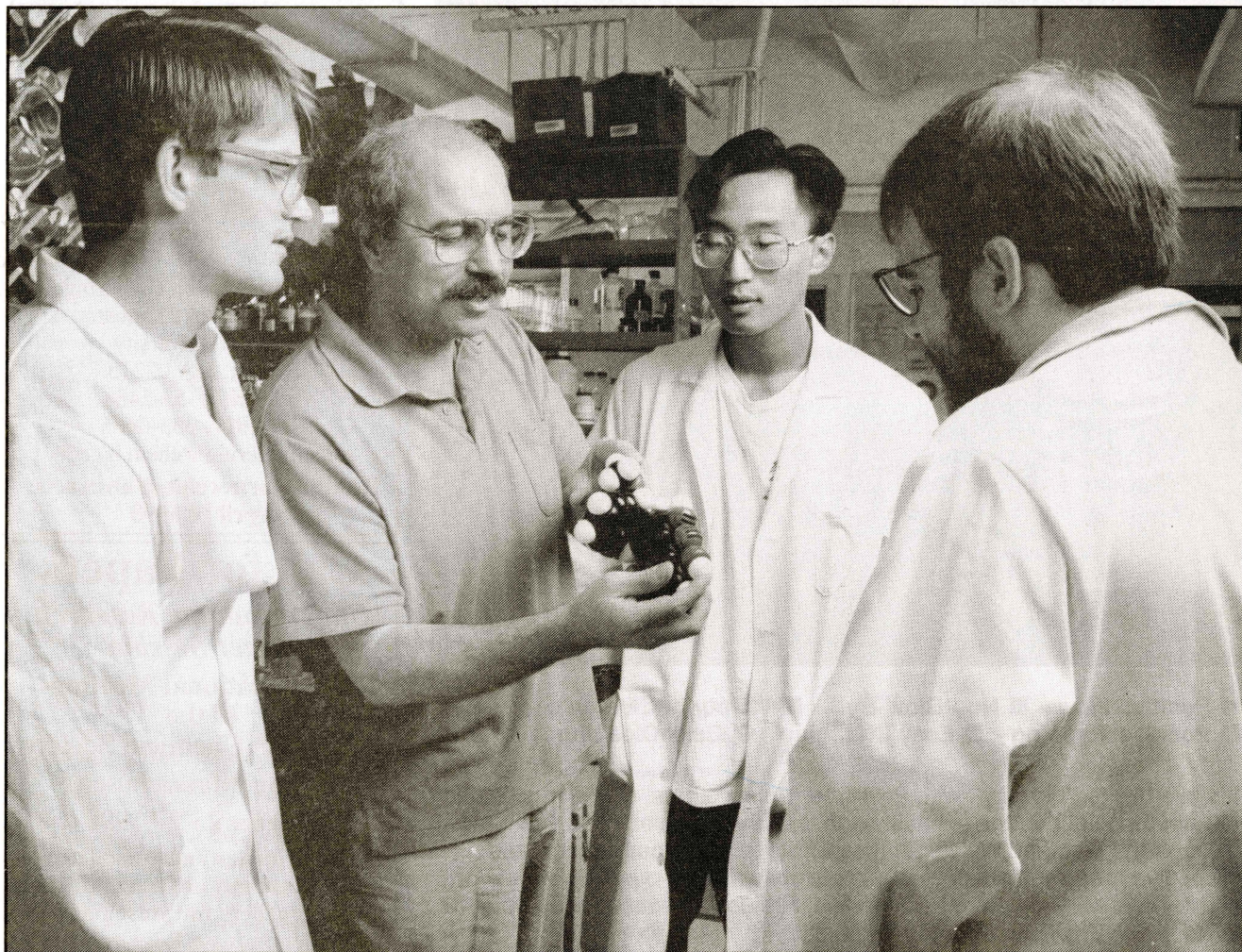


THE NUCLEUS

Centennial Year

April 1998

Vol. LXXVI, No. 8



Monthly Meeting

*Gustavus J. Esselen Award to K.C. Nicolaou,
Scripps Institute*

Meeting Report

*Fuel Cell Technology, from
the Jan. 8 Section Meeting*

Summer Scholar Report

*Anthocyanin and Flavonol
Biosynthesis in Cranberries*

Centennial History

*Detailed account of the start
of the Northeastern Section*

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of the
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the American Chemical Society
on
Saturday, April 25, 1998
Noon-5 p.m.
Boston University
Metcalf Center for Science and
Engineering
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(hosted by the Department of Chemistry and
Chemia, the ACS Student Affiliates Chapter at B.U.)

Send abstracts on standard ACS forms to
the organizer:

Professor Warren P. Giering
Department of Chemistry
Boston University
Boston, MA 02215
Tel: (617) 353-2488
Fax: (617) 353-6466
e-mail: giering@chem.bu.edu

Deadline for receipt of abstracts:
April 10, 1998

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216th National Meeting
of the
American Chemical Society
Boston, Massachusetts
August 23-27, 1998

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Jiwon Kim
Student Affiliates Program
American Chemical Society
1155 Sixteenth Street, NW
Washington, DC 20036
Deadline for receipt of abstracts:
May 1, 1998

The Northeastern Section of the American Chemical Society, Inc.

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Deadlines:	<i>Summer Issue: June 26, 1998 (National Meeting Issue) September Issue: July 24, 1998</i>

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 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.

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Board of Directors

Notes of the Meeting of January 8, 1998

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

Officers' Reports:

Chair: The new Chair, M. Hearn, presented the Past Chair pin to M. Idelson with thanks from the Section for his leadership during 1997.

Chair-Elect: D. Rickter reported on program plans for 1998: At the evening meeting on this date James Cross of A.D. Little Co. will speak on The Future of Fuel Cell Technology in lieu of the scheduled speaker from ADL who was unavailable. For future months: February: Attila Pavlath (ACS Director) What the ACS Can Do; March: Richards Award, April: Esselen Award; May: Education night, Dudley Herschbach, speaker; September: Sacco, on a space-related topic; October: a speaker on Chemical Information; November: Norris Award.

Secretary: Minutes of the previous meeting were APPROVED with one correction, of changing "chairman" to "chair".

Treasurer: J. Piper distributed the report for December. The report was ACCEPTED. The proposed budget was distributed, to be voted at the February meeting.

Councilors: The question was raised whether Councilors would be reimbursed for hotel expenses at the Boston meeting. It was suggested that a room be rented in a Boston hotel for Section business and Councilors.

Resignations have been received from Patricia Samuel and Valerie Wilcox, both Councilors for a term ending 12/31/98. Alternate Councilors will be elected by the Board to serve until the next election. (See New Business).

Standing Committees:

Bd. Of Publications: D. Lewis and A. Heyn reported that the 32-page Centennial Issue had gone to press. It contains historical material and a Summer Scholar report.

Membership: I. Hartman reported that there are new Section Affiliates. There was a discussion of participation of the Section in the National 2001 drive for membership. I. Hartman has contacted members who have not renewed their ACS membership.

Chemistry Education: R. Tanner reported on summer scholars and two travel grants for the Dallas meeting for the two students who will have posters at the Undergraduate Poster Session. R. Tanner MOVED and it was VOTED to increase the Richards/Norris Summer Scholarships from \$500 to \$750.

Constitut. and Bylaws: D. Costello stated that the amendments of Bylaw III will be presented for a vote at the monthly meeting this evening. The proposed amendments were printed in the December 1997 NUCLEUS.

Other Committees:

Continuing Education: A. Viola stated that it would be inadvisable to plan short courses for 1998 inasmuch as such courses are being offered at the Boston National Meeting in August.

Centennial: D. Phillips reported that dates and commitments from speakers for the Fall 1998 celebration are still being received. Plans are under way for a reception during the National Fall meeting in Boston. In addition, an afternoon symposium and an evening meeting with Paul Walter, ACS President, are being considered. Also, a Holiday Lecture in December at the Museum of Science is being planned.

