connections to Chemistry**, a program to connect high school chemistry teachers with the educational resources of the ACS and the Northeastern Section. The program, hosted by Burlington (MA) High School, drew over 120 teachers from 78 different high schools in Massachusetts, New Hampshire, Connecticut, and Rhode Island. In addition, there was an on-line registrant from Buenos Aires University (Argentina).

The high school chemistry teachers were welcomed to the program at the opening ceremony by Ruth Tanner (University of Massachusetts Lowell), Chair of the NESACS Education Committee. Timothy Frigo (Advanced Magnetics, Inc.) Chair of NESACS, also welcomed the participants and encouraged them to utilize the most important resource of the section, its members. Steve Lantos (Brookline High School), Chair of NESACS High School Education Committee, gave an overview of the ACS resources for high school chemistry teachers and their students and encouraged the teachers to become involved in the Chemical Education Division of the ACS.

Workshop on laboratory experiments from the Chemistry Olympiad

Workshop on the ACS Computer Toolbag

Four afternoon workshops were offered to showcase the ACS resources for high school chemistry teachers and students. These included workshops on laboratory experiments from the U.S. National Chemistry Olympiad Exam as examples of creative, open-ended laboratories, led by Steve Lantos; on ACS computer software and Web-based programs, led by Michael Tinnesand, Head, Department of K-12 Sciences, ACS, Washington, DC; and on the National Chemistry Week (NCW) theme, *Celebrating Chemistry and Art,* led by Richard Newman, Head of Scientific Research, Museum of Fine Arts, Boston. In addition, a pedagogical workshop was offered on teaching calculator-free chemistry led by Morton Hof fman, Chemistry Department, Boston University.

The evening program included dinner and a seminar by Michael

Continued on page 20

Meeting Report

Toward Better Teaching

Norris Award Address, delivered November 8, 2001 by Dennis G. Peters

After recalling the various people who influenced his career, Dr. Peters presented his ideas on improving the teaching of chemistry

(L. to R.) Timothy B. Frigo, NESACS Chair; Patricia L. Samuel, Chair of the Norris Award Committee; Dennis G. Peters (Indiana University at Bloomington, IN), recipient of the James Flack Norris Award for Outstanding Achievement in the Teaching of Chemistry; John M. Hayes (Oceanographic Institute, Woods Hole, MA), introducer of Dr. Peters (photos by M.Z. Hoffman)

In my view, one cannot overemphasize the value of undergraduate research. Participation in research is the best way I know to discover what being a scientist really is and to learn if one wants to pursue a research career. Merely attending the usual set of conventional lecture and laboratory courses in a baccalaureate program and even excelling in these endeavors, misses the true target of the undergraduate experience. I have said these things even to my undergraduates who aspire to become medical doctors; those students benefit by doing undergraduate research because they gain a fuller appreciation for the difficulty of reaching sound scientific conclusions — something quite important if one is trying to comprehend the value of the latest publications in the *Journal of the American Medical Association* or the *New England Journal of Medicine*. Additionally, having undergraduates in my laboratory affords me the opportunity to work with them myself and to recognize, once again, how difficult research can be — and that is a wonderful reality check.

I want to digress at this point to mention my involvement in our Cooperative Education Program in Chemistry, which provides another avenue by which students can gain practical research experience. This is a five-year Bachelor of Science program that permits students to gain valuable industrial experience by working at companies such as DuPont, Merck, Dow, Shell, and Eli Lilly. Although the number of students involved in this program has been modest over the years, the participants as well as the corporate sponsors have, time and again, extolled the joint benefits of this venture. Now, in recent months, we have begun to explore with Eli Lilly Company the possibility of creating a new five-year B.S.- M.S. program in our department that would provide in-depth preparation of students with the laboratory skills needed in the pharmaceutical industry. It is too early to say in what direction this concept will go, but it might be interesting to hear comments from industry representatives here tonight.

I should mention that approximately 40 high school students have done research in my group during summer periods over the past 39 years. Each of these students has contributed to my maturation as a chemistry teacher. I owe everyone of the individuals mentioned tonight — mentors, faculty colleagues, and students — an enormous debt of gratitude. I hope that I have played a constructive role in each of their lives, although I am frequently haunted by the thought that I should and could have done more.

I wanted to tell you a little about these individuals — although there are certainly others who deserve acknowledgement and recognition, as well as almost 9,000 students who have toiled in my courses — because I have not done my "thing" in a vacuum. It is not possible to work in an academic environment and not be heavily influenced by those around you. I admit to having thoroughly enjoyed being shaped by those around me.

Toward Better Teaching

Last week, I was invited to go to an awards dinner at one of the sorority houses at Indiana University — perhaps a few young women in my general chemistry course decided that I look emaciated. During the table conversation, one of the students asked me when I first became interested in teaching. I think the answer to this question emerged a long time ago. Apparently, my career path was charted quite early in life. As a college student, I commuted daily between home in Eagle Rock and the Caltech campus in Pasadena. I used some of my spare time to prepare chemistry and mathematics examinations for my two younger sisters who were junior and senior high school students. As I recall, for totally incomprehensible reasons, I spent a good deal of time creating questions that were very challenging. And even more curious is the fact that I convinced my sisters to take those examinations, and to allow me to grade them! Those same sisters, along with neighborhood kids, also had to be volunteer visitors to my "summer science museum in our patio greenhouse," where 1 had displays of rocks and minerals, insects and spiders in jars, old skins shed by lizards and snakes, and occasional fossils — all of which were thoroughly documented with information that I gleaned from reading encyclopedias and reference books that I borrowed from our local library.

To bring us closer to the main themes of my remarks for tonight, I should tell you that, from time to time in recent years, I have been asked to talk about teaching to the incoming fall crop of new chemistry graduate stu-

Continued on page 12

Meeting Report

Continued from page 11

dents who serve as teaching assistants; at Indiana University, we call these individuals Associate Instructors. After ad libbing for a few years, I was finally convinced to put some of my thoughts in writing. Although these ideas seem quite obvious and natural to me, they are nonetheless important — and so I would like to share some of them with you tonight. It always surprises me when I hear one of my faculty colleagues say, "I read one of those statements and I never thought of that before." Unfortunately, when I visit the classrooms of some of my faculty colleagues or my Associate Instructors, I discover that these seemingly obvious ideas are too often forgotten.

Someone has said that the role of a teacher is to teach students to teach themselves. What are the ways in which a teacher can set about trying to reach this lofty goal? Hopefully, in some of the remaining minutes, I can offer some answers to this profound question that are based on quite a few years of personal observations, experiences, and numerous mistakes.

1. Benefit from your own experiences as a student

Recall your own experiences as a student in various classes, some of which might have been headed by a relatively inexperienced teacher. Try to remember what was good and what was bad about those classes and the instructors' performance. Think deeply and constructively about how to take advantage of the good points you remember and how to avoid the bad points you recall.

