

THE NUCLEUS

April 2000

Vol. LXXVIII, No. 8

Monthly Meeting

*Esselen Award
to William A. Pryor*

Trustees Report

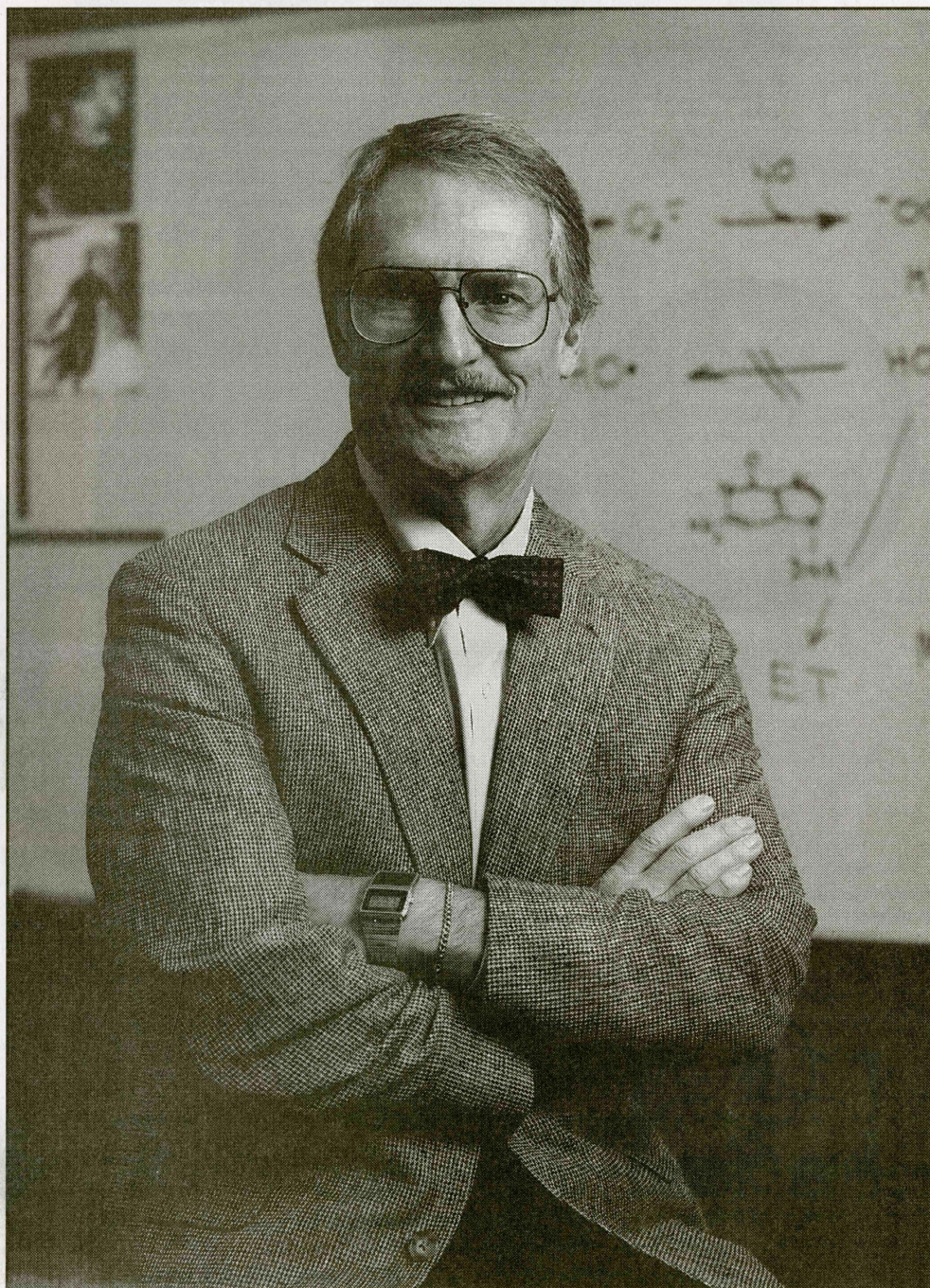
*Condition of NESACS
Trust Funds*

Book Review

*Chemical Creativity
by J.A. Berman*

G.N. Lewis

A Weymouth native



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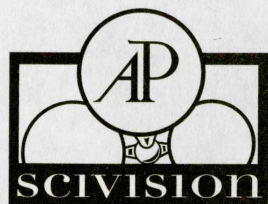
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Cover: *William A. Pryor (photo: Louisiana State University, Baton Rouge, LA)*

Deadlines: *Summer issue: June 9, 2000
September issue: July 21, 2000*

THE NUCLEUS

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Gustavus John Esselen 1888-1952

and the Esselen Award

This year is the 13th anniversary of the Award named in Esselen's honor. The award was established by the Board of Directors of NESACS "to recognize and reward a chemist whose scientific and technical work has contributed to the public well-being and has thereby communicated positive values of the chemical profession." A brief biography of Esselen follows:



Esselen was born in Roxbury, Mass., June 30, 1888, the son of Gustavus J. and Joanna Blyleven Esselen. All of his higher education was obtained at Harvard University where he was awarded an A.B. (*magna cum laude*) in chemistry in 1909 and a doctorate in 1912. In that same year he was married to Henrietta W. Locke who with three children survived him at the time of his death on Oct. 22, 1952.

Until 1921 he was a member of the research staff of General Electric Co. of Lynn and then of Arthur D. Little, Inc., of Cambridge, Mass. At the latter firm he was associated with Little and Wallace Murray in the fabrication of a "silk" purse from reconstituted collagen, in turn derived from a sow's ear. In 1921 he founded Gustavus J. Esselen, Inc., which subsequently became Esselen Research Corp. and then, following a merger, Esselen Research Division of United States Testing Co., Inc. During this period he was involved in solving a variety of problems submitted by industrial

clients. Among these was the development of anhydride curing agents for epoxy resins and poly(vinylbutyral) as an improved material for safety glass, both of which enjoyed considerable commercial success.

Esselen was a member of the American Chemical Society for 43 years during which time his outstanding ser-

vices to the society and to the profession of chemistry were recognized and honored not only in his native New England but throughout the United States.

Esselen was twice chairman of the Northeastern Section, ACS (1922-23), and served as councilor and director of the national organization, during which time he was a member of the ACS Council Policy Committee. His chairmanship of the national ACS meetings held in Boston in 1928 and 1939 was an outstanding service. He was on the advisory boards of I/EC and C&E News, 1946-48. In 1948 he received the James Flack Norris Honor Scroll as "the person who has done most to advance the interests of the Northeastern Section." In 1950 he was made an honorary member of the American Institute of Chemists for his services to the profession of chemistry and chemical engineering. From 1919 to 1951 he was chairman of the American Section of the Society of Chemical Industry. Prior to World War II he was a reserve officer in the U.S. Army's Chemical Warfare Service.