Project SEED: D. Phillips reported that Patricia Mabrouk at Northeastern University has volunteered to be a Preceptor for two students.

Esselen Award: M. Simon stated that the Esselen Awardee will be announced at the February Board meeting.

Medicinal Chemistry Group: M. Singer submitted the list of officers of the group for 1998. Because of the National Meeting in Boston in August and plans for a Centennial meeting, changes in the usual meeting schedule of the group will be made.

Old Business: T. Light discussed the setting of dinner prices for Award Meetings, tabled at the December meeting. He proposed that the respective Award Committees set these prices according

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NESACS Election

Addition to the list of candidates

Due to an oversight, a candidate for Councilor/Alternate Councilor was omitted from the list published in the March issue: Please add **Arlene Light** to this list.

Patricia Mabrouk has withdrawn (Councilor/Alternate)

Candidates' statements will be included in the May NUCLEUS. Ballots are to be returned by June 1. ◇

to their own finances, rather than by the Board since deficits in the charges for meals would come from Award funds, rather than from regular Section funds. It was MOVED and VOTED to table this item.

New Business: It was MOVED and VOTED to elect Michael Dube and Michael Singer for filling the two vacancies in the Councilor positions. Names to fill the three Alternate Councilor vacancies are to be submitted by Nominating Committee.

Get-well wishes are to be sent to Janet Perkins who is hospitalized in Virginia.

From the minutes taken by T. and A. Light. ◇

Monthly Meeting

The 797th Meeting of the Northeastern Section of the American Chemical Society
The Gustavus J. Esselen Award for Chemistry in the Public Interest

Wednesday, April 8, 1998 (Yes, the meeting is on Wednesday!)

5:30 Social Hour, Harvard University, Faculty Club, 20 Quincy St.
Music by the Baverstam Chamber Players
A table of Career Services Literature and Aids will be available

6:30 Dinner

8:15 Award Meeting, Pfizer Lecture Hall, Mallinckrodt Chemistry Lab., 12 Oxford St., Rm. MB-23
Dr. Michael J. Hearn, Chair, Northeastern Section, presiding
The Esselen Award—Dr. Henry Brown, Chair, Esselen Award Committee
Introduction of the Award Recipient—Dr. Madeleine M. Joullie
Presentation of the Award to Dr. Nicolaou—Gustavus J. Esselen, III
Esselen Award Address—*Chemical Synthesis and Chemical Biology of Natural Substances*

Dinner reservations should be made no later than April 1, 1998, noon. Choice of chicken, fish or vegetarian entrée. Please call or fax Marilou Cashman at (800) 872-2054. Reservations not canceled 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: At the Felton St. garage (3rd level or higher); enter from Cambridge St.

Next Meeting: Education Night: May 14, 1998 at the Boston Science Museum. 5:30 Social Hour and dinner; 8:00 Evening Meeting, Dr. Dudley R. Herschbach: "The Impossible Takes a Little Longer."

Biography

K.C. Nicolaou was born in 1946 in Cyprus. In 1964 he went to England and studied chemistry at the University of London (BSc. 1969, First Class Honors, Ph.D. 1972, University College, with Professors F. Sondheimer and P.J. Garratt. Postdoctoral appointments at Columbia University (1972-1973, Prof. T.J. Katz) and Harvard University (1973-1976, Prof. E.J. Corey). He joined the faculty at the University of Pennsylvania, rising through the ranks to become the Rhodes-Thompson Professor of Chemistry. In 1989 he accepted joint appointments at the University of California, San Diego and the Scripps

Research Institute, where he is the Chairman of the Department of Chemistry as Skaggs Professor of Chemical Biology and holds the Darlene Shiley Chair in Chemistry. His numerous awards include a Camille and Henry Dreyfus Teacher-Scholar Award (1980), a Guggenheim Fellowship (1984), A.C. Cope Scholar Award, ACS (1987), the ACS Award for Creative Work in Synthetic Organic Chemistry (1993), the William H. Nichols Medal, New York Section of the ACS (1996), the ACS Ernest Guenther Award in the Chemistry of Natural Products (1996), the Chemical Pioneer Award of the American Institute of Chemists (1996), and many others. He is a Fellow of the American Academy of Arts and Sciences

Abstract

Since ancient times, humankind recognized particular changes in matter under certain conditions and was quick to exploit them. Cooking, wine-making, and alchemy are examples of processes in which matter changes from one form to another. These transformations of matter were practiced for ages without an understanding of the science involved. It was only in the nineteenth century that we began to comprehend such changes on the molecular level, and chemists soon realized that they could create new substances by rational scientific methods. Today, this awesome power, known as synthetic chemistry, promises to bring even more drastic changes to our lives than the ones we already experience in our everyday existence: foods, medicines, shelter, cosmetics and high tech materials for aircraft, automobiles, computers, and other electronic devices are some of the ways chemistry improves human well-being and drives progress. Organic synthesis, in particular, currently serves as the enabling technology for biology and medicine. It is due to the basic advances in this field that we are able to understand a great deal about life and to rationally design and

continued on page 7

(1993), and a Member of the National Academy of Sciences, USA (1996). He holds honorary degrees from the University of Pennsylvania, the University of London, the University of Athens, Greece, the University of Thessaloniki, Greece, and the Universidad de Alcalá, Madrid, Spain. K.C. Nicolaou's research interests focus on chemical synthesis, molecular design and molecular recognition, and the biological actions of molecules.

He has imaginatively synthesized many critically important medicinals including our best systemic anti fungal agent, amphotericin B, and anti cancer agents taxol and rapamycin.

He is the author or co-author of over 360 publications, 47 patents (14 pending) and two books. ◇

NESACS Trustees

Condensed Annual Report for 1997

The data presented have been abstracted from the comprehensive Annual Report (28 pp.) submitted by the Board of Trustees to the Section in February, 1998. Copies of the complete report may be obtained from Marilou Cashman or Karen Piper (see p. 3 for addresses).

The net worth of our assets in 1977, when I first became exposed to the Trustee activities, was about \$350,000. At that time there were five Trust accounts. Since 1980 the Section has added the Hill Award, The Esselen Award and the Levins Prize, with separate Trust accounts for each one. These eight endowment and income Trust Funds have been allowed to grow and appreciate in value, until now they have a net worth of 1.76 million dollars.

The Consolidated Trust Fund, an endowment account, and the five income accounts allied to it, had a combined net worth of \$1,412,000 on December 31, 1997, up 14% in the twelve month period just ended. This sum includes both cash and stock and bond investments. The net worth of the Esselen Trust at the beginning of 1998 is about \$335,000, and the Levins Trust is valued at \$17,500.

The new income earned during the past year by the Consolidated plus income accounts was \$83,000. The average yield of the new money from the investments (or rate of return), was thus nearly 6%, based on the market value of \$1,412,000 on 12-31-97. The amount paid out from these Trust Funds was nearly \$95,000, the difference being made up from surplus cash remaining from 1996.

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.

The total expense liability from these accounts in 1997 for activities of the Section amounted to \$46,300, mostly reimbursed to the Section during the year. The expenses were close to the amounts budgeted for 1997, except for the Norris Trust, which overran its budget somewhat. An additional \$48,700 was paid out during exchanges of stock investments, 90% of it going into the Consolidated endowment base.

For 1998, new income projected is \$76,200 for the Consolidated plus income accounts, \$12,000 for the Esselen Trust, and \$1,650 for the Levins Prize Trust, with budgets arranged accordingly. Due to our Centennial Celebration contemplated for 1998, some extraordinary expenses are in the budget. The costs have been anticipated and will be met with surplus cash accumulated in the non-restrictive Publications and Permanent Trust Funds.