2. Benefit from lectures that you attend

In much the same vein as the preceding point, when you attend a lecture—and you are not so much concerned with taking detailed notes about the content of the lecture — spend a little time, as you are listening and observing, just thinking about and analyzing the style of the lecturer. Does that individual speak to the audience, or spend most of the time facing the blackboard or screen? Are visual aids (slides, overhead transparencies) useful and intelligible, or have they been quickly and sloppily prepared? Does the speaker give you enough time to see and understand the visual aids, or does the lecturer race through a seemingly infinite number of visual aids? Does the speaker write legibly and allow time for the audience to hear, see, and write down pertinent points? Is the speaker enthusiastic? Does the speaker communicate audibly and clearly? Are there good things about that lecture you could use in one of your own lectures? As someone interested in teaching, I frequently find myself analyzing the lectures and lecturing styles of visiting speakers in these ways.

Here I want to digress to say something about the use of lecture demonstrations and computers in the classroom. I have become a strong advocate for the use of PowerPoint presentations for scientific talks at meetings. On the other hand, in a classroom setting where one is dealing with undergraduates, I find that, with PowerPoint presentations, it is too easy to race through the planned material and to leave many students frustrated at not being able to keep up. This is not a way to create a cooperative bridge between the teacher and students. Thus, perhaps as one of the last of a vanishing breed, I still prefer to write on the blackboard to keep pace with what I am saying and with what students can logically be expected to hear, assimilate, and record. I love to do lecture demonstrations, either to illustrate a particular scientific point or simply to break the normal routine, because a demonstration allows me to be very enthusiastic about some chemical phenomenon. My demonstrations are regarded by my students as "zany."

I am excited about a relatively new development in our use of computers for home work problems. Briefly, one of my colleagues—Professor Romualdo de Souza—has developed a Computer Assisted Learning Method (CALM) whereby each student can download a unique set of homework exercises. These CALM problems are completed according to a schedule, and correctly done exercises are given credit via the computer. If a

student is unsuccessful in working a problem, the CALM system is programmed to offer hints as to where the student has gone astray. Several colleagues in my department, myself included, are in the final stages of submitting a grant proposal to the National Science Foundation for a major expansion of this concept. In particular, we think other science departments on our campus would like to utilize the CALM system, we want to extend the CALM system to reports in laboratory courses, and we want to try to make the CALM system available to other campuses of Indiana University as well as to high schools throughout the state.

3. Punctuality

Because a teacher is responsible to and for students, punctuality is crucial. To me, this has always meant getting to my lecture or laboratory class early. Being early permits several good things to happen. First, students immediately perceive that the class is important to me, and consequently it becomes more important to them. Second, in arriving early, I can do a bit of mingling with early-arriving students to sense their concerns and questions, and to learn their names. Third, on occasion, I discover that the previous instructor has left the room or laboratory in some disarray which, by being early, I can correct. Fourth, by arriving early, I have a chance to lay out notes and other materials, to catch my breath, and to collect my thoughts for an effective beginning.

4. Preparation

Preparation before arriving at the lecture room or the laboratory is crucial. We know from our own social experiences that first impressions are all important. Similarly, the first lecture or two, or the first laboratory experiment or two, of a semester set the tone for the entirety of that semester. You can win over your students with good initial performances and then continue to reap those benefits, or you can bomb out at the beginning of the semester and perhaps never gain the goodwill of your students. Moreover, you can never let down in being well prepared. If one is overseeing a laboratory experiment, it is important to practice or rehearse the experiment. A successful experiment makes students comfortable with and confident about a particular technique; however, a bad experience caused by a poorly prepared experiment has the opposite effect. I am not advocating that we do experiments which are so o verly orchestrated that errors are impossible. Encountering mistakes, learning to overcome mistakes, and being able to extrapolate one's experiences to a new situation are essential parts of scientific training. What I have said about laboratory work applies equally well to working problems in the classroom. Preparation is all important.

Another way I prepare for teaching is to visualize myself actually working with a group of students. In advance, I try to visualize what is to be written on a blackboard, and the spatial arrangement of material on the blackboard. In other words, I try to put myself in the place of a student who is sitting in the classroom. It also helps me if I sit at the very back of a classroom or on the side of the classroom to see what the student might be seeing. Not so amusingly, I discovered several semesters ago that our large ultramodern chemistry lecture hall, with its three mechanically operated vertical blackboards, is configured in a way that, when the blackboards are raised, approximately two feet at either end of a blackboard is obscured from view by students sitting along the sides of the auditorium. Oddly, I never heard any student complain about not being able to see the full blackboard, but nowadays I am very conscious of not using those two feet at each end of the blackboards. One of my colleagues, now retired, for years used an overhead projector and for years blocked some (even much) of the projected material by the position he assumed in lecturing over the projector; despite student comments, he never changed, and it became a challenge (almost a game) for students to arrive to class early to capture seats where their view would not be blocked.

5. Be in contact with your class (students)

Speak to your students; be sure that you engage their attention when you speak. Speak clearly and audibly,

Continued on page 14

Meeting Report

Continued from page 13

and avoid jargon. Experts in presenting technical or scientific material have concluded that no more than 100-120 words per minute should be spoken; this seems like an unbelievably slow pace, but it is absolutely essential for the hearing and comprehending of complex material, and to speak much faster will only lose your audience. Try hard to integrate your students into the presentation of material by soliciting their questions and then responding meaningfully to those questions. Learn the names of your students as quickly as possible.

Being in contact with students in a large class is very challenging. I try to solve this problem by asking lots of questions and strongly encouraging student response. I have a supply of sheets of green paper; when a student responds insightfully concerning one of my questions, he or she gets one of these sheets and fills it out to receive extra credit. I usually deliver the sheet literally by racing up the aisles of the lecture hall. Sometimes the competition to be first to respond is fierce. Another procedure I use to give every student a chance for extra credit — and not merely reward "the quickest with the mostest" — is to have extra credit questions for the entire class. Toward the end of a class period, I may decide quite spontaneously to pose a question about the lecture material. Everybody takes out a piece of paper and submits an answer for my personal grading — the question may be a numerical problem or it may be conceptual.

There is another way for a teacher to be in contact with his or her students. I strongly advocate the use of what I call Student Advisory Committees. Especially when one is teaching a course for the first time, it helps to ask students to volunteer for the Student Advisory Committee. This committee, meeting occasionally during the semester with the teacher, is a sounding board to get opinions about how a course is progressing or not progressing, or how the examinations and other assignments are being received. Sometimes, a very good idea is advanced. Many years ago, a freshman in my class suggested that periodically we have short, unannounced quizzes to promote and reward conscientious day-by-day study; this seemingly minor event led to what has become standard practice in most of our general chemistry courses.

Earlier this semester, one of my colleagues commented that my students seem to like my class because it is so spontaneous. I would agree, but I would also say that one has to be very well organized for spontaneity. If one is not organized to be spontaneous, the result will almost assuredly be a state of maximal classroom entropy.