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During the War he was a committee chairman with the Office of Scientific Research and Development.

Esselen's distinguished contributions to chemistry and chemical engineering were in accordance with the highest ethics of these professions; his recognition of the duties of a professional led to his exertion of a wise and beneficent influence on all the professional societies to which he gave so generously of his time and led to his active participation in church and civic activities in the Boston area.

Esselen was a very sensitive person, devoted throughout his life to the fine arts and music. His motto, contained on a tapestry in his office, was a quotation of Richard Wilstätter, "It is our destiny, not to create, but to unveil."

Edward R. Atkinson, in W. D. Miles (Ed.), "American Chemists and Chemical Engineers," American Chemical Society, Washington, D.C., 1976, p. 147. ◇

Monthly Meeting

*The 815th Meeting of the Northeastern Section
of the American Chemical Society*

Esselen Award Meeting

Thursday, April 13, 2000

Harvard University, Cambridge, MA, Faculty Club 20 Quincy St.

5:30 Reception; a table of Career Services Literature and Aids will be available

6:30 Dinner

8:15 Award Meeting, Harvard University Science Center

1 Oxford St., Lecture Hall B. Dr. Doris Lewis, NESACS Chair, presiding

Dr. Iclal S. Hartman, Chair, Esselen Award Committee

The Esselen Award – Judith L. Koob, Rohm & Haas Co.

Introduction of the Award Recipient – Dr. Lynn W. Jelinski, Vice

Chancellor for Research and Graduate Studies, Louisiana State
University, Baton Rouge, LA

Presentation of the Award – Gustavus J. Esselen, III

Vitamin E and the Prevention of Heart Disease – Dr. William A. Pryor,

Thomas & David Boyd Professor and Director of the Biodynamics

Institute, Louisiana State University, Baton Rouge, LA

Dinner reservations should be made no later than noon, April 6. Please call or fax Marilou Cashman at (800) 872-2054 or e-mail at MCash0953@aol.com. Please indicate entrée choice: Breast of Duck, Roast Bass or Almond Raisin Couscous Vegetarian. Reservations not cancelled at least 24 hours in advance must be paid. Members, \$30.00; Non-members, \$35.00; Retirees, \$20.00; 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.

Free Parking in the Broadway St. Garage (3rd level or higher), enter from Cambridge St. via Felton St.

Next Meeting: Education Night, May 11, 2000. Boston University, School of Management, 595 Commonwealth Ave., Boston, MA. Dr. Morton Z.

Hoffman: "Exploring the High School/College Chemistry Interface"

Biography

Dr. Pryor was an early entrant at the University of Chicago (without attending high school) where he obtained a PhB in philosophy and a BS in chemistry. He received the PhD in chemistry at the University of California, Berkeley where he has worked with four Nobel Laureates: Linus Pauling (protein folding), Melvin Calvin (photo-synthesis), Willard Libby (radiocarbon dating), and Albert Szent-Gyorgyi (vitamin C).

Currently, Dr. Pryor is the Thomas & David Boyd Professor and the Director of the Biodynamics Institute

at Louisiana State University, Baton Rouge. In addition, Dr. Pryor has appointments in the Department of Chemistry and the Department of Biological Sciences on the main LSU campus, in the Department of Pharmacology, Physiology & Toxicology in the LSU School of Veterinary Medicine, in the LSU Pennington Biomedical Research Center, and in the Biochemistry Department of the LSU School of Medicine in New Orleans.

Dr. Pryor's research group has been supported by grants from the National Institutes of Health, the National Science Foundation, the National Foundation for Cancer

continued on page 6

Abstract

Vitamin E And The Prevention Of Heart Disease

A review will be presented of some of the studies on the effects of vitamin E on heart disease, studies encompassing basic science, animal studies, epidemiological and observational studies, and four published, large intervention trials. The *in vitro*, cellular, and animal studies, which are impressive both in quantity and quality, leave no doubt that vitamin E is the most important fat-soluble antioxidant in animal cells and protects animals against a variety of types of oxidative stress. The hypothesis that links vitamin E to the prevention of cardiovascular disease (CVD) postulates that the oxidation of unsaturated lipids in the LDL particle initiates a complex sequence of events that leads to the development of atherosclerotic plaque. This hypothesis is supported by numerous studies *in vitro*, in animals, and in humans. There is some evidence that the *ex vivo* oxidizability of a subject's LDL is predictive of future heart events.

This background in basic science and observational studies, coupled with the safety of vitamin E, lead to human intervention trials. The three human trials that have been reported in detail are, on balance, supportive of the proposal that supplemental vitamin E can reduce the risk for heart disease, but one trial that has just been reported showed only small, and not statistically significant, benefit. Subgroup analyses of cohorts from the older three trials, as well as smaller trials, indicate that vitamin E provides protection against medical conditions that are indicative of atherosclerosis (such as intermittent claudication). Vitamin E supplementation also produces an improvement in the immune system and protection against diseases other than CVD (such as prostate cancer).

Vitamin E at the supplemental levels being used in the current trials, 100 to 800 IU/d, is established as safe, and there is little likelihood that

continued on page 6

Biography

continued from page 5

Research, the Environmental Protection Agency, the Health Effects Institute, and a substantial number of national and international corporations.

Dr. Pryor was one of the first four scientists granted MERIT Award from the National Institute of Health. He has been awarded about 25 national and international medals and honors, including four medals from the American Chemical Society, three awards from NIH, and a number of awards in nutrition.

Dr. Pryor is an expert on the mechanism of organic reactions, particularly free radical reactions and the reactions of other potent oxidants. He currently works in the fields of free radical chemistry, toxicology and oxidative biology, and, in particular, on the effects of smog, soot, ozone, the nitrogen oxides, and cigarette smoke on models of the human lung. He is an expert on animal defenses against oxidative stress, including the antioxidant vitamins, and particularly vitamin E.

Dr. Pryor is the author of 700 articles and the author or editor of more than 25 books that have been translated into many languages, including Russian and Japanese. One of his books *Free Radicals*, was the first textbook on free radical chemistry and is an ISI Citation Classic. He is the Co-Editor-in-Chief of the journal *Free Radical Biology & Medicine*, the major journal on oxidative stress, and he serves on the board of editors of journals in the fields of chemistry, biology, nutrition, and gerontology, including flagship journals of prestigious societies. One of Dr. Pryor's publications has been identified by the Council of Biology Editors as one of the 400 all-time most cited papers in the life sciences.