Projected Income, Budget, and Expenses for 1998

	estimated income for 1998			sources for 1998 expenses			Trust budgets 1998	Estimated total cash available in 1998
	cash bal. 12-31-97	uncommitted 1-1-98	new div+int 1998	of Consol.	other	total new available		
	(a)			(b)				(c)
Richards	2,547	2,544	5,360	5,440	5,360	10,800	13,800	13,340
Norris	9,958	3,379	1,670	26,480	1,670	28,150	31,100	31,530
Publications	16,086	16,086	570	3,700	570	4,270	12,000	20,360
Permanent	23,180	23,180	2,540	7,500	2,540	10,040	28,025	33,220
Hill	2,112	1,967	0	2,270	0	2,270	2,500	4,240
	53,883	47,156	10,140	45,390	10,140	55,530	87,425	102,690
Consolidated	27,627	27,474	66,040	(45,390)		20,650 ^b	1,200	48,120
	81,510	74,630	76,180			76,180	88,625	150,810
Esselen	3,186	2,257	12,000			12,000	12,000	14,260
Levins Prize	1,865	1,865	1,650			1,650	700	3,510
	86,561	78,752	89,820			89,830	101,578	168,580

a) After deducting liabilities from 1997.

b) Assumes 70% of Consolidated new income (\$66,040) is distributed to income accounts.

c) Sum of net cash uncommitted 1-1-98 and total new income in 1998.

Prepared for the Trustees by G. Richard Handrick, 12 February 1998. ◇

Member News

ACS Awards

Christopher C. Cummins, Professor of Chemistry at M.I.T. will receive the ACS Award in Pure Chemistry for his discovery and mechanistic description of new reactions for the cleavage of nitrogen-nitrogen multiple bonds of new transition-metal complexes of unique reactivity.

Peter J. Stang, Professor of Chemistry at the University of Utah, will be awarded the James Flack Norris Award in Physical Organic Chemistry, which is sponsored by our Section. Stang, whose research is at the cutting edge of physical organic chemistry according to his colleagues, has made seminal contributions to supramolecular chemistry via self-assembly and coordination.

JoAnne Stubbe, Novartis Professor of Chemistry and Biology at M.I.T. will receive the Alfred Bader Award in Bioinorganic or Bioorganic Chemistry for her work on enzyme mechanisms. Prof. Stubbe was the Northeastern Section's 1996 T.W. Richards medalist. ◇

Board of Directors

Notes of the Annual Meeting, January 8, 1998

Officers' Reports:

Chair: M. Idelson yielded to the chairs and representatives of the several committees to present their annual oral reports. He stated that material for the written annual report was being collected by M. Cashman.

Chair-Elect: M. Hearn presented a summary of the programs for 1997.

Treasurer: J. Piper presented a summary of the operating fund: Expenses for the year were \$139,000, leaving a balance of \$61,000 at the end of the year.

Auditor: It was reported that the Auditor has audited and approved the Treasurer's annual report.

Trustees: E. Hopkins stated that the full financial report would be presented at the February Board meeting.

Archivist: M. Simon reported that the archives, located at Regis College were being used for preparing articles for the Centennial Issue of the NUCLEUS

Standing Committees:

Bd. Of Publications: D. Lewis reported that the number of pages in the NUCLEUS had increased at a decreasing cost to the Section because of increasing advertising revenue. Special issues for the Centennial and National Meeting in Boston are being prepared. The NUCLEUS is being cited by the National ACS as an example of a successful Local Section Publication. The Section's Homepage on the Web is being operated successfully by Webmasters A. Obermayer and B. Solbjor, to whom material for inclusion in the home-page can be e-mailed.

Public Relations: D. Howell reported that the photographer we have been using will be leaving the Boston area.

Abstract

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develop new medicines for people. In this lecture, the current status of organic synthesis as exemplified by projects in these laboratories involving total synthesis and chemical biology of natural substances will be discussed. ◇

Chemistry Education: R. Tanner listed the many Awards that had been made, including Norris/Richards Scholars, and grants to students to attend National Meetings, undergraduate research symposium, Career Day at B.U., the High School Ashdown Examination Contest and U.S. Chemistry Olympiad, *Aula Laudis*, and Richards Teachers' Awards, etc.

Awards: A. Heyn reported that the Henry A. Hill Awards were presented at the October meeting, and the Levins Prize at the May meeting.

Local Arrangements: W. Gleekman reported on the successful meetings held in 1997.

Constitut. and Bylaws: C. Costello reported that an amendment to the Constitution of the Section has been approved by the National C&B committee.

Other Committees:

Continuing Education: A. Viola stated that two successful short courses had been presented: Mass Spectrometry, and Chemical Health and Safety, presented by J. Kaufman. 37 different organizations were represented by 54 participants. Both programs contributed to the funds of the Section.

Centennial: D. Phillips reported that planning began in March 1997. A Centennial Celebration is planned for the fall of 1998. P. Brauner exhibited the Centennial Banner with the Centennial logo which will, be used on stationary and on NUCLEUS issues in 1998 and also at the January 10, 1998 Museum of Science program in conjunction with Channel 2, titled "A Space Odyssey."

Esselen Award: M. Simon reported that the 1997 Award was made to R. Srinivasan.

Medicinal Chemistry Group: M. Singer reported that two symposia had been held. Plans are underway for arranging a Centennial Program at the Medicinal Chemistry Division at the National Meeting in August 1998.

From the minutes recorded by T. and A. Light ◇

Book Review

Chemistry Today and Tomorrow: The Central, Useful and Creative Science by Ronald Breslow, Jones and Bartlett and Am. Chem. Soc., 1997, 134 pp. \$ 21.25 hardcover
Reviewed by Lynne A. O'Connell, Boston College.

Chemists often lament the lack of interest in, and numerous misconceptions regarding their chosen profession by the general population. *Chemistry Today and Tomorrow* by Ronald Breslow is aimed at the non-scientific community and attempts both to overcome negative perceptions and to inspire young people to consider career opportunities in science. By presenting an overview of different areas of research and development, Breslow demonstrates that the products of chemical industry touch our lives in positive ways every day and that exciting new developments in the field of chemical research promise the solution of a broad range of problems in the future by the accomplishments of chemists.

Breslow does not assume that the reader has any background in chemistry, thus he begins with an introductory chapter that covers some history as well as basic principles of bonding and energy. Each of the remaining chapters cover an area in which chemistry plays an important role, including health care, consumer products, the environment, computer science and catalysis. Following descriptions of the contributions that chemists have made to the topic of concern, each chapter concludes with a section entitled "The Future" that focuses on very recent developments and directions which research will likely take in the time to come.

The book is very comprehensive. It touches upon nearly every contribution that chemistry has made to modern life. Some of the chapters will capture the reader's attention more than others. In particular, the discussion of health related issues such as AIDS and Alzheimer's disease will

continued on page 8

Book Review

continued from page 7

interest readers. The environmental chapter does not ignore the effects that some synthetic compounds have had on ecological systems. Some sections of the book read like a collection of lists because chemistry affects so many varied aspects of our lives. A section on the role of chemistry in housing and home furnishings describes the chemical products cement, glass, adhesives, plastics, ceramics, metals, fibers, coolants, and heating fuels.

Much of the true excitement of chemistry is communicated to the reader in "The Future" sections at the ends of the chapters. Many of the areas in these sections are described more in depth than those in the main body of the chapters. Areas of research that are not familiar to the general public, such as pre-biotic chemistry, and nitrogen fixation, to name just two, are included and should spark curiosity among receptive readers. An entire chapter concerning synthesis stresses the point that chemistry is truly the creative science.

While I believe that most of the book will be understandable to the lay person, in some instances new vocabulary and notations may be overwhelming. For instance, a detailed mechanistic explanation is included for the acid catalyzed conversion of ethanol to diethyl ether, which will fly over the heads of readers who lack any background in chemistry. On the other hand, some good analogies do bring difficult concepts down to a reasonable level of understanding, such as one which compares kinetic and thermodynamic control in protein folding to the traversing of valleys and mountains.