6. Admit ignorance

Sooner or later, a student will ask a question that you cannot immediately answer. In such a case, the best thing to do is admit that you do not know the answer. Trying to bluff is transparently bad practice, although I have seen others try to do it. However, after one confesses ignorance, it is then essential to do one of two things. First, you can inform the student that you will seek the answer and that you will provide an answer as soon as possible; then, as quickly as you can, you get the job done and report back to the student. Second, and an approach I tend to prefer, is to have the student go with you to your bookshelf or to the library to seek out the answer. Working in the library with a student teaches him or her how to use the library and how to be resourceful — and those are good things. Finally, as stated earlier, you want to be well prepared so that you do not have to admit your ignorance very often.

7. Seriousness and professionalism

These attributes are obvious traits of a true teacher-scholar. You must take your subject seriously and you must behave professionally, if you are to gain credibility with students. If you exhibit these qualities, your students will too, and they will be apt to work harder and to show more commitment. However, exhibiting these qualities does not mean that you should be an individual without humor or compassion.

John Hayes thinks that there is a measurable amount of nonsense (i.e., levity and fun) in my classes, but only on terms ultimately dictated by me. To a certain extent, I do this deliberately in order to inject a break and a certain bit of humanity into my class. However, this cannot be overdone—to me, chemistry is serious business—and I certainly do not allow students to control what amusement or nonsense is injected into the class.

8. Do not talk down to or belittle students

Talking down to students creates an atmosphere in which the teacher seems to know everything and in which the students know little or nothing. This is inadmissible behavior — behavior which I have heard about and also witnessed. Instead, it is incumbent upon a teacher to treat students as young colleagues and to nurture an environment in which instructor and students together are on a collective quest for knowledge. It is catastrophic to student morale if a teacher tells students or otherwise makes them think that they are inferior and stupid. One cannot profit from announcing that a particular student question is stupid or that the student is stupid. Although students certainly do not know everything and certainly have much to learn — as we all do — a teacher's challenge is to advance the students' knowledge, their abilities to learn and teach themselves, and their attitudes about higher education. Finally, it verges on being unethical to criticize or belittle a student in the presence of his or her peers; if one has some critical matter to discuss with a student, let that be done in the privacy of office hours.

9. Attitude

In my view, attitude is everything in teaching. Most of what I have spoken about earlier comes down to attitude. So I say to all teachers, behave as if you are important, and treat your students as if they are even more important. Believe, and demonstrate by your behavior and actions, that what you are doing is important, and you should find that your students will take the same attitude.

continued on page 15

Board of Directors

Notes of Meeting of October 11, 2001

NOTE: Board Meetings are held on the monthly meeting day at 4:30 p.m. Section members are invited to attend.

Officers' Reports:

Chair: T. Frigo greeted Dr. Eli Pearce, President-Elect of the ACS, who attended the meeting.

Meeting Report

Continued from page 14

The Advance College Project

I want to finish by speaking briefly about one of the most rewarding educational experiences of my career — the Advance College Project at Indiana University. Almost 20 years ago, Les Coyne (then Director of our Summer Sessions), Bill Lumbley (an accomplished chemistry teacher at Bloomington High School South), and I set in motion a program, modeled after that at Syracuse University, to offer Indiana University general chemistry courses at selected high schools throughout Indiana. Bill was able to identify approximately 20 high schools having outstanding chemistry teachers and chemistry programs. During the summer preceding the beginning of our program, these high school teachers spent a full week of training, with lively give-and-take discussion, about how to present our first-semester lecture and laboratory courses in general chemistry to juniors and seniors in their respective high schools. In the Advance College Project, each high school chemistry teacher is required to follow the basic syllabus for our college courses. We monitor how the courses go by making periodic site visits to the high schools, by receiving and evaluating course materials, and by preparing and administering a common final examination. In every possible respect, the course as it is offered at a high school is comparable to the course offered at Indiana University. High school students receive Indiana University credit, which is accepted by a large and ever-increasing number of

continued on page 21

Three of the 50 year-members who are to be recognized at the meeting are attending.

The Nominating Committee has nominated a slate for the 2002 Nominating Committee (see *New Business*).

T. Frigo thanked M.Z. Hoffman for a job well done on the joint September meeting, with the Rhode Island Section at Bristol College

Chair-Elect: M. Hoffman stated that the November meeting will honor Norris Awardee (for teaching), Dr. Dennis Peters (Indiana University) and will be at the Newton Holiday Inn. The speaker at the February 14 meeting at the Brookline Holiday Inn will be Dr. Willie E. May, Chief of the Analytical Chemistry Division, National Institute of Standards and Technology, to be a joint meeting with YCC and NOBCChE. Since this will be Valentine's Day, it is proposed that members' spouses, companions and significant others also be guests of the Section for dinner.

Secretary: The May minutes were APPROVED. The September minutes will be revised before being presented at the November Board meeting.

Treasurer: The May-August, and September Treasurer's reports were presented and APPROVED. Budget requests for 2002 are to be presented by the November Board meeting.

Trustees: M. Strem reported that the Section's investments are in good shape.

Standing Committees:

Bd. Of Publications: No report

Editor: A. Heyn reported that the October 2001 issue has been mailed and is 28 pages because of the Suppliers Index, which is planned to be an annual feature. The "Blueline" copy of the November issue was circulated, to be printed imminently.

Chemistry Education: R. Tanner reported that the *Connections to Chemistry 2001* program for high-school chemistry teachers will take place October 17. The program has been oversubscribed, with a waiting list in addition to the 110 attendees.

Tenth Annual Regional Undergraduate Chemistry Day is scheduled during National Chemistry Week, on November 3, 2001 at Boston University. Prof. Bassam Shakhashiri (University of Wisconsin-Madison) will give the keynote address: *The Joy of Learning.* There will be technical talks, workshops and a Job-Grad. School fair.

ACS Scholar Program: Because of Mr. George Whitfield's resignation from the program as a result of changing his field of interest to computer science, Marlita Taylor, a junior at MIT, has been nominated.

Secondary School Subcommittee: S. Lantos reported that three high school students from our Section participated in the Chemistry Olympiad Summer Camp, more than from any other Section!

Prof. Peter Bowers, who for over 20 years actively helped running the Ashdown Exam Contest and Chemistry Olympiad Exam has retired. Other faculty members at Simmons will assist the committee in running these annual exams.

Constitution and Bylaws: *(See Old Business)*

Norris Award: To be presented at the November 8 Section meeting.

Esselen Award: J.L. Koob reported that the deadline for nominations has been extended to November 1, 2001, and will be both on the NESACS website, and in *C&ENews*. Efforts will be made to reduce costs of the award event because of the overrun in 2000.

Hill Award: To be presented at the evening meeting to Dr. Myron Simon.