Further details can be found on the NESACS website: <http://people.ne.mediaone.net/obermayer/nesacs> ◇

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Puzzle

A Number Puzzle

(This puzzle appeared on the internet at the website address <http://enchanted-mind.com/calpuz.htm> and is reprinted with the permission of J. L. Read.)

All of the digits from 0 thru 9 appear once in the multiplication problem below. Fill in the missing digits and solve the problem.

$$\begin{array}{r} \quad ? ? ? \\ \times \quad 27 \\ \hline ? ? ? ? ? \end{array}$$

Answer in next month's issue ◇

Abstract

continued from page 5

increased risk will be found for those taking supplements. About one half of American cardiologists take supplemental vitamin E, about the same number as take aspirin. In fact, one study suggests that aspirin plus vitamin E is more effective than aspirin alone.

There are a substantial number of trials involving vitamin E that are in progress. However, it is possible, or even likely, that each condition for which vitamin E provides benefit will have a unique dose-effect curve. Furthermore, different antioxidants appear to act synergistically, so supplementation with vitamin E might be more effective if combined with other micronutrients. It will be extremely difficult to do trials that adequately probe the dose-effect curve for vitamin E for each condition that it might affect, or to do studies of all the possible combinations of other micronutrients that might act with vitamin E to improve its effectiveness. Therefore, the scientific community must recognize that there never will be a time when the science is "complete". At some point, the weight of the scientific evidence must be judged adequate; while some may regard it as early to that judgment now, clearly we are very close. In view of the very low risk of reasonable supplementation with vitamin E, and the difficulty in obtaining more than about 30 IU/d from a balanced diet, some supplementation appears prudent now. ◇

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Trustees Report 1999

The Trustees of the Section for the year 1999 were Esther A. H. Hopkins, Michael Strem and Joe Lima. We met with our financial consultant, Robert M. Sarly, Senior Vice President at Salomon Smith Barney, Inc., held informal meetings, received reports from Salomon Smith Barney and from Piper Enterprises and discussed recommendations for the Board as to uses for the Funds in our care in keeping with the wishes of the donors of the funds.

The Trust Funds of the Northeastern Section are in three Trust Accounts and five income accounts. The Trust Accounts are: (1) the Consolidated, comprising the principal amounts of the Richards, the Norris, the Publication, the Permanent and the Hill trusts, (2) the Esselen Trust, and (3) the Levins Trust. To keep the capital ratios constant in the Consolidated Trust, capital amounts withdrawn from it are distributed to the Income accounts in the ratio of their ownership.

Trust Accounts

The Consolidated Account for 1999 had an opening value of portfolio of \$1,358,003.12. Withdrawals made over the year totaled \$49,000.00. The adjusted opening value was, therefore, \$1,302,267.39. The closing balance was \$1,302,546.69 for a difference of \$6,456.40. This represents a loss of 0.5%. The Consolidated Trust has a cash balance of \$78,378.12. It contains Money Funds, common stocks and options, closed end funds, mutual funds and corporate bonds. The current yield at year-end was 5.75% and the annualized anticipated income was \$74,941.58.

The Esselen Fund, comprising money funds and government bonds had an opening balance of \$366,693.56. \$13,267.55 was withdrawn for the expenses of the award this year. The adjusted opening value was \$353,626.01 and the closing value was \$317,506.57.

The Levins Fund, comprising money funds, common stock and options, and

mutual funds had an opening portfolio balance of \$16,803.88, a capital withdrawal of \$575.96 and an adjusted opening balance of \$16,227.92. The closing portfolio value was \$13,724.70.

Income Accounts

The Hill income account comprising only money funds has a balance of \$4,858.34. No withdrawals were made this year.

The Norris income account, comprising money funds, common stock and options, closed end funds and mutual fund had an opening portfolio value of \$26,318.81 and an adjusted value of \$20,298.13 after a capital withdrawal of \$6,020.68. Checks written this year totaled \$34,606.99. The closing portfolio value was \$18,772.05.

The Permanent income account, comprising money funds, common stocks and closed end funds had an opening portfolio balance of \$48,055.12, received \$8,094.99 from the prorated distribution for an adjusted opening value of \$56,150.11. The closing value of the portfolio was \$49,789.70.

The Publication income account, comprising money funds, common stock and closed end funds, started with an opening value of \$14,655.69, added \$4,000.46 from the distribution for an adjusted opening value of \$16,656.15. The closing value was \$16,128.22.

The Richards income account, comprising money funds, common stock, closed end funds and mutual funds had an opening value of \$56,421.04, received \$5,871.13 in capital distributions for an adjusted opening of \$62,292.17. The closing value was \$56,365.19.

The Trustees explored the possibility of putting some the funds from the Consolidated Trust into an actively managed account but after discussions among themselves and with our financial consultant, with financial advice from the National headquarters, and considerations by the Board of the Section decided not to pursue that direction further.

Respectfully submitted,

*The Trustees: Esther A. H. Hopkins,
Michael Strem, Joe Lima* ◇

Board of Directors

Notes of Meeting of January 13, 2000

From the minutes of M. Singer

Officers' Reports:

Chair: D. Rickter for D. Lewis requested Councilors to notify Marilou Cashman about their availability for the ACS meeting in San Francisco in March. He announced that the NERM 2001 meeting will be hosted by NESACS at the University of New Hampshire.

Chair-Elect: T. Frigo announced that the February meeting will be on Science Policy issues, that the March meeting (Richards Medal Award) will be at Harvard on March 16 (*third* Thursday). The April meeting will be the Esselen Award meeting, also at Harvard, on April 13, the regular meeting date. The awardee will be William Pryor of Louisiana State University at Baton Rouge, LA.

Treasurer: J. Piper presented the December 1999 report which, on MOTION, was ACCEPTED.

Standing Committees:

Bd. Of Publications: The *NUCLEUS* continues to be in good financial health.

Editor: A. Heyn stated that the February issue is at the printer, to be 20 pages. The delayed mailing of the January issue, due to a mistake at the US Post Office, has been taken care of and the rest of the year 2000 issues should be mailed in time. He stated that there is need for more articles. P. Hamm has been appointed Features Editor to seek to provide additional articles. Starting with the January issue, members of the Central Massachusetts Section will be receiving *The NUCLEUS*, making the total circulation now 6,900 copies.

Old Business: None

New Business: J. Piper presented a draft of the NESACS 2000 budget for review, to be voted at the February Board meeting. ◇

ACS Scholars Program

The American Chemical Society sponsors a scholarship program for students who want to enter the fields of chemistry, biochemistry, chemical engineering or other chemically related fields. The program is designed to encourage African-American, Hispanic/Latino, and American Indian students to pursue undergraduate college degrees in the chemical sciences and chemical technology. The scholarship program provides one-year awards and renewable yearly awards of up to \$2,000 dollars to eligible students. In addition, internships and mentors are integral parts of the ACS Scholars Program and are identified for the scholars whenever possible. The Scholars Program thus aids students in the acquisition of the skills and credentials needed for success in their chosen field.