Chemistry Today and Tomorrow should achieve its goal to educate the general public about the ways in which chemistry is an integral part of everyone's life. High school or college student with some interest in science will be inspired as they read about the breadth and applicability of the "central, useful and creative science." ◇

Letter to the Publisher Editor

Dear Sir,

I read with interest your latest version of *The NUCLEUS* and noticed a section entitled "Pictures of Nobel Laureates of the Section". I suspect a little parochialism here since you chose only to include those Laureates who were honored in Chemistry, even though many of them, such as Wald, Bloch, Lipscomb, Khorana and Gilbert have made seminal contributions to molecular biology. For those of us who work in the field of molecular biology, we have the singular advantage of being eligible for the Nobel Prize in Chemistry or in Physiology or Medicine. It seems that you have overlooked those individuals who were trained in chemistry, have a great interest in chemistry, but in fact received their Nobel Prizes in Physiology or Medicine. Both Philip Sharp and myself, who received the 1993 Prize in Physiology or Medicine, were trained as chemists and, speaking for myself, I attribute my success in molecular biology to the rigorous training that I received in chemistry. If you were to cast your net further afield, you may discover that there are other molecular biologists with similar credentials.

I fear that your decision to list only winners in chemistry reflects the fact that many chemists have still not come to the realization that the fields of biology and chemistry are rapidly becoming almost indistinguishable. Many studies now carried out in departments of biochemistry, molecular biology, cell biology, etc. could be viewed as the very best of chemistry. Some enlightened chemistry departments have realized that the frontier of

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THE NUCLEUS to your local
High School when you no
longer need them.**

Publisher News

Wiley Expands Pan-European Journal program

Normally, The NUCLEUS does not publish company news announcements which flow over the editor's desk almost daily. However, the announcement that Wiley has joined forces with the chemical societies of Belgium, France and Italy, in addition to the existing partnerships with the German and Dutch societies, has an impact on the structure of European journal publication. As a result of these partnerships, six national chemistry journals will be merged into two new journals, the European Journal of Organic Chemistry and the European Journal of Inorganic Chemistry. The first issues of these new journals appeared in January 1998.

Already starting in 1997, Liebigs Annalen/Recueil and Chemische Berichte/Recueil had merged the former German Liebigs Annalen and the Dutch Recueil des Travaux Chimique des Pays-Bas, and similarly the German Chemische Berichte and Recueil.

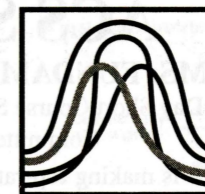
Starting with 1997, Wiley has made the text of all of its printed scientific and technical journals available via a website through its new Wiley InterScience service (<http://www.wiley.com>). ◇

biology is very much their domain, but others, unfortunately, have been slow to follow. This is a shame since chemistry has so much to offer and so much to discover in the biological realm. I was disappointed that *The NUCLEUS* did not seize this opportunity to promote biology as one of the most exciting frontiers for chemists to explore.

Richard J. Robert, Ph.D.

Director of Research
New England BioLabs

Mea culpa! We indeed limited our listing to to chemistry Nobel Laureates and should have "cast our net further afield." ◇



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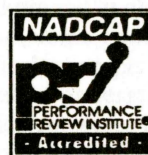
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ACS Short Course

LC/MS: FUNDAMENTALS AND APPLICATIONS

A Two-Day Short Course Sponsored by the Northeastern Section, ACS,
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National ACS is making top-rated ACS Short Courses available to local sections at tuition fees greatly reduced from the normal \$825. The NESACS Committee on Continuing Education is pleased to present this new course, which has just recently been developed, in part, by David Sparkman whose highly successful course on *Interpretation of Mass Spectra* was offered here last year.

DATES and TIME: Thursday, May 14, 1998, 8:00 a.m. - 5:30 p.m.
and Friday, May 15, 1998, 8:30 a.m. - 5:30 p.m.

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

PROGRAM AGENDA:

Introduction: Overview; bibliography

Atoms, Molecules, Ions

What is LC?: Technique; Hardware; Columns; Solvent systems; Nondestructive LC detectors

What is MS? Mass analyzers; Detectors; Vacuum systems

LC/MS - The Interface and Ionization Techniques: Flow injection; Particle beam; Continuous flow FAB; Atmospheric pressure ionization; Electrospray; AP-chemical ionization

Applications and Dealing with Data: Protein and peptide analysis; Synthetic polymers; Environmental contaminants; Pharmaceuticals and their metabolites; Small molecule vs. large molecule analyses; Open access instrumentation; MS/MS; Negative-ion detection; CR/MS

Problems and Exercises

Instructors: O. David Sparkman, an independent consultant in GC/MS and mass spectrometry who is currently working with the National Institute of Standards and Technology, has extensive experience in quadrupole ion traps, transmission quadrupoles, and sector instruments, and has been involved with the development of a number of different GC/MS data systems. He has been teaching ACS Short Courses in mass spectrometry since 1978 and is consistently one of the top rated instructors in the ACS program.

Frederick E. Klink, an industrial consultant in LC, LC/MS, and other scientific instrumentation, has had 16 years of experience in the analytical instrumentation industry. He is uniquely qualified to offer insights to the chromatographer who wishes to undertake LC/MS while David Sparkman provides the same insight for the mass spectroscopist.

Pre-registration Required - Registration Fees:

ACS Members if received before April 30 \$275.00; after April 30 . . . \$325.00
non-ACS Members if received before April 30 . . . \$375.00; after April 30 . . . \$425.00

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

Parking Fee \$5.00/day University cafeterias will be available for lunches.

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

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Northeastern University Boston, MA 02115

Fuel Cell Technology

A talk given by James Cross of
Arthur D. Little Co. at the
January 8, 1998 meeting of
the Section

By James Cross.

A fuel cell is a device which converts chemical potential energy into electricity and heat. Figure 1 illustrates the basic fuel cell architecture. Fuel is introduced at the anode and oxidant at the cathode. An electrolytic substance facilitates transport of ionic charge carriers between the electrodes while electrons which derive from the catalytic decomposition of hydrogen, migrate through an external electrical circuit, producing electric power. Different types of cells have different charge carriers and operate at different temperatures, as shown. The types shown include:

- PEM = Proton Exchange Membrane, or Polymer Electrolyte Membrane
- PA Phosphoric Acid
- MC Molten Carbonate
- SO Solid Oxide

Though similar to a battery, a fuel cell differs in several important respects. A battery stores its own energy; a fuel cell does not. A fuel cell will produce energy as long as it is supplied with fuel and oxidant. A fuel cell requires refueling while a battery requires recharging.

Fuel cell performance is characterized via a so-called polarization curve, illustrated in Figure 2. This curve shows voltage level as a function of current density. As current density is reduced, the cell voltage approaches the theoretical open circuit voltage, calculable from the Gibbs free energy change associated with the prevailing electrochemical reaction via Faraday's law. As current density is increased, irreversible losses give

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A fuel cell converts chemical potential energy into electricity and heat.

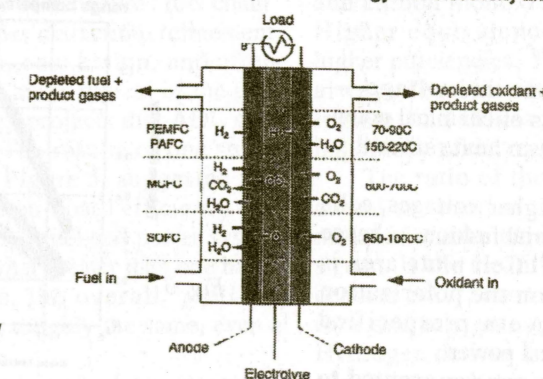


Fig. 1

Fuel cell performance is expressed via a polarization curve.