Other Committees:

Continuing Education: A. Viola reported in writing that the 3-day Short Course *Pharmacology for Chemists* was subscribed to capacity (40 participants, with 19 additional applicants who had to be refused) by mid-September, which will result in a significant financial return to the Section.

Natl. Chemistry Week: A number of activities have been planned:

continued on page 16

Summer Scholar Report

Synthetic Routes to Biologically Important Retinoids and retro-Retinoids

Matthew S. Tremblay*, Edwin G. E. Jahngen
Department of Chemistry, University of Massachusetts, Lowell, Massachusetts 01854

Introduction

In the past decade, certain retinoid compounds – thought originally to be metabolites of retinol, oxygenated for excretion – were shown to affect the growth and differentiation of tumor cells[1]. These compounds block blood flow to the tumor by inhibiting angiogenesis. Figure 1 shows retinol and the three retinoid compounds whose anti-tumor function has been reported. The prefix *retro-* in **14HRR** refers to the rearrangement of the double bond system from the four position, usually occurring through a long-range elimination across the conjugated π skeleton; this *retro* configuration is also seen in **AR**, though not indicated in the name.

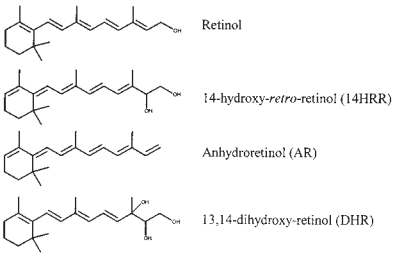


Fig. 1 Retinol and Biologically Active Retinoids

The general aim of this work was to make structural modifications to the compounds shown in Figure 1 with the hope of increasing their efficacy. The potency of any drug hinges upon its ability to enter the cell and perform its function. In order to enter the cell, the compound must first permeate the lipid bilayer. At this interface, hydrophilic substituents such as the hydroxy groups on **14HRR** and **DHR** can be a hindrance to cellular uptake. It was thought that protecting these hydroxy groups with something like a fatty acid ester would promote cellular uptake, thereby increasing the efficacy of the drug on a purely colligative basis. The mechanism by which these retinoids work inside the cell is not well understood, but it is thought to be a reasonable assumption that once inside the cell enzymatic cleavage of the relatively labile esters would occur, resulting in endogenous behavior similar if not identical to that of the aforementioned retinoids. This same ideology has been applied and shown to work in other systems[2].

Results and Discussion

Figure 2 shows the compounds that were prepared. Compounds **I** and **II** were prepared from the commercially available (and more affordable) retinyl esters rather than from retinol.

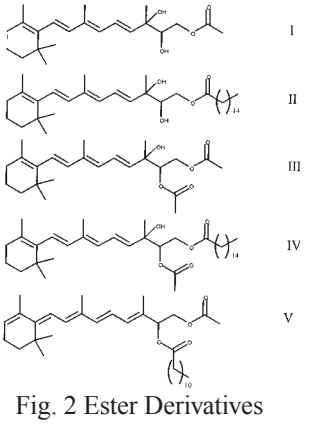


Fig. 2 Ester Derivatives

Figure 3 summarizes the synthetic efforts. The Sharpless method was used to effect the regiospecific[a] dihydroxylation at the 13,14 double bond[b, 3]. Monoacetylation of the diol (at the 2° alcohol, C14) yielded the retinoid diesters **III** and **IV**. In a similar attempt to monoesterify **I**, this time with $CH_3(CH_2)_{10}COCl$, the dehydrated diester **V** resulted rather than the expected 13-hydroxydiester. It is unclear whether the dehydration was catalyzed by the acid generated from the acid chloride used in the esterification, (similar dehydrations are carried out using

* 2001 Norris/Richards Summer Scholar

Board of Directors

Continued from page 15

November 3: Undergraduate Day at Boston University
November 4: Shakhashiri lecture at the Museum of Science
November 6: Chemistry and Art at the Forsyth Institute.
For 2002, National chemistry Week will be held in the last week in October to avoid conflict with Election Day.

Old Business:

Brauner Memorial Committee: D. Lewis reported that the committee had completed arrangements for the Brauner Memorial Lecture, to be the Chemistry Week Demonstration Lecture by Prof. Bassam Shakhashiri on November 4 at the Museum of Science. Following the lecture, there will be a reception in memory of Phyllis A. Brauner at the Museum for family, friends of Phyllis Brauner and members of the Board, all of whom have been invited for the event.

The committee agreed that funds should be raised to establish a Phyllis A. Brauner Memorial Lecture Trust to insure the that the lecture would exist in perpetuity.

Constitution and Bylaws Amendments were presented to establish a Phyllis A. Brauner Memorial Book Award. After discussion, it was MOVED and PASSED to approve the revised wording of the amendments. C. Costello indicated that she will send the proposed amendments to the ACS C&B Committee for preliminary review before submitting the amendments to the members of the Section, (following possible revisions, and after publication of the text in the *NUCLEUS),* in conformity with the provisions for amendment in the constitution.

New Business:

M. Strem announced that the ACS Women Chemists Committee is seeking nominations for Regional Awards for Contributions to Diversity, as announced to Officers and Councilors.

From the minutes of M. Singer ◇

$SOCl_2$[3] and ethanolic HCl[4]), or during filtration through silica gel in the workup. This result was not entirely surprising, since failed attempts to esterify retinol with various acid chlorides resulted in dehydration, showing the conversion of retinol to **AR** via (4,15)-elimination to be facile.

This *retro* double bond configuration (as seen in **14HRR, AR, V**) is easily distinguishable by characteristic fine structure in the ultra-violet absorption spectra (Fig. 4) and seems to impart stability to the molecule, given the resistance of **AR** to standard oxidation attempts. Intuitively, **AR** would be rather susceptible to addition given its plethora of unsaturated sites and the documented reactivity of retinol. However, attempts to dihydroxylate **AR** with conditions similar to those used in the preparation of **I** and **II** showed no appreciable transformation. This was surprising, since the Sharpless method has been shown to work with a multitude of substrates – including terminal olefins[5a,b] and polyenes[5c] – and the reaction conditions can be tailored to fit the substrate[c] and the desired regio- and stereo- outcomes. The dihydroxylation of **AR** is still under investigation, since it provides a more direct route to **14HRR** than has been previously reported[3]; at this point, the primary hindrance is thought to be the solubility of the hydrophobic substrate in the two-phase (t-BuOH/H_2O) reaction.