The Scholars Program was started in late 1994 with an initial \$5 million contribution by the ACS Board of Directors. Since then, a number of corporations and organizations have contributed more than \$1 million including Bayer, GlaxoWellcome, and Astra-Zeneca. The three organization sponsors, include the Northeastern Section of the ACS, the only section that independently sponsors a Scholar for up to four years of undergraduate education in chemistry.

The 1999 award winners include a total of 176 students from 36 states and Puerto Rico. Thirteen of the 1999 award winners are attending universities in the Northeastern Section: Massachusetts Institute of Technology and Harvard University. The 1999 ACS Scholar sponsored by the Northeastern Section is George C. Whitfield, who is from Plainfield, New Jersey. Mr. Whitfield is currently a freshman at the Massachusetts Institute of Technology (MIT) where he is majoring in Chemistry. He has been interested in

Chemistry ever since he got a chemistry set when he was in junior-high school. He is especially interested in Materials Science and hopes to learn about molecular nanotechnology while at MIT.

Students who want to apply for an ACS Scholars Program award for 2001 should send an application to the ACS Scholars Program in the fall of 2000 (deadline for this year was March 1). Additional information about the program is available on the web at <http://www.acs.org/minorityaffairs/scholars.html> or by contacting Robert Hughes by telephone at 1-800-227-5558 x6250 or by e-mail at r_hughes@acs.org:

For information about the Northeastern Section's involvement in the ACS Scholars Program contact Jan Reichert at 617-636-2182 or by e-mail at jreichert@infonet.tufts.edu. The NESACS Scholars Program is a program of the NESACS Education Committee. ♦

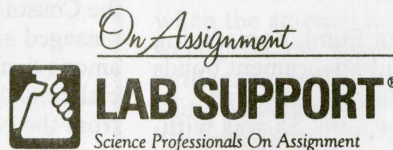


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DATES and TIME: Thursday, May 11, 2000, 8:00 a.m. – 5:00 p.m.
and Friday, May 12, 2000, 8:30 a.m. – 5:00 p.m.

PLACE: Snell Library, Room 90, Northeastern University, 360 Huntington Ave., Boston, MA

PROGRAM AGENDA:

- *Introduction to Combinatorial Chemistry*
- *Challenges of Combinatorial Chemistry*
- *Resins and Linkers for Solid Phase Synthesis*
- *Encoding Techniques for Synthesis*
- *Building Virtual Libraries*
- *Instrumentation for Parallel Synthesis*
- *Combinatorial Chemistry Applications Using Solid and Solution Phase Chemistry*
- *Techniques and Methods to Tackle Synthetic Problems and Plan Library Synthesis*
- *Solution Phase Synthesis*
- *Scavenger Resins*

INSTRUCTORS:

Dr. Aubrey Mendonca, the Director of Marketing and Product Manager at IRORI., was previously involved in the development and production of cancer vaccines while at Biomira, after which he was the Director for Novabiochem in San Diego, where he helped develop the combinatorial catalog for solid and solution phase synthesis.

Dr. Michael Organ, founder and director of the Combinatorial Chemistry Facility at York University in Toronto, Canada, has focused on synthetic efficiency and the application of tandem-reaction methodology. Initially targeted carbon-carbon bond forming methods have now been expanded to carbon-heteroatom bond formation. There are ongoing collaborative research efforts with a number of pharmaceutical and instrumentation companies.

PRE-REGISTRATION REQUIRED – Registration Fees:

ACS Members if received before April 26.....\$325.00; after April 26\$375.00

Non-ACS Members if received before April 26.....\$425.00; after April 26\$475.00

There will be a limited number of scholarships for unemployed ACS Members on a space-available basis.

Parking Fee \$7.00/day

University cafeterias will be available for lunches.

For further information contact: Prof. Alfred Viola – (617) 373 2809

Registration form for Short Course: *Combinatorial Chemistry: Solid and Solution Phase Synthesis*

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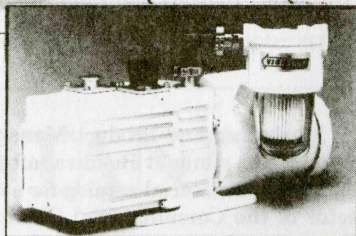
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Health and Safety Column

EPA and the University of New Hampshire

From a note in the ACS "Capitol Connection (February 2000)" and a conversation with Brad Manning, Health and Safety Office at the UNH.

"The University of New Hampshire (UNH) settled a pending enforcement action by the EPA on January 7 by agreeing to pay \$49,000 in fines and to spend \$180,000 in creating and maintaining a rigorous hazardous material-tracking, reduction, and management system. EPA reported that the alleged violations at UNH included storing incompatible hazardous wastes near each other; pouring treated mercury waste down a drain without first ensuring that the waste was treated to proper standards; and leaving outside, in unsecured locations, large stockpiles of used fluorescent bulbs, which contain mercury above regulatory limits.... UNH was the third university to be hit recently with enforcement actions by EPA. The actions are part of a larger effort aimed at emphasizing environmental compliance at New England colleges and universities....

As government regulations begin to focus more closely on compliance, so too must colleges and universities take stock of their environmental contribution."

Mr. Manning commented that the chief problems encountered by UNH were inadequate record keeping of the disposal of wastes, including insufficient labeling of containers, infrequent safety inspections, and inadequate formal training of persons who generate or handle hazardous waste (i.e. researchers, teaching fellows who supervise labs, stockroom personnel).

Following the EPA action, UNH has instituted weekly inspections of all laboratories and satellite sites where

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Book Review

Chemical Creativity: Ideas from the Work of Woodward, Hückel, Meerwein, and Others, by Jerome A. Berson (Wiley VCH, 1999, 194 pp., paper, \$62.95.)

Reviewed by Bernard Miller.
Department of Chemistry. University of Massachusetts, Amherst

Recently an opponent of the new Massachusetts requirement that all students pass tests in English and mathematics in order to graduate from high school wrote that "the sooner we eliminate these tests, the sooner we can get back to programs that foster the spontaneity and creativity of our children."

The suggestion that creativity is linked to spontaneity, rather than to knowledge, appears to be popular with many current theorists in education. (A common comment is that "children don't need to learn facts; they just need to learn how to look up the facts.") However, that suggestion is unlikely to convince those who prefer the very schooled creations of Mozart and Rembrandt to the spontaneous products of a child with a new set of drums or finger paints.