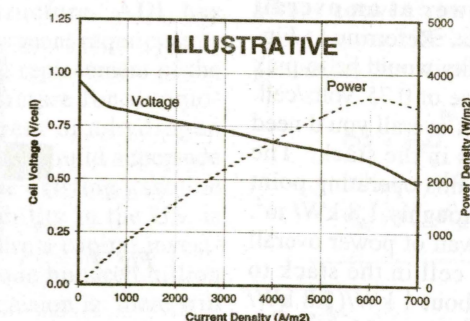


Fig. 2

This curve serves as the basis for sizing, and costing, FC stacks for specified applications.

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Fuel Cells

continued from page 11

rise to reductions in voltage — increasing amounts of chemical potential are converted to heat rather than electrical work.

To achieve higher voltages, cells are stacked in a serial fashion — hence the term “stack.” Cell plate area is selected, based on the polarization curve, to produce a prespecified amount of electrical power.

For example, say you wanted to design a stack which would produce 1 kilowatt of power at an overall voltage of 15 Volts. Referring to Figure 2, one possibility would be to pick an operating voltage of 0.75 Volts/cell. To achieve 15 Volts overall you'd need $15/0.75 = 20$ cells in the stack. The current density at this operating point is indicated to be roughly 1.8 kW/m^2 . To achieve 1 kilowatt of power overall you'd need each cell in the stack to have an area of about $1 \text{ kW}/(1.8 \text{ kW/m}^2/\text{cell} \times 20 \text{ cells}) = 0.03 \text{ m}^2$, e.g. squares with a side length of 6.5 inches. If the cell thickness were 0.25 inch, the stack length would be 5 inches long.

Fuel cells have the potential for increasing the efficiency of many conventional energy systems. Ford has developed the plot shown in Figure 3 to illustrate this benefit when compared to internal combustion engines in transportation applications. As a testament to its confidence that this technology will be a signature of the 21st century, Ford has committed over \$500 Million in the past year to development of fuel cell technology with Ballard Power Systems in Vancouver, Canada; Daimler-Benz of Germany has invested roughly \$300 Million in Ballard. Other car companies are making significant investments as well.

To make fuel cell systems practical, provisions must be made for the continuous supply of fuel. In the case of PEM and PA fuel cells, hydrogen is the fuel. But hydrogen is neither readily available nor easily storable. Thus a PEM or PA fuel cell system will

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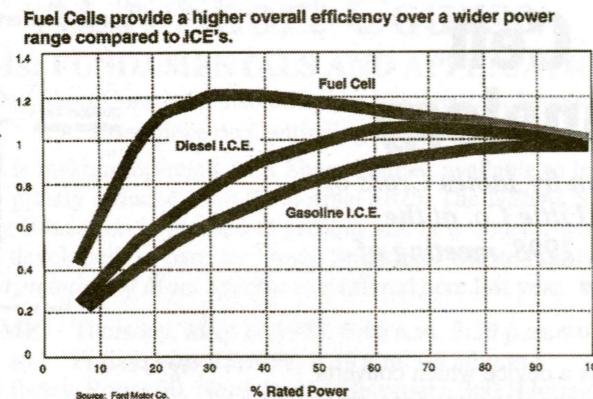


Fig. 3

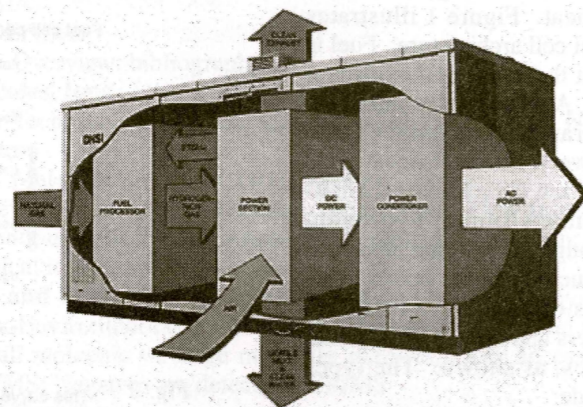


Fig. 4

The “well-to-wheels” fuel chain efficiency must be considered when evaluating the merits of alternative fuels.

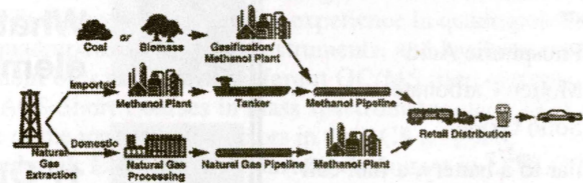


Fig. 5

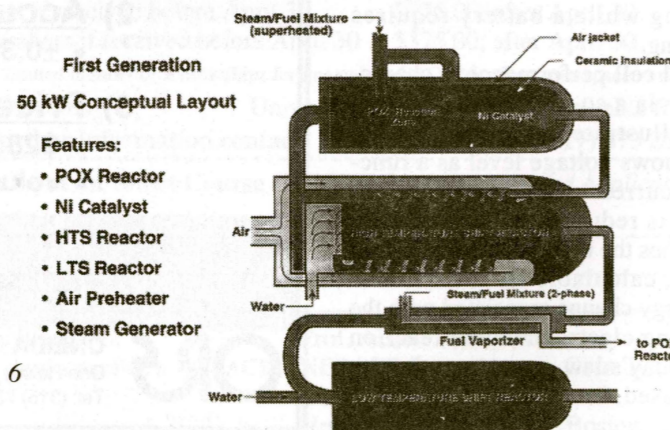


Fig. 6

Fuel Cells

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require a fuel processor, a device capable of efficiently extracting hydrogen from common fuels such as natural gas, propane, and gasoline. Clearly this adds complexity. The ONSI system, shown in Figure 4, is an integrated system consisting of a steam reformer, which extracts hydrogen from natural gas, and a phosphoric acid fuel cell. Over 100 of these units have been sold to commercial customers.

For many applications, low pressure and low temperature operation are preferred. Lower pressure generally leads to higher efficiency and reliability, and lower temperature leads to shorter start-up time. PEM fuel cells, the technology which has received the most press in recent times, have the following characteristics:

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Any fuel processing approach that can accommodate these needs is a candidate for integration with the fuel cell.

Since 1991, a focused team of researchers at Arthur D. Little, Inc. in Cambridge, MA has been developing fuel processors to support fuel cell systems. Today these systems are being adapted to four different application areas:

- Transportation
- Stationary power
- Portable/Distributed power
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which represent a wide range of fuels: methanol, ethanol, gasoline, natural gas, and propane.

Because it is the easiest fuel to extract hydrogen from, or reform, methanol is being considered as a primary fuel by a number of research teams. To properly evaluate the merits of different fuels with respect to

resource utilization, one must examine the efficiency of the entire “fuel chain” which includes extraction, refinement, distribution, conversion, and after-treatment. This is typical of the type of technology projects that ADL staff undertake. The results of one study, depicted in Figure 5, suggested that although the on-board efficiency of a methanol-based fuel cell power system looks somewhat greater than one based on gasoline, the overall “well-to-wheels” was roughly the same, even a little lower.

The need for fuel processors is difficult to dispute given the lack of a hydrogen infrastructure. ADL has estimated the investment requirements associated with the replacement of the gasoline infrastructure for automobiles. Development of a hydrogen infrastructure which would supersede a mere 10% of the existing gasoline distribution capability in the US, is estimated to require a capital investment of roughly one hundred billion dollars. The conclusion is: there will be no appreciable hydrogen distribution system in place in the short term.