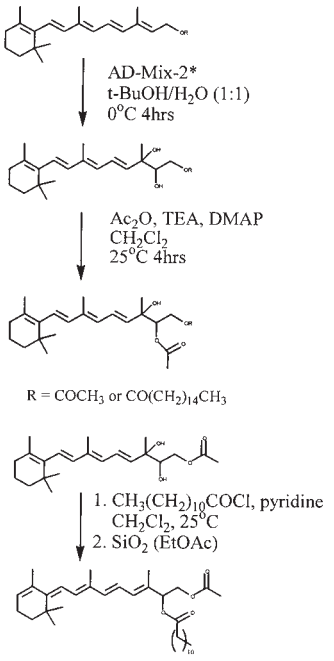


Fig. 3 Synthetic Routes

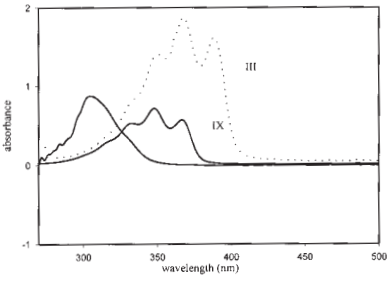


Fig. 4 UV Spectra of Retinoids

Studies assessing the anti-tumor activity of the reported compounds are currently in progress. All of the compounds have not been tested, but preliminary results are promising. The dihydroxy retinyl ester **I** has been observed to be more potent than its trihydroxy counterpart **DHR**.

Conclusion

Compounds **I – V** were successfully synthesized. Their function as tumor inhibitors is still being studied, but preliminary results suggest that they will have enhanced potency relative to their parent compounds **14HRR** and **DHR**. Various experiments involving **AR**, and the synthesis of **V**, provided some general insight concerning the class of retinol derivatives known as *retro*-retinoids. Future work in this area will include the refinement of the substrates herein presented in accordance with the results of the inhibition assays.

Experimental

NMR Chemical shifts are reported in ppm relative to TMS (d $CDCl_3$ = 7.26). Retinol, retinyl acetate, and retinyl palmitate were all used as received. Unless otherwise noted, reaction progress was assessed by thin layer chromatography. Products were concentrated by rotary evaporation (15 torr, 25-40°C), followed by several hours under reduced pressure (2 torr) to remove oil-bound solvent.

(13,14-dihydroxy)-retinyl acetate (I): Retinyl acetate (2.31g, 7mmol) was dissolved in 5mL of THF and added to a stirred solution of AD-mix-2 (9.94g, 7mmol) in 1:1 t-BuOH/H_2O (100mL) at 0°C. After six hours of stirring at 0°C, 100mL of saturated Na_2SO_3 solution was added. The quenched reaction mixture was extracted with ethyl acetate (2 x 75mL). The combined organic phases were washed with 1M H_2SO_4 (50mL), brine (50mL), dried over Na_2SO_4, and concentrated. Purification by column chromatography yielded **I** as a light yellow syrup (2.00g, 5.53mmol, 79%): R_f = 0.37 (1:1 hexanes/ethyl acetate); UV(hexanes): λ 226, 290 (34,000); FTIR (film): 3464, 2932, 1736, 1450, 1366, 1242, 1175, 1049, 972 cm^{-1}; ^1H NMR (250mHz, $CDCl_3$): δ 6.77 (dd, *J* = 11.2, 1H, *J* = 15.3 Hz), δ 6.15 (s, 2H), δ 6.07 (m, 1H), δ 5.78 (d, 1H, *J* = 15.2 Hz), δ 4.33 (dd, 1H, *J* = 2.6, 11.7 Hz), δ 4.10 (dd, 1H, *J* = 8, 12 Hz), δ 3.77 (dd, 1H, *J* = 2.5, 8 Hz), δ 2.62 (s, 1H), δ 2.27 (s, 1H), δ 2.10 (d, 2H), δ 1.97 (s, 3H), δ 1.72 (s, 3H), δ 1.62 (s, 3H), δ 1.47 (m, 2H), δ 1.37 (s, 3H), δ 1.29 (t, 2H), δ 1.04 (s, 6H)ppm; ^{13}C NMR (250mHz, $CDCl_3$): δ 171.8, 138.2, 137.7, 137.3, 136.0, 129.7, 128.9, 127.8, 127.0, 76.9 (76.1), 74.5, 66.0 (60.8), 39.9, 34.6, 33.4, 29.3, 23.6, 22.1, 21.4, 19.7, 14.6, 13.1ppm.

(13,14-dihydroxy) retinyl palmitate (II): The procedure for **I** was followed, with an extended reaction time

Continued on page 18

[a] In addition to being regioselective, the Sharpless asymmetric dihydroxylation (AD) method is also stereoselective; in the case of retinyl acetate, it has been shown by Corey *et al.*[3] that the Sharpless AD produces the (13S,14R) enantiomer in 95% ee (as determined by ^1H NMR of the corresponding mono-MTPA esters). However, the importance of stereochemistry for this class of compounds in the mentioned biological role has not been clearly demonstrated[1b,d]. Enantiomeric excess was not determined for the compounds synthesized.

[b] Both the Sharpless asymmetric dihydroxylation and the selective protection of the 14-hydroxy group are part of a documented synthetic route to **14HRR**, synthesized by Corey *et al*[3].

[c] Two changes were made in the asymmetric dihydroxylation of AR as compared with the formation of I and II: the linker in the bis-cinchona alkaloid catalyst was changed from phthalazine to diphenyl pyrimidine and methanesulfonamide (used to hasten the hydrolysis of the osmate ester) was not used.

Summer Scholar

Continued from page 17

(7hrs). The crude residue, a brownish yellow oil, was purified by column chromatography (5:1 hexanes/ethyl acetate) yielding **II** as a yellow oil (0.560g, 1.0mmol, 77%): R_f = 0.30 (5:1 hexanes/ethyl acetate); UV(hexanes): λ 290; FTIR (film): 3474, 2959, 2926, 2857, 1744, 1466, 1378, 1239, 1173, 1050, 973 cm^{-1} (C – H stretch peak was larger (relative to C=O) than that for **I**. ^1H and ^{13}C NMR studies showed peaks characteristic to **I**, with the following exceptions: the acetate peak was shifted slightly downfield (δ 2.03), integrated for 2H, and appeared as a triplet; δ 1.11 (bm, 28H), δ 0.93 (s, 3H); numerous peaks in δ 14 – 30 ppm region.