In the sciences it is clear that the creative efforts that have resulted, for instance, in our present understanding of the way organic reactions take place are hardly spontaneous products of unschooled minds. What, however, are the factors that have led great chemists to their discoveries, often in fields where many other highly competent scientists scrambled less successfully to find answers?

This is the principal, though far from the only, question considered by Professor Jerome Berson in "Chemical Creativity"—a fascinating set of essays on the history of chemistry (or, more broadly, on the history of science with emphasis on organic reaction mechanisms.) In his studies Professor Berson considers the discovery of the Diels-Alder reaction, of orbital symmetry

conservation rules, of the nature of aromaticity and of the (many) mechanisms of dienone-phenol rearrangements. In addition, his "meditations" on the ubiquitous influence of considerations of symmetry on science include discussions of the discovery of the mechanisms of Wagner-Meerwein, pinacol, and Favorskii rearrangements, and of the Walden inversion.

It must be said that Berson's studies do little to illuminate why some chemists are especially brilliant, creative people. Instead, they often focus on the perhaps more interesting question of why some brilliant, creative, chemists do not make major discoveries that appear to be almost at their fingertips. For instance, Berson points out that L. J. Osterhoof had "with considerable diffidence" (Berson's words) suggested an explanation for the stereochemistry of electrocyclic reactions that is essentially identical with that suggested by Woodward and Hoffmann several years later. Yet Osterhoof did not, at the time, bother to publish anything on the subject.

Berson suggests that Osterhoof was inhibited by his understanding of the complexity of photochemical reactions, in particular by the question of whether the cyclizations take place from the first excited states or from higher energy states. Osterhoof would have been quite right to worry about those difficulties, which have interfered with easy understanding of many photochemical processes. But Woodward and Hoffmann were certainly aware of the same problems, yet chose to propose their rules anyway. They undoubtedly did so because their (or at least Woodward's) wide-ranging knowledge of organic reactions made them aware of how useful those rules would be, particularly in regard to ground state reactions.

Similarly, Berson considers the question of why Erich Hückel was successful in applying quantum mechanics to the question of the nature of double bonds and of aromaticity—a field in which few of his fellow theoretical physicists made much progress. Berson suggests that the expertise in organic chemistry of Walter Hückel,

Erich's brother and a fellow member of the faculty at the University of Marburg, was a key factor in Erich's success. Again, a broad knowledge of "facts" (so despised today) was essential.

Erich Hückel produced almost no work of substance after the age of forty, a fact that Berson attributes to a conflict between Hückel's natural decency and what he felt to be his necessary collaboration with the Nazi regime. It is difficult for me to express adequately my admiration for Berson's compassionate, yet principled, discussion of this subject and its significance for those of us in academic positions, and in society today. If I had my way it would be required reading, and the basis for serious discussion, in every college classroom.

In his preface Berson expresses the hope that his book will be read by "scientists from a broad range of disciplines, and by others interested in the genesis of ideas", but the epilogue suggests the book is addressed to "professional chemists." For much of the text, the latter suggestion seems more realistic. The material discussed is seldom simple, and, despite a suggestion in the preface, much of it is unlikely to be readily comprehensible to non-chemists. However, even scientists in other fields, and many non-scientists, should find fascinating the extended sections dealing with aromaticity. Hückel's rule, (and Hückel's dilemma), as well as the extensive non-technical portions of the "meditations" on symmetry, which extend beyond organic chemistry to discuss, among other subjects, gestalt psychology, evolutionary theory, and Kepler's belief that the orbits of the planets are connected to the possibility of packing together the five Platonic solids.

It is often difficult, when reading complex technical material, to appreciate how good the writing may be. (Not every technical paper is, to use Berson's words, "bland, stilted, just-the-facts, dead-pan.") Fortunately, the lengthy non-technical portions of "Chemical Creativity" allow the reader to appreciate the fine—indeed, the

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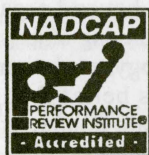
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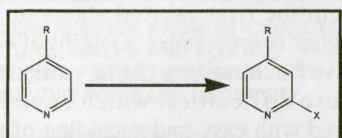
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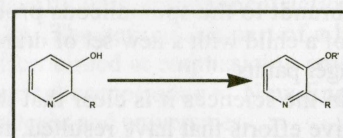
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hazardous wastes are stored, has set up formal training programs for faculty and staff. The University now has 230 trained people who are allowed to handle hazardous chemical wastes. With these changes the University is allowed to store hazardous wastes, until collected by licensed disposal firms. ◇

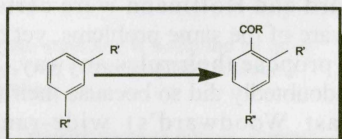
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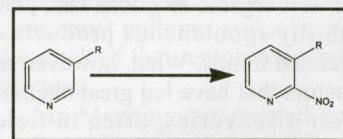
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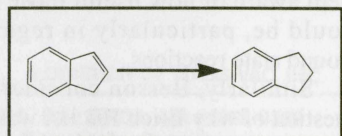
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New Insights and Recognition

Gilbert Newton Lewis and Harold Paretchan

By David L. Adams, Associate Professor of Chemistry, Babson College

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Introduction

Gilbert Newton Lewis, known as "GN" by his colleagues, is one of the most distinguished chemists of the twentieth century. His work in thermodynamics, the electron pair bond, and acid-base theory is well known in the scientific community. Many of his biographies, including one in the *NEACT Journal*,¹ have presented and analyzed his scientific contributions.^{2,3} Recently, two people have made unique contributions to a better understanding of the man and his accomplishments. Lewis' son, Edward (Ted) S. Lewis has written a biography of his famous father that includes heretofore undocumented insights into his personal and private life.⁴ The last chapter in the book chronicles the efforts of Mr. Harold R. Paretchan of Weymouth, MA in gaining public recognition for GN Lewis. Here we examine Ted Lewis' biography of his father, and Harold Paretchan's activities on behalf of GN Lewis.

Traveling north on Route 18 (Washington Street) through Weymouth Landing there is, at the bottom of the landing, a plaque mounted on a pole marking the birthplace of Gilbert Newton Lewis. The plaque, erected by the Weymouth Board of Selectmen in 1998, symbolizes both the contributions Lewis made to the development of modern chemistry, and the persistence and commitment of Harold Paretchan in gaining public recognition of those accomplishments. Though separated by years and careers, GN and Harold have become

connected.