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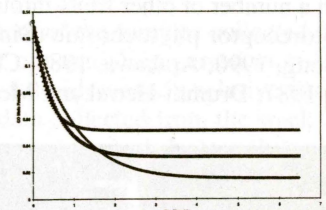
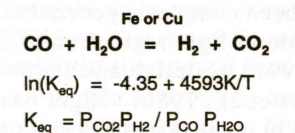
A conceptual layout of the first generation 50 kW_{electrical} fuel processor (adequate power for a passenger car) is shown in Figure 6.

An important operating parameter in the ADL fuel processor is the equivalence ratio, which is defined as the number of stoichiometric (based on oxidation of fuel to produce carbon dioxide and water solely) equivalents of fuel present in the reactant stream. An equivalence ratio less than one indicates an excess of air, and leads to complete combustion. In a system with an equivalence ratio greater than one, there is insufficient oxygen for

complete combustion, and hydrogen and carbon monoxide are produced. Higher equivalence ratios lead to higher efficiencies. However, it is not always feasible to operate in this regime, and this is wherein lies the importance of the reactor design.

The ratio of the moles of water added as reactant to the number of moles of carbon atoms in the reactant stream is the steam-to-carbon ratio, denoted S/C. Steam controls temperature and mitigates soot formation. Hydrogen derives from both the fuel and the water that is added.

The water gas shift reaction offers a very convenient means to convert carbon monoxide and water to hydrogen and carbon dioxide. Figure 7.



Equilibrium favors H₂ production at lower temperatures, but kinetics are accelerated at higher temperatures =>

Fig. 7

This is a reaction which has been used industrially for a very long time, and its kinetics and equilibria are very well characterized. A catalyst is almost invariably used. This reaction can be used to reduce the CO level to about 0.5 mol%, tremendous from an efficiency standpoint, but very far short of the 10 ppm target needed for integration with the PEM fuel cell.

For PEM-based systems, CO elimination remains the predominant technical challenge. Preferential oxidation, ultra-low temperature shift membranes, selective methanation, and pressure swing adsorption are all being explored to this end. Initiatives are proceeding in parallel on the fuel cell side to develop electrode catalysts

continued on page 21

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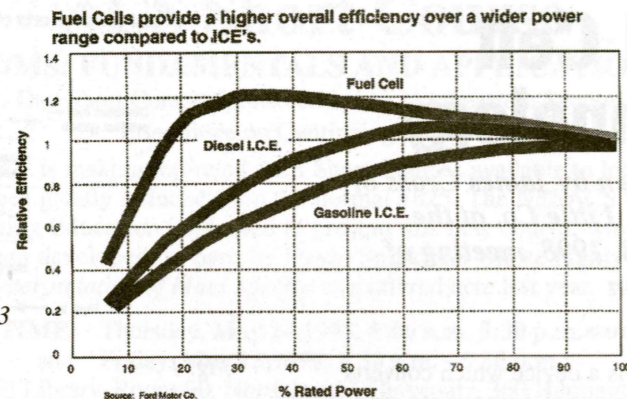


Fig. 3

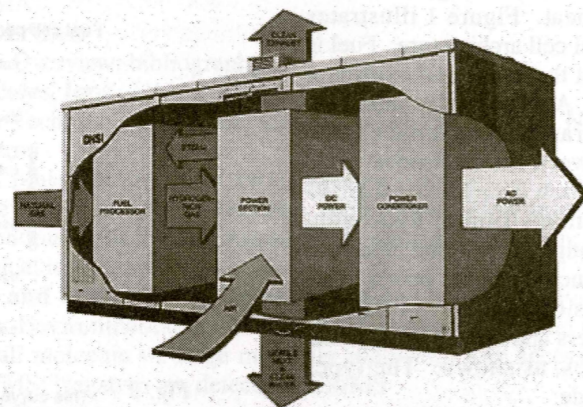


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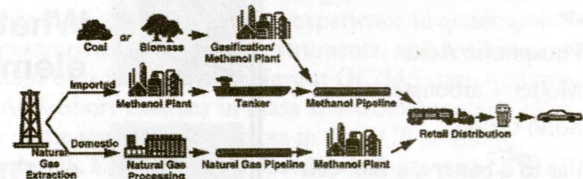


Fig. 5

	Fuel Chain Eff.	Vehicle Eff.	Net Efficiency
Methanol FCV	62%	34%	21%
Gasoline ICE	84%	14%	12%
Gasoline FCV	84%	28%	23%

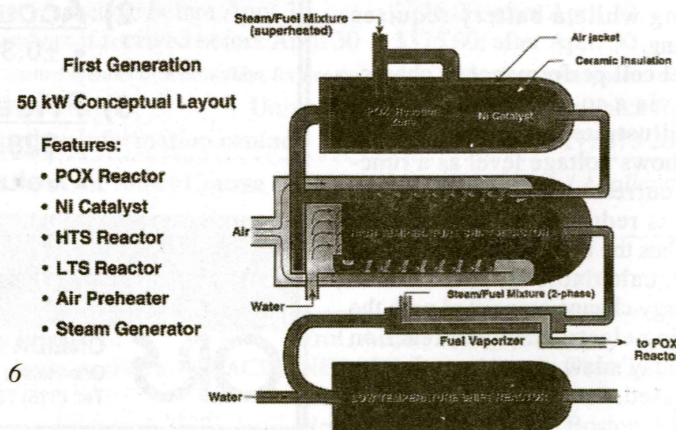


Fig. 6

Fuel Cells

continued from page 12

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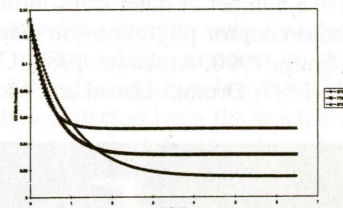
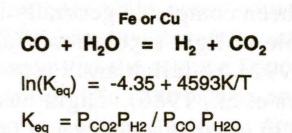
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Summer Scholar Report

Light Regulation of Anthocyanin and Flavonol Biosynthesis in Cranberry Plants

Robert R. Boulanger, Jr. †
Faculty supervisor: Bal Ram Singh

Introduction:

The attractive, brilliant red color of cranberries is due to the presence of anthocyanins and to a lesser extent flavonols (Sapers and Hargrave, 1987). Although the value of the crop is dependent on these pigments, little is known about their biosynthesis in cranberry plants, and the studies that have been completed generally ignore the role of light regulation (Farag et al., 1992; Abdallah and Palta 1989; Sapers et al., 1986). Light has been found to regulate anthocyanin production in a number of other fruits through a photoreceptor phytochrome (Singh and Song, 1990; Arakawa, 1988; Chai et al., 1987; Drumm-Herrel and Mohr,

1982; Mancinelli and Walsh, 1979; Kinnersley and Davies, 1977). It is likely that the same chromoprotein regulates the biosynthesis of cranberry anthocyanins.

Anthocyanins are cyanidin and peonidin based chromophores whereas flavonols are myricetin and quercitrin based chromophores. Since the chemical structures of the two classes of pigments are very similar, we hypothesized that the synthesis of anthocyanins may require flavonols. The purpose of this research was to determine if flavonols and anthocyanins developed at the same rate and time during the season to understand if their production was interrelated. The effect of natural light exposure on the production of flavonols and anthocyanins was also investigated.

Results leading to the develop-

ment of methods that increase the anthocyanin and flavonol contents of cranberry plants will not only be an economic benefit to cranberry farmers, but may also lead to therapeutic benefits. This is because recent literature reports correlate amounts of fruits and vegetables containing high content of antioxidants such as flavonols in the diet with reduced rates of malignancy. It has been hypothesized that flavonols block the biochemical pathway that results in cancer (Morricca et al., 1997). Anthocyanins have been proposed to act as a negative risk factor for the development of atherosclerosis and coronary artery disease (Demrow et al., 1995). Our results, so far indicate that anthocyanin biosynthesis is regulated by light but, flavonols may not act as precursors to anthocyanins.