(13-hydroxy-14-acetyl)-retinyl acetate (III): To a stirred solution of **I** (725mg, 2mmol) in CH_2Cl_2 (20mL) was added triethylamine (253mg, 2.5mmol, 347µL), (N, N-dimethyl)-4-amino-pyridine (DMAP) (1.56mg, 0.0128mmol), and acetic anhydride (220mg, 2.16mmol, 205µL). After 4 hours of stirring at room temperature, the reaction was quenched with 30mL of saturated $NaHCO_3$ solution, extracted with ethyl acetate, washed with brine, dried over Na_2SO_4 and concentrated. The diacetate **III** (697mg, 1.72mmol, 86.2%), isolated as a light yellow syrup, required no further purification: R_f = 0.70 (1:1 hexanes/ethyl acetate); UV(hexanes): λ 292; FTIR (film): 3479, 2929, 2866, 1747, 1446, 1372, 1229, 1046, 975 cm^{-1}; The mono-acetylation of **I** to yield **III** was confirmed by ^1H NMR and ^{13}C NMR (δ 1.96 (s, 3H), δ170.2ppm)

(13-hydroxy-14-acetyl)-retinyl palmitate (IV): The procedure for **III** was followed with a shortened reaction time (2hrs). The crude product was purified by column chromatography (5:1 hexanes/ethyl acetate), which yielded **IV** as a yellow oil (327mg, 0.55mmol, 66%): R_f = 0.40 (5:1 hexanes/ethyl acetate); UV(hexanes): λ 290; The mono-acetylation of **II** to yield **IV** was confirmed by ^1H NMR and ^{13}C NMR (δ 1.95 (s, 3H), δ170.8ppm)

14-lauryl-(4,14)-*retro*-retinyl acetate (V): To a stirred solution of **I** (59mg, 0.16mmol) in CH_2Cl_2 (20µL) was added lauroyl chloride (65.6mg, 0.30mmol, 62µL) and pyridine (17mg, 0.21mmol, 17µL). After stirring for 3hrs, the reaction mixture was concentrated to about 5mL and filtered through a six-inch plug of silica gel first with CH_2Cl_2 as eluent, then with ethyl acetate. TLC of the ethyl acetate layer showed two spots (R_f = 0.8, 0.5 in 3:1 pet. ether/ethyl acetate). The spot at 0.5 was isolated by chromatography and shown to be **V** (33.5mg, 0.065, 40%): The diester functionality of **V** was confirmed by ^1H and ^{13}C NMR: (laurate: δ 2.35 (t, 2H, $COCH_2$-), δ 1.20 (bm, 20H, -$(CH_2)_{10}$-), δ 0.90 (s, 3H, -CH_3), δ 180.0 (CO) ppm; acetate: δ 2.10 (s, 3H, $COCH_3$), δ 171.7 (CO) ppm) and the *retro* double bond configuration was confirmed by UV: (pet. ether): λ 332, 346, 366.

Summer Scholar

Continued from page 18

AD-Mix-1: The following dry ingredients were combined and blended into a fine yellow powder: K_2OsO_4:$2H_2O$ (109.3mg, 0.30mmol), $(DHQ)_2PHAL$ (234.9mg, 0.30mmol), $K_3Fe(CN)_6$ (30.0g, 90mmol), K_2CO_3 (12.5g, 90mmol). The molecular weight of the mix was calculated as 1413 g/mol, such that the bulk ingredients were 300 mol% and the catalysts were 1 mol%. The powder was stored in a desiccator.

AD-Mix-2: (AD-Mix-1 plus 1 molar equivalent of $CH_3SO_2NH_2$)

AD-Mix-1 (14.1g, 10mmol) was blended together with $CH_3SO_2NH_2$ (950mg, 10mmol).

Acknowledgements

The author acknowledges the support of the Northeastern Section of the American Chemical Society through a Norris/Richards Summer Research Fellowship. The author also wishes to express his gratitude to Prof. Ed Jahngen.

References

1) Buck, J. *et al.* "Intracellular Signaling by 14-hydroxy-(4,14)-*retro*-retinol." *Science* **1991**, *254*, 1654-1656. b) Derguini, F. *et al.* "Intracellular Signaling Activity of (14R)-, (14S)-, and (14RS)-14-hydroxy-(4,14)-*retro*-retinol." *Biochemistry* **1994**, *33,* 623-628. c) Buck, J. *et al.* "Anhydroretinol: A Naturally Occurring Inhibitor of Lymphocyte Physiology." *J. Exp. Med.* **1993**, *178*, 675-680. d) Derguini, F. *et al.* "13,14-dihydroxy-retinol, a New Bioactive Retinol Metabolite." *J. Biol. Chem.* **1995,** *270(32)*, 18875-18880.

2) Van Berkel, Theo J. C.; Kruijt, J. Kar; Kempen, Herman Jan M. "Specific targeting of high density lipoproteins to liver hepatocytes by incorporation of a tris-galactoside-terminated cholesterol derivative." *J. Biol. Chem.* **1985**, *260(22)*, 12203-12207.

3) Corey, E. J. *et al.* "Catalytic Enantioselective Synthesis of (14R)-14-Hydroxy-4,14-*retro*-retinol from Retinyl Acetate." *Tetrahedron Letters* **1994**, *36*, 4171-4174.

4) Derguini *et al.* "Spectroscopic Studies of Anhydroretinol, and Endogenous Mammalian and Insect *retro*-Retinoid." *Angew. Chem. Int. Ed. Engl.* **1994**, *33*(18), 1837-1839.

5) Sharpless *et al.* "Improved Enantioselectivity in Asymmetric Dihydroxylation of Terminal Olefins Using Pyrimidine Lighands." *J. Org. Chem.* **1993**, *58*, 3785-3786. b) Sharpless *et al.* "Modified Cinchona Alkaloid Ligands: Improved Selectivities in the Osmium Tetroxide Catalyzed Asymmetric Dihydroxylation (AD) of Terminal Olefins." *Tetrahedron Letters* **1993**, *34(46)*, 7375-7378. c) Sharpless *et al.* "Selective Asymmetric Dihydroxylation of Polyenes." *Tetrahedron* **1995**, *51(5)*, 1345-1376. ◇

Chemistry Week's Events

Chemia members (l-r) Penny Lancaster, Kristyn Kitabayashi and Athena Nomikos demonstrating the chemiluminescence of luminol, at the November 5, 2001 Boston University event Photos by M.Z. Hoffman

Dominick DePaola, President and CEO, The Forsyth Institute, greeting the audience at the Chemistry and Art event at the Forsyth Institute, November 6, 2001

At the Chemistry and Art event: (l-r) Shelby Kashket (Forsyth Institute); Sarah Iacobucci, Chair of the NESACS Chemistry Week Committee (Tufts University); Michael Douma (Michael Douma Productions); Michael Henchman (Brandeis University)

(l-r) Richard Newman (Museum of fine Arts, Boston); Francesca Bewer (Harvard University); Margaret Merritt (Wellesley College); Michael Douma (Michael Douma Productions); Shelby Kashket (Forsyth Institute)

Member News

The following will be honored at the Orlando ACS Meeting, April 9, 2002

David M. Lemal, Dartmouth, NH*ACS Award for Creative Work in Fluorine Chemistry*
Andrew G. Myers, Harvard*Award for Creative Work in Synthetic Organic Chemistry*
Charles H. DePuy, U. of Colorado, Boulder,
James Flack Norris Award for Physical Organic Chemistry (Sponsored by NESACS).
James S. Panek, Boston University*Arthur C. Cope Scholar Award*
Matthew D. Shair, Harvard University, *Arthur C. Cope Young Scholar Award*

Our congratulations to these distinguished chemists ◇

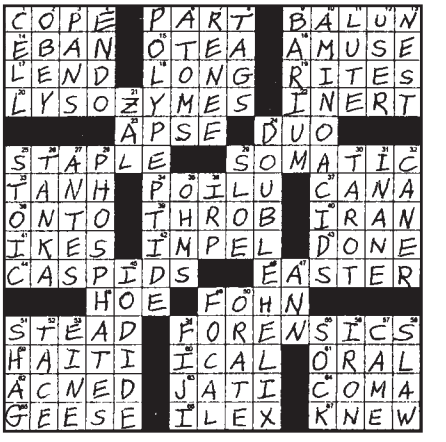
Connections 2001

Continued from page 10

Henchman entitled *The History of Art Viewed as the History of Chemistry.* Michael Henchman is an art historian and Professor of Chemistry at Brandeis University. Following his address, several items were raffled, including subscriptions to *J. Chem. Educ.*, affiliate memberships in CHED and NESACS, ACS Chemical Education Division CD's and software, and several ACS logo products. The program was concluded with participants receiving certificates awarding professional development credits.