Gilbert Newton Lewis not only contributed significantly to the foundations of modern chemistry, but also built the chemistry department at the University of California at Berkeley, one of the strongest and most highly regarded in the world. He was a family man, respected colleague, noted researcher, admired teacher, and skilled administrator. Harold Paretchen, a long-time resident of Weymouth, is not a scientist, yet strongly believes in the critical role science and scientists have played in creating our high quality of life. Mr. Paretchen has led a six-year effort to secure public understanding and appreciation of G.N. Lewis and, more generally, the role of science and medicine in modern society

G.N. Lewis – background

Gilbert Newton Lewis was born in Weymouth, Massachusetts on October 23, 1875 and died in Berkeley, California in 1946. GN's birth date and place have been firmly established by birth and death certificates and 1880 census data. Earlier biographies of Lewis state incorrectly that he was born in West Newton, MA on October 25, 1875. This error apparently originated in an article written by R. E. Kohler in 1971 and has been subsequently reproduced as fact.⁵ Ted's biography reveals that GN was a direct descendant of George Lewis who came to America in 1632 from East Greenwich in Kent, England. In 1639 George Lewis became one of the original founders of the town of Barnstable, Massachusetts, the first English settlement on Cape Cod. Ted writes that GN's success was due to four factors: his ancestry, education, lack of distractions early in his career, and timing. GN was home schooled until high school and attended the University of

Nebraska and Harvard (BS 1896; PhD, 1899 from T. W. Richards). GN did not marry until the age of 36 and was active in chemical research and theory at a time when the ideas of thermodynamics were being shaped.

Harold Paretchan – background⁶

Harold Paretchan was born in Roxbury, MA on April 9, 1921. A member of the US Army Air Corps, he was serving in the China-India-Burma Theater as WWII ended in August, 1945. His war experience sparked a life-long interest in the science and scientists behind the atomic bomb. After the war, Harold worked for 41 years as an inhalation technician in Boston City Hospital. His interest in baseball led him to write two statistical fact books on the sport. In 1992, when Harold was 70 years old, his grandson, who was working on a school project, asked him about the periodic table. Harold's resourceful search for information for his grandson eventually led him to contact Professor Glenn Seaborg at Berkeley. In conversations with Seaborg, whom Harold learned about earlier due to his interests in the Manhattan Project, he discovered that Weymouth was the birthplace of GN Lewis. Harold was astounded to discover that literally no one in the local area knew this.⁷ That was the beginning of a six-year continuing effort to promote awareness and recognition of Lewis in any way possible.

Ted Lewis' biography

Ted Lewis writes that Harold Paretchan was instrumental in prompting him to complete a biography of his famous father. Professor Glenn Seaborg, a personal research assistant to GN at Berkeley from 1937-1939, also offered encouragement in writing a new Lewis biography. Ted states in his book that Seaborg told him that somebody should write a personal biography of his father. Ted later concluded that he should be that person. In 1998, the Edwin Mellen Press of Lewiston, NY (Box 450, 415 Ridge Street, 14092-0450) published Ted's book, "A Biography of Distinguished

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New Insights

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Scientist Gilbert Newton Lewis." (ISBN 0773482849).⁴

The primary value of Ted's biography is that it provides an insight into G.N. Lewis, the person, from his son's unique perspective. It is an invaluable supplement to the technical biographies that have chronicled GN's scientific achievements. Ted includes chapters that discuss GN as a person, a family man, a conversationalist, an administrator, and a non-winner of the Nobel Prize. This biography also provides new understanding of Lewis – his personal characteristics, traits, and humanity.

G.N. Lewis and his scientific achievements

G.N. Lewis' interests and research spanned many scientific disciplines. His work in thermodynamics, the electron pair bond, and acids and bases is well documented. Lesser known, however, are his involvements in heavy water studies, photochemistry, anthro-

pology, and geology. In order to gain assessments of the significance of Lewis' contributions to chemistry and science, Harold Paretchan has written inquires to and received responses from over 45 Nobel Laureates in chemistry, as well as dozens of other distinguished chemists around the world. These letters may be one of the largest collections of correspondence from chemistry Nobel Prize winners in existence. A sampling of the letters is found in Chapter IV in Ted Lewis' book titled "Paretchan and the Letters to Him."

G.N. Lewis and local recognition

Harold Paretchan's efforts in gaining recognition for GN have been extraordinary. His work is valuable as much for the activist model it provides as for the increased public awareness of Lewis. He has gained local, state, national, and international attention for GN in ways that have truly enhanced public understanding of science and chemistry. Harold's efforts have extended well beyond letter writing. He was instrumental in prompting Massachusetts Governor William Weld

to declare October 23, 1993 as Gilbert Newton Lewis Day.⁸ He was also responsible for the placement and dedication of the plaque at the Lewis birthplace in Weymouth and the establishment of a G.N. Lewis alcove at Weymouth High School.⁹ Harold is currently involved in many other efforts at bringing recognition to Lewis, including a street name, a postage stamp, a train station, television documentaries, and the Presidential Medal of Freedom. Several articles about Paretchan's efforts have appeared in *Chemical & Engineering News*⁸ and the local press^{10,11}. He has received the enthusiastic support of many chemists, including Professors Dudley Herschbach of Harvard University, Glenn Seaborg of the University of California at Berkeley, and Roald Hoffmann of Cornell. Harold is the chairman of the Gilbert Newton Lewis Committee, recently established by the Weymouth Board of Selectmen. Currently this committee is considering recommending to the Weymouth Board of Selectmen that they name its High School Scholarship and the South Weymouth train station after Lewis.

In recognition of these efforts, Harold Paretchan has been named an Honorary Member of the "Alumni of the Gilbert Newton Lewis Era" in the chemistry department at Berkeley. He is the first non-chemist to be so honored!

GN Lewis as teacher and mentor

Ted Lewis' book details G.N. Lewis as a teacher and research seminar leader. Although Lewis never taught a formal class at Berkeley, he was regarded by many of his students as a master teacher. This feeling emanated largely from the weekly research seminars he conducted in the chemistry department at Berkeley. Lewis, surrounded by an ever-present cloud of cigar smoke, would pose questions of such insight that capable students, able to grasp his thought process and model it, found their research always benefited. His graduate students, such as Harold Urey, William Libby, and Gerald Branch, later commented that GN was the best

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New Insights

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teacher they had ever encountered. Lewis was also known for always speaking in complete sentences. In fact, Melvin Calvin commented that Lewis dictated research papers for publication to him in complete and finished form.