Materials and Methods:

Steven's cranberry samples were collected from the University of Massachusetts Cranberry Experiment Station weekly from July 29th through October 9th. These samples were stored at -20°C until the samples could be analyzed for anthocyanin and flavonol content.

Three sets of samples, 3-4 cranberries each, were prepared from every weekly collection. The cranberry samplings were placed in a 47 ml miniblender with 20 ml of extraction solvent (85:15, ethanol: 1.5 M HCl). The berries were macerated by blending for 1 minute at low speed. The sample was then blended at high speed for two minutes, and the resulting homogenate was allowed to incubate at 4°C overnight. Homogenates were filtered using a suction filter apparatus with Whatman #1 filter paper. The residue on the filter paper was washed with the extraction solvent to remove all pigments (Fuleki, and Francis, 1968a; Fuleki, and Francis, 1968b, Lees and Francis, 1971). The filtrate was diluted to 250 ml in a volumetric flask, and 500 µl aliquots of this filtrate were diluted to 1.5 ml with extraction solvent for spectral analysis.

The effect of natural light exposure on Bergman cranberry plants of the

Summer Scholar Report

continued from page 14

University of Massachusetts Cranberry Experiment Station was determined by taking samples from the top and bottom of the cranberry plants, where maximum and minimum sunlight exposure occurred, respectively. Measurements taken with a photometer were made to insure that the berries collected from the bottom of the plant, received at least 90% less natural light, due to foliage coverage, than the berries collected at the top of the plants. The procedure described above was followed to extract and analyze the pigments from this set of samples.

Results and Discussion:

Relationship between anthocyanin and flavonol biosynthesis

The spectra of the cranberry extracts were analyzed between the wavelength range of 350 and 600 nm where two bands of interest are observed. In Figure 1, the absorbance peak observed at 535 nm is due to the presence of anthocyanins in the sample while the shoulder occurring at 360 nm is attributed to the presence of flavonols. These spectral characteristics of anthocyanins and flavonols in our experimental berries are in agreement with literature reports (Fuleki, and Francis, 1968a; Fuleki, and Francis, 1968b, Lees and Francis, 1971).

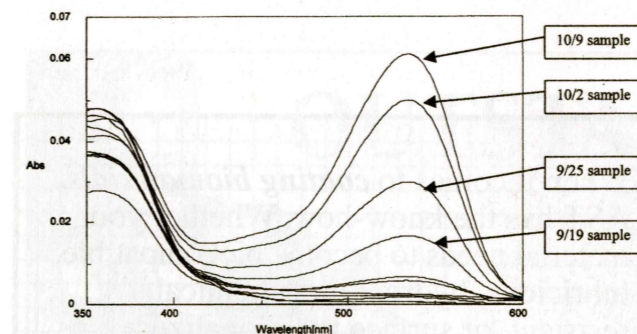


Figure 1: Absorbance spectra of the cranberry extract sample. The peak at 535 nm is attributed to anthocyanin content and the shoulder at 360 nm is due to the presence of flavonols.

The absorbance of flavonols and anthocyanins (normalized for cranberry sample weight) present in the cranberry samples collected over an eleven week time period is displayed in Figure 2. The samples collected during the first week represent the cranberry anthocyanin and flavonol contents just after the plant produced the berries early in the season. The cranberries picked at this time lack the characteristic deep red color; instead they have a yellowish green color. Samples picked just prior to cranberry harvesting were picked on the 11th week. The data collected from these deep red cranberries is indicative of the pigment levels that are present when the farmers consider the berries to be ripe, and adequate for harvesting.

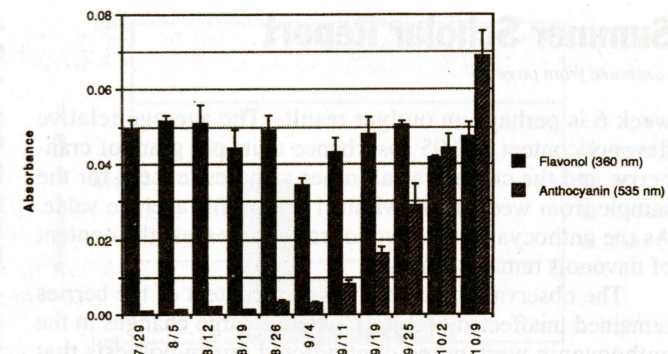


Figure 2: Flavonol and anthocyanin content of cranberry samples. The striped bars indicate the absorbance of anthocyanins (535 nm) present per gram of cranberry and the solid bars indicate absorbance of flavonols (360 nm) per gram of cranberry.

The flavonol content remained relatively constant throughout the 11-week period with small fluctuations due to natural deviations between cranberries in their individual developments. However, the analysis of flavonols extracted from the week six sample differs from this flavonol content trend considerably. It is assumed that the relative flavonol content analysis of the week six sample is erroneous and it can be ignored. This assumption will be tested in future cranberry samplings.

The anthocyanin content of the samples collected during the first six weeks of our sampling period increased slowly. There is a three-fold increase in relative anthocyanin content when the data collected from the week 1 is compared to week 5. This is a nominal change when compared to the change in anthocyanin content observed during the final five weeks of the season. The berries collected in the final week contained nearly nine-fold higher content of anthocyanin than those four weeks earlier.

Table I - Comparative Analysis of Anthocyanin and Flavonol Contents in Cranberry Samples

	Δ Flavonol	Anthocyanin to Flavonol Ratio	Anthocyanin to Total Antioxidant	Percent Anthocyanin
Week 1	6.7	0.02	2.0	1.0
Week 2	11.2	0.03	2.5	1.9
Week 3	9.5	0.04	3.8	2.9
Week 4	-4.3*	0.03*	2.8*	1.9*
Week 5	5.82	0.07	6.7	5.1
Week 6	-26.3*	0.09*	8.3*	4.5*
Week 7	-7.1	0.19	15.6	11.6
Week 8	3.5	0.34	25.2	23.4
Week 9	9.1	0.57	36.4	42.0
Week 10	-9.9	1.06	51.5	64.2
Week 11	2.4	1.45	59.2	100.0

Table I - Comparative Analysis of Anthocyanin and Flavonol Contents in Cranberry Samples

Δ Flavonol = (Flavonol absorbance of week specified - Average flavonol absorbance of the 11 week period) / Average flavonol absorbance of the 11 week period * 100; Anthocyanin to Flavonol Ratio = Anthocyanin absorbance / Flavonol absorbance; Anthocyanin to Total Antioxidant Ratio = Anthocyanin absorbance / Flavonol absorbance + Anthocyanin absorbance * 100; Percent Anthocyanin = (Anthocyanin absorbance / Anthocyanin absorbance of week 11 sample) * 100; *possible outlier results

The Δ Flavonol values in Table I indicate that the flavonol content determined for the cranberry samples of

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week 6 is perhaps an outlier result. The average relative flavonol content is 0.05 absorbance units per gram of cranberry, and the content of all other samples, except for the sample from week 6, are within 11 % of this average value. As the anthocyanin to flavonol ratio increases, the content of flavonols remains constant.

The observation that the flavonol content of the berries remained unaffected (Table I), whereas large changes in the anthocyanin were noted contradicted our hypothesis that flavonols could be used as precursors for anthocyanin biosynthesis. We had predicted that the content of flavonols would decrease as the anthocyanins began to develop. Although this was not observed, it is still possible that flavonols could act as anthocyanin precursor as a result of a change in the equilibrium of the biochemical pathway of flavonols that favors an increase in flavonol biosynthesis as these pigments are converted into anthocyanins. Further experiments need to be conducted to address this question.