The event was supported by the Northeastern Section as well as a minigrant from the ACS Membership Division. The program received material assistance from the ACS, and publicity support from the New England Association of Chemistry Teachers (NEACT), the Massachusetts Association of Science Supervisors (MASS), the Massachusetts Association of Science Teachers (MAST), Science Teachers Area Resources Swap (STARS) and the New England Science Teachers (NEST). The Program Conference Committee also wishes to acknowledge the support of the Planning and Program Associates from various high schools and industries. ◇

December Puzzle Solution



Section News

Three NESACS Student Affiliates Chapters Cited by ACS

The Society Committee on Education and the International Activities Division have announced that three Student Affiliate Chapters within the Section will receive Honorable Mention awards for their activities in the academic year 2000-2001.

The listing below gives the chapters, their 2000-01 presidents and their faculty advisors:

Boston University; John Perry; Prof. John Snyder

Bridgewater State College, Hillary Thomas; Profs. Frank Gorga and Cielito DeRamos-King

Suffolk University, Harolin Sosa and Angela Buffone; Prof. Doris Lewis ◇

Meeting Report

Continued from page 15

colleges and universities through the United States; that is real testimony to the success of the program which, in addition to chemistry, now embraces courses in biology, calculus, English composition, computer science, economics, history, literature, political science, physics, psychology, sociology, and public and environmental affairs. What has made this venture so enjoyable are the opportunities to interact with high school teachers and students and to tear away the unnecessary barriers that have for so long separated high schools and universities.

One of the outgrowths of the Advance College Project in Chemistry was the subsequent creation of I-ACT (the Indiana Alliance of Chemistry Teachers). This organization was born in the mid-1980s out of a series of Saturday morning coffee-and-doughnut meetings in my office with all of the original group of teachers in the Advance College Project. Today, I-ACT is a statewide organization with a membership in the hundreds that brings high school and college teachers together semiannually to get to know each other better and to share experiences in teaching. Seeing the embryo of I-ACT grow into a large and vital organization has been a source of great personal satisfaction.

In conclusion, I feel as though I have barraged you with little more than a stream of consciousness and personal experience. I do hope, however, that something I said will have some enduring value. I want to express my heartfelt appreciation to all of you for honoring me by your attendance tonight and, once again, I thank the Northeastern Section of the American Chemical Society for this coveted award. ◇

Nominations

2003 ACS Regional Award In High School Chemistry Teaching

The Office of the Awards Program is soliciting nominations for the Regional Award in High School Chemistry Teaching that will be presented in 2003. If there are outstanding and dedicated high school chemistry teachers in your region, nominate them for this award. The award consists of a $1,000 cash prize, two certificates (for the recipient and the recipient's institution), and reimbursement of reasonable travel expenses to and from the regional meeting where the award will be presented. Former recipients and retired teachers are ineligible for nomination. Recipients of the Regional Award in High School Chemistry Teaching will automatically become candidates for the James Bryant Conant Award in High School Chemistry Teaching http://chemistry.org/awards/conant.html in 2004.

The deadline date for all nominating material for the 2003 Regional Award in High School Chemistry Teaching is February 1, 2002. Earlier transmittal is encouraged. Contact Marvin Jones at m_jones@ acs.org or 800-227-5558, x4408 for more details. ◇

DIRECTORY

SERVICES

Chemistry Nobel Laureates

Dr. Barry Sharpless

Dr. Barry Sharpless (Scripps Research Institute, La Jolla, CA) shares the 2001 Nobel Prize in Chemistry with Dr. William Knowles and Dr. Ryoji Noyori.

Dr. Sharpless was this Section's Richards Medal Awardee in 1988: Another Richards Medalist who went on to become a Nobel Laureate. Other Section Richards medalists who became Nobel Laureates:
(R=Richards, N=Nobel)
Linus Pauling, 1947 R, 1954 N
Melvin Calvin, 1956 R, 1961 N
R.B. Woodward, 1958 R, 1965 N
Robert S. Mulliken, 1960 R, 1966 N
Lars Onsager, 1964 R, 1968 N
William Stein, 1972 R, 1972 N
Henry Taube, 1980 R, 1983 N
Rudolph A. Marcus, 1990 R, 1992 N

[The average time between receipt of the Richards Medal and the Nobel Prize is 4 years.] ◇

BUSINESS DIRECTORY

SERVICES

SERVICES

SERVICES

A CALL FOR *NUCLEUS* VOLUNTEERS

Help publish the *Nucleus*
You can do so in a variety of ways

Writers

Roving Reporters in the academic or corporate communities

Proofers

Editors and editorial assistants

You can help make the ***Nucleus*** more useful to our members. We adjust our schedule to yours, and you serve with your peers in the process.

Phone for more details
Arno Heyn
Nucleus Editor
Tel: 617-969-5712

BOOK REVIEWERS WANTED

The Nucleus is looking for people to review the following books:

Daniel S. Greenberg, "Science, Money and Politics. Political Triumph and Ethical Erosion"

Michael Gross, "Travels To The Nanoworld. Miniature Machinery In Nature And Technology"

Ivan Valiela, "Doing Science. Design, Analysis, and Communication of Scientific Research"

Timothy Pasquarelli and Frankie Woid-Black, "Emergency Preparedness Planning. A Primer For Chemists"

Please contact Dennis J. Sardella, the Book Review Editor directly, either by phone, (617)-552-3621 or by e-mail sardella@bc.edu

BUSINESS DIRECTORY

SERVICES

Yasui Seiki Co., (USA)

Coating Test Laboratory

- Battery Electrode and Primer
- Pattern or 'Patch' Coating
- Display Coatings 0.1 to 1 μ
- Photo / Photo-Resist 0.1 to 9μ
- 1 micron UV Hardcoats

Featuring *Precise* Yasui Seiki Machines
Tel 812.331.0700 ✦ Fax 812.331.2800
www.yasui.com✦yasui@ix.netcom.com

CNH Technologies, Inc.