G.N. Lewis and the Nobel Prize

Why Lewis never received the Nobel Prize is a question that may never be answered satisfactorily. Ted speculates that there may have been several reasons, each related to specific areas in which GN might have received the prize. For instance, in order to receive the prize in thermodynamics, the approval of Walter Nernst was virtually required, and GN and Nernst did not have a cordial relationship. In the area of valence, many chemists simply did not regard his contributions as worthy.⁵ His work in acids and bases, the most noted contribution indicated by the Nobelists that Paretchan contacted, was unpopular or neglected at the time. Lewis received 34 nominations for the Nobel Prize between the years 1922 and 1935, but he never garnered the award. Harold Paretchan wrote to Peder Kierkegaard of the Royal Swedish Academy of Sciences (RSAS) to inquire about this apparent injustice, suggesting that Lewis be awarded the prize posthumously. Professor Kierkegaard replied that the Prize is not awarded posthumously. Paretchan countered that this indeed has been done, specifically in the case of Eric Axel Karlfeldt, who died in the interval between the announcement and award of the 1931 Prize in literature. Professor Kierkegaard responded by explaining that Karlfeldt was alive at the time of nomination and evaluation for the prize. Harold's persistence and communication in this effort continues.

G.N. Lewis the public person

In his book Ted Lewis observes that GN disliked speaking in public and had a minimal mathematics background. Clearly in GN's case these

were not impediments to his accomplishments! Ted also describes GN's administrative style; GN was head of the department of chemistry and Dean of the College of Chemistry from 1912 to 1941. GN did not, however, let his administrative duties interfere with his chemistry. He ran the department from his laboratory, dictating letters and making decisions while conducting experiments. GN rarely left Berkeley except to serve in WWI, take a sabbatical in 1923 at Oxford, and attend an occasional conference. He built the Berkeley chemistry department from an outpost in the Wild West to one of the best in the world in terms of faculty, graduates, teaching and research, facilities, honors, and awards.

G.N. Lewis the family man

Chapters XI and XIII in Ted's book exemplify why this biography is unique. In Chapter XI Ted talks at length and in detail about Lewis the family man. GN married Mary Hinkley in 1912 when he was 36 years old. Ted describes the family summer home in Inverness, California, about 40 miles north of San Francisco. GN was fond of relaxing at Inverness and tak-

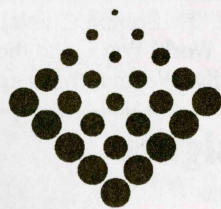
ing the family on camping trips to the ocean and redwood forest. Ted describes his father's dealings with bootleggers during prohibition, GN's mother living with them in her later years, and GN's politics. In Chapter XIII Ted describes Lewis the person. Short in stature and moustached, he always wore a gray flannel suit with a several hours' cigar supply tucked in the pockets, even while doing experiments in the laboratory. Ted concludes that GN loved chemistry more than anything else: Why else would he spend all week staying at the faculty club in Berkeley while the family was enjoying the summer months at Inverness? GN liked pastimes such as card games and music. Whatever GN did, he demanded that it provide an intellectual challenge. GN constantly exercised his intellect, whether at Berkeley or Inverness.

Conclusion

Ted Lewis' biography must be read by anyone interested in the history of chemistry. Its attention to personal detail and focus on Lewis the family man and father make it an invaluable

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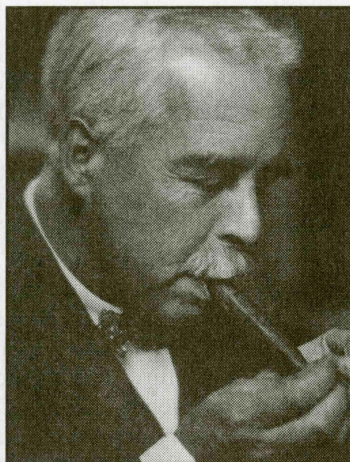
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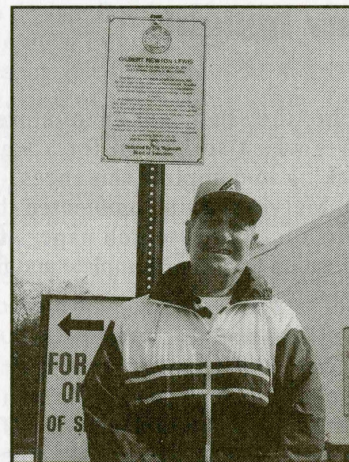
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Text of the plaque in Weymouth Landing

Gilbert Newton Lewis

Born in a house in the area on October 23, 1875. Died in Berkeley, California on March 23, 1946.

Gilbert Newton Lewis was a brilliant and dedicated scientist, World War I hero, mentor to Nobel laureates, and renaissance man. He excelled in many areas of scientific study and achieved international recognition for his research, teaching, and facilitation of knowledge in the world of chemistry.

He formulated the Lewis theory of acids and bases and coined the word "photon" in the study of light and electromagnetic radiation. He was one of the early advocates of Einstein's theory of relativity. Lewis published articles on various subjects, including economics, history and archeology, and many books on chemistry.

His many honors and awards include the most prestigious awards in the international chemical community, membership in the Academy of Science of the Soviet Union, the French Chevalier Legion of Honor for reducing poison gas deaths during World War I, and the United States Distinguished Service Medal. Dedicated by the Weymouth Board of Selectmen. ◇

New Insights

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addition to the G.N. Lewis literature. In so doing, it emphasizes the human side of science and scientific achievement, aspects of science frequently neglected and in need of attention.

Gilbert Newton Lewis contributed significantly to the development of modern chemistry. Thermodynamics, the electron-pair bond, and Lewis acids and bases are foundations of chemistry that we routinely rely on and use. Now, with the untiring efforts of Harold Paretchan, the general public also is more aware of

Lewis' contributions to science and chemistry.

Acknowledgements The author wishes to thank Dr Myron Simon, Archivist of the Northeastern Section of the American Chemical Society for bringing the work of Mr. Paretchan to the author's attention. I also want to express gratitude and appreciation to Harold Paretchan for his willingness to share his work and personal history with me. Also, the efforts of Mary Thibault in gathering information and conducting research in support of Harold's work should be acknowledged and is appreciated by both Harold and me. *continued on next page*

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Book Review

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elegant — quality of Berson's prose. Every word seems to be precisely correct. Berson has a predilection for rather long sentences (which this reviewer shares, as the preceding paragraph demonstrates), but even the eight line, ninety-two word sentence on page 165, complete with a colon and two semicolons, flows smoothly to its completion. This reader, at least, found that he could share Berson's evident (and doubtless tongue in cheek) pleasure in the use of the English language even on the very rare occasions when his writing results in rather ornate and rococo concoctions.

It should be mentioned that Berson also has a fine ear for quotations to which the reader is treated, from Plato to our scientific contemporaries.