Contract Organic Synthesis – R & D – mg-kg
On Time & On Spec
10A Henshaw St. Ph: 781 367-4047
Woburn, MA 01801 Fax: 781 933-1839
e-mail: services@cnhtechnologies.com

***NMR** Service **500**MHz
***Mass** ***Elemental** Analysis
Fast Turnaround / Accurate results
NuMega Resonance Labs.
(858) 793-6057 Fax (858) 793-2607

PROTECT
Your Expensive Lab Work With Research and Development Record Books
STOCK RECORD BOOKS
B50D ---- Fifty pages and fifty duplicates 1/4 inch sqs. on right pages
B100P --- 100 - 1/4 inch sqs. on right pages 100 - 10 sqs. per inch on left pages.
B200P --- 208 1/4 inch sqs. on right and left pages
B200PH - 208 horizontally lines right and left pages.
Books have instruction and TOC's. Page size 11 x 8 1/2. Hard extension brown cloth covers. Pages open flat.
$14.50 EACH, FOB Chicago
CUSTOM MADE BOOKS TO ORDER
Scientific Bindery Productions
60 E. 13th Street Chicago, IL 60605
Phone: 312-939-3449 Fax: 312-939-3787
www.scientificbindery88yrs.com

micron inc.
Analytical Services
Complete Materials Characterization
Morphology Chemistry Structure
3815 LANCASTER PIKE, WILMINGTON DE.19805
PHONE 302 - 998 - 1184, FAX 302 - 998 -1836
MICRONANALYTICAL@COMPUSERVE.COM
WWW.MICRONANALYTICAL.COM

CAREER OPPS

VOLUNTEERS

Reporters needed to cover ACSNES monthly meeting lectures

Phone for more details
Myke S. Simon
Nucleus Associate Editor
Tel: 617-332-5273

Chemical Analysis Services

- Materials ID/Deformulation
- Competitive Product Analysis
- Defects/Failure Analysis
- Polymer Analysis & Testing

Since 1959
Chemir / Polytech Laboratories, Inc.
(800) 659-7659
chemir.com
2672 Metro Blvd.
Maryland Heights
Missouri 63043

POLYMER STANDARDS for

- **GPC/SEC Molecular weight Analysis**
- **GPC/SEC Column Repacking**

American Polymer Standards Corporation
8680 Tyler Boulevard, Mentor, OH 44060
Phone: 440-255-2211 Fax: 440-255-8397

TELL OUR ADVERTISERS
Advertisers want to know if their ads are working. When you call or write them tell them you saw their ad in the Nucleus. This will allow us to increase the amount of articles that you want in the Nucleus.

Front Run OrganX, inc.
Custom/Contract Synth.-Process R&D
Scaffolds B-Blocks Pre-Clinical
Simple.....Complex
FrontRun@sprynet.com Ph 978-356-7133
17 Hayward St., Ipswich, Ma. 01938 Fax-7449

CAREER OPPS

RECRUITING ?

The Nucleus readership is New England's largest source for chemical and bio-chemical personnel.

The Nucleus reaches more than 15,000 readers each month. These professionals perform in the following areas:

INDUSTRY	Management & R&D	67%
ACADEME	Faculty & Admin	14%
STUDENTS	Grad & post-docs	10%
CONSULTING & CLINICAL LABS		5%
GOVERNMENT		4%

One company recruiting through *The Nucleus* said -----
We received more *qualified resumes* from our ad in *The Nucleus* than we did from our newspaper ad.

Contact Customer Service for info at:
Phone - 781-837-0424 or
email vincgale@tiac.net

Index of Advertisers

THE NUCLEUS
19 Mill Road
Harvard, MA 01451

NONPROFIT ORG.
U.S. POSTAGE PAID
NORTHEASTERN
SECTION
AMERICAN CHEMICAL
SOCIETY

Call for Nominations

ACS Women Chemists Committee Regional Award for Contributions to Diversity

This program commemorates the 75th Anniversary of the Women Chemists Committee (1927-2002)

Purpose: To recognize individuals who have significantly stimulated or fostered diversity in the chemical enterprise.

Nature: The award consists of $250, a plaque, and up to $750 for tra vel expenses to the regional ACS meeting at which the award will be presented.

Established: By the ACS Women Chemists Committee.

Rules of Eligibility: Nominees for the award may come from any professional setting: academia, industry, government, or other independent facility. The award is intended to recognize significant accomplishments by an individual. The award will be gi ven without regard to the age, gender, or nationality of the recipient.

To Nominate: Write a one page letter describing the accomplishments and include biographical and contact information of the nominee. One seconding letter will be accepted.

Send nominations to:
Women Chemists Committee,
American Chemical Society
1155 Sixteenth St., NW,
Washington, DC 20036

For information regarding the award, contact Cheryl Brown, 800-227-5558 ext. 6123, or e-mail: wcc@acs.org

Deadline for receipt of nominations is February 1, 2002 ◇

Grants-in-Aid Awarded to Undergraduates

Grants-in-Aid of $250 each have been awarded by the Education Committee to four undergraduates at colleges and universities within the Northeastern Section. This award is to enable them to attend the 223rd National Meeting of the American Chemical Society in Orlando, Florida and to present a paper at the Undergraduate Research Poster Session in the Division of Chemical Education on Monday, April 8, 2002. Matching funds have been committed by the institutions to support travel of the students. The awardees, their research supervisors, and the titles of the papers are as follows:

Erik Turnberg, University of Massachusetts Amherst (Prof. Vincent Rotello), *Structural Alteration Effects on Recognition Induced Polymerasome Systems*

Andrae Vandross, Stonehill College (Prof. Louis Liotta), *Synthesis and Study of Polyhydroxylated Pyrrolidines*

Brian Murphy, University of Massachusetts Dartmouth (Prof. Catherine Neto), *Isolation of Anticancerous Compounds from Cranberry Fruit Extracts*

Patrick Furcolo, Stonehill College (Prof. Cheryl Schnitzer), *Determining the Surface Activity of Heavy Metal Complexes Using a Novel Bubble Column* ◇

Calendar

For additional information, call:

Northeastern University - (617) 373-2822
Check the NESACS Homepage for late additions: http://www.NESACS.org
Note also the MIT Chemistry Department Webpage calendar: http://web.mit.edu/chemistry/www/temp/seminars/pchemseminars.html
and the Harvard Chemistry web site for updates: http://www - chem.harvard.edu/events/Physical_Seminars.html (which includes the Harvard/MIT joint seminars).

January 10

Prof. Kara Bren (Univ. of Rochester)
"Exploring the Influence of Protein Conformational Fluctuations on Stability and Function"
Northeastern Univ., 129 Hurtig Hall, 4:00 pm

Notices for the Nucleus Calendar should be sent to:

Dr. Donald O. Rickter, 88 Hemlock St.,
Arlington, MA 02474-2157
e-mail: 72133.3015@compuserve.com

Have you looked at the NESACS website?

WWW.NESACS.org