I can highly recommend this book to chemists for their own pleasure. It would also serve as a fine stimulus of discussion for students contemplating careers in chemical research. ◇

New Insights

continued from page 16

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Apr. 20

Prof. Robert Bergman (Univ. CA, Berkeley)
"Chemo- and Enantioselective Reactions of Metal-Heteroatom Bonds with Organic Molecules"

Boston College
Merkert Chemistry Ctr., Rm.130, 4 PM

Prof. Moustafa El-Sayed (Georgia Inst. Tech.)
Title TBA
Harvard Univ.
Room MB23, 5 PM

Prof. Jay Siegel (Univ. CA, San Diego)
Title TBA
Mass. Inst. of Tech.
Bldg. 6, Rm. 120, 4 PM

Apr. 24

Prof. Andrew G. Meyer (Harvard Univ.)
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Boston University
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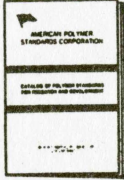
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 "Genomic Approaches for the Identification and
 Validation of Novel Antimicrobial Targets"
 Boston Univ.
 R. B. Hariri Bldg., Rm. 220, 2 PM

Mar. 27

Prof. Alan Davison (Mass. Inst. Tech.)
 "Technetium: Chemistry and Medicine"
 Brandeis University
 Gerstenzang 122, 4 PM

Mar. 28

Prof. Michael McCarthy (Harvard Univ.)
 "Extraterrestrial Organic Chemistry"
 Mass. Inst. of Technology
 Bldg. 2, Rm. 105, 4 PM

Mar. 29

Prof. Edward Wong (Univ. New Hampshire)
 "Cross-bridged Cyclic Tetramines and their Metal
 Complexes"

Univ. Mass, Boston
 Science Bldg., 1st Fl., Rm. 089, 4:30 PM
 Prof. Ken Feldman (Penn State Univ.)
 "Organic Synthesis and Natural Products
 Chemistry"
 Univ. Mass, Dartmouth
 Sci. & Eng. Bldg., Rm. 305, 4 PM

Mar. 30

Prof. Stephen Marlin (Univ. TX, Austin)
 "Recent Advances in the Synthesis of Natural
 Products"
 Boston College
 Merkert Chemistry Ctr., Rm.130, 4 PM
 Prof. John H. Haseltine, (Mass Inst. Technol.)
 "How Do Enzymes Really, Really Work?
 Reading Mechanism from Extensively
 Organized Structure"
 Mass. Inst. of Technology
 Bldg. 6, Rm. 120, 4 PM

Mar. 31

Dr. Nabil El Tayar (Ares Advanced Technology
 Inc.)
 "Protein Mimetic and Privilege Motifs"
 Boston Univ.
 R. B. Hariri Bldg., Rm. 220, 2 PM

Apr. 3

Prof. Engene Shklovitch (Harvard Univ.)
 "Listening to the Music of Evolution: Folding
 Theme with Functional Variations"
 Brandeis University
 Gerstenzang 122, 4 PM

The Pfizer Symposium

Prof. Andreas Pflatz (Univ. Basel, Switzerland)
 Prof. Guenter Helmchen (Univ. Heidelberg,
 Germany)
 Prof. B. L. Feringa (Univ. Groningen,
 Netherlands)
 Harvard Univ.
 Pfizer Lect. Hall, Mb 23, 1:30 PM
 Prof. Michael A. Rodgers (Bowling Green State
 Univ.)
 "Photodynamics of Metallophthalocyanines"
 Boston University
 Metcalf Science Center Auditorium, 4 PM

Apr. 4

Prof. Dinshaw Patel, (Sloan Kettering Inst.)
 "Structural Basis of Adaptive Recognition by
 Nucleic Acid Aptamers"
 Tufts University
 Pearson Hall, Rm. 106, 4:30 PM

Prof. James Heath (Univ. California, Los
 Angeles)

"Quantum Dot Designed Solids: Insulators,
 Conductors, and Superconductors"
 Mass. Inst. of Technology
 Bldg. 2, Rm. 105, 4 PM

Apr. 6

Prof. Timothy Mitchison (Harvard Med. Sch.)
 Title TBA
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 Bldg. 6, Rm. 120, 4 PM
 Prof. Robin Hochstrasser (Univ. Pennsylvania)
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Apr. 7

Dr. James Bristol (Parke-Davis Pharmaceutical
 Research)
 Integrating Technologies in Pharmaceutical
 Research and Development
 Boston Univ.
 R. B. Hariri Bldg., Rm. 220, 2 PM

Apr. 10

Prof. Thomas E. Mallouk (Pennsylvania State
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 "Searching the Periodic Table for Better Catalysts
 and Electrocatalysts"
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 Metcalf Science Center Auditorium, 4 PM
 Prof. Steve Zimmerman (Univ. Illinois)
 "Supramolecular Chemistry Using Dendrimers,
 Heterocycles, and Other Organic Materials"
 Brandeis University
 Gerstenzang 122, 4 PM

Apr. 11

Prof. Tara Meyer (Univ. Pittsburgh)
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 Mass. Inst. of Technology
 Bldg. 6, Rm. 120, 4 PM
 Prof. Paul Czech (Providence College)
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 Conjugated Heterocycles by Coordination of
 Manganese to an Adjacent Carbocyclic Ring"
 Northeastern Univ.
 Hurtig Bldg., Rm 129, 4 PM
 Prof. William Armstrong (Boston College)
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 the Photosystem II Water Oxidase Active
 Site"
 Tufts University
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Apr. 12

Prof. Michael Fryzuk (Univ. British Columbia)
 "Activation of Dinitrogen by Metal Complexes"
 Mass. Inst. of Tech.
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Apr. 13

Prof. Nathan Lewis (Cal. Inst. Technol.)
 Title TBA
 Boston College
 Merkert Chemistry Ctr., Rm.130, 4 PM
 Prof. Galen Stucky, (Univ. California, Santa
 Barbara)
 Title TBA
 Harvard Univ.
 Room MB23, 5 PM

Prof. Madeleine Joullie (Univ. Pennsylvania)
 Title TBA
 Mass. Inst. of Tech.
 Bldg. 6, Rm.120, 4 PM

Apr. 14

Dr. Patrick Gage (Wyeth-Ayerst Research)
 "Applications of Biotechnology to the
 Development of First-in-Class
 Pharmaceuticals and Vaccines"
 Boston Univ.
 R. B. Hariri Bldg., Rm. 220, 2 PM

Apr. 17

The Bristol-Myers Squibb Symposium
 Prof. James Panek (Boston Univ.)
 Prof. William Roush (Univ. Michigan)
 Harvard Univ.
 Pfizer Lect. Hall, Mb 23, 4:15 PM

Apr. 19

Prof. Yann Schrodi (Mass. Inst. Tech.)
 "Group 4 Metal Diamido-Donor Complexes:
 Development of New Ziegler-Natta
 Polymerization Catalysts"
 Mass. Inst. of Tech.
 Bldg. 6, Rm. 120, 4 PM