Light regulation of anthocyanin and flavonol biosynthesis

Flavonol and anthocyanin contents of cranberries collected from the top and bottom parts of the plants are displayed in the bar graph in Figure 3. Berries from the top of the plant received intense sunlight, while the berries located

at the bottom part of the plant, underneath all of the foliage of the plant, received less than ten percent of the sunlight. This is due to the leaves of the cranberry plant absorbing a large amount of the sunlight. The flavonol content of berries at the top of the plants did not vary significantly whereas anthocyanin content was dramatically different (70-fold difference). This indicated that photoreceptors for the regulation of anthocyanin biosynthesis were located in the cranberries.

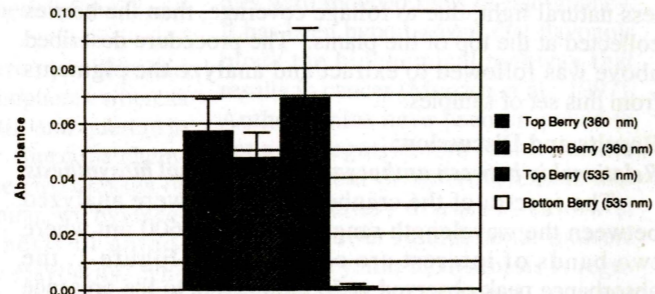


Figure 3: Anthocyanin (535 nm) and flavonol (360 nm) content of berries collected from the top of the plant compared with berries from the bottom of the plant. Anthocyanin contents are normalized for sample weight.

In order to identify the photoreceptor for the mediation of light regulation of anthocyanin biosynthesis, we designed

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a set of experiments with red (660 nm) and far-red (730 nm) light to determine if phytochrome is involved in the mediation of light response. Control experiments were carried out in natural light and in dark conditions. It is evident from Figure 4 that plants receiving natural light throughout the day has the highest anthocyanin content, while the plants receiving five minutes of red light each day for 25 days produced only one-third of the anthocyanin compared to those in natural light conditions. There is very little difference between the anthocyanin content of berries from far-red light irradiated plants and the plants kept under dark conditions. There is a 9-fold increase in the anthocyanin content of the berries from the plants under natural light conditions compared to those in the dark and far red light conditions.

These results not only support that a photoreceptor is involved in the synthesis of cranberry anthocyanins but they also indicate that the photoreceptor involved is most likely to be phytochrome. This is because the red light, which is known to stimulate phytochrome into its physiological active form, causes an increase in the anthocyanin content of the plant. Also far-red light which is known to convert phytochrome into its inactive state prevents any increase in anthocyanin content.

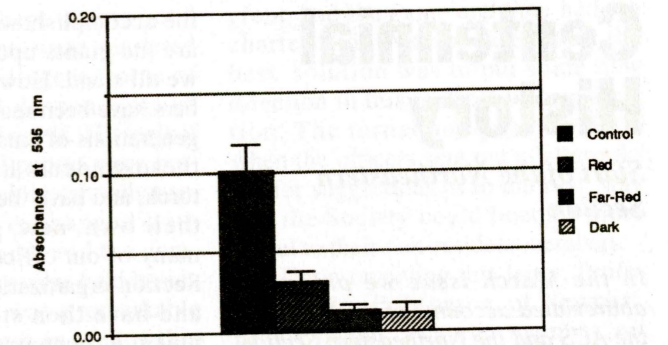


Figure 4: Anthocyanin content (535 nm) of berries stored in natural lighting, red lighting, far-red lighting and dark environments, respectively.

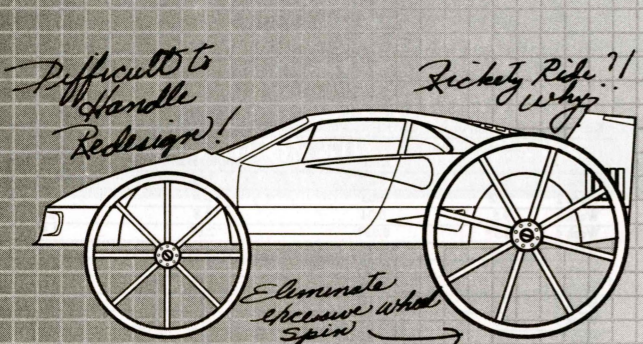
Acknowledgements:

We would like to take this opportunity to thank Drs. Frank Caruso and Carolyn Demoranville of the University of Massachusetts Cranberry Experiment Station for assistance in sample collections.

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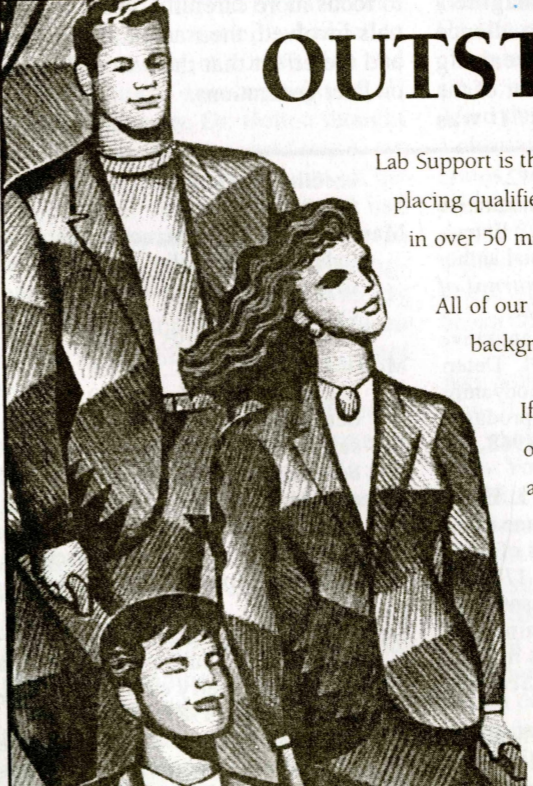
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Centennial History

Start of the Northeastern Section

In the March issue we presented abbreviated accounts of the history of the ACS and the Northeastern Section. From time to time we will publish excerpts from the original articles in the 1973 NUCLEUS, during the Section's Diamond Jubilee year. The following is excerpted from the January issue and was written by the late Robert D. Eddy, Professor of Chemistry at Tufts University.

Under the heading "Seventy-Five Years with the Northeastern Section" Eddy makes some introductory remarks about the plans for publication of the story in the 1973 issues of *The NUCLEUS* and he indicates the help he has received and the sources he has consulted. The following is the verbatim text from the January 1973 issue:

Our story is not just a dry summary of events and their dates. It is a story of the lives, and the dreams, and

the accomplishments of people. They are the giants upon whose shoulders we all stand. How many of our members have been much-loved teachers to generations of students? How many of these students have picked up the torch, and have become the leaders of their own, new, generation? How many of our officers have served the Section organization with distinction, and have then stepped upward to make a permanent mark on the national scene? How many of our speakers, and medalists, have won acclaim, both nationally and internationally, for the brilliance of their scientific efforts? The answers to these questions are not trivial: they demonstrate better than anything else could that we have a glorious past. May we cherish it, and take heart from it, and build upon it to fashion a similar, glorious future.

Though many of our records are couched in the terse, undemonstrative prose of the busy scientist, they are not dull. A love of fun, a love of life and a heart-warming humanness keep shining through. Can you imagine a Section meeting, where the audience welcomed its speaker by breaking forth in song? Did you ever hear of the great Mass Marathon Run? It was

staged at a joint outing (with the Rhode Island Section) "under the incentive of a sudden and very moist shower" as the soggy participants covered the few hundred feet from the baseball stands to the Club House. Do you know about the "First Quadrennial Leap Year Party" of February 1924? It was perpetrated at the American House (wherever that was) with singing and dancing. About one hundred and fifty members and guests were entertained with a pantomime, presented by a bevy of Simmons girls. And some unscrupulous soul accumulated a tidy profit by distributing, in exchange for ten cents, copies of an underground newspaper called *The Nude L'il Cuss*.¹ And when it was all over, the exhausted revelers had to rush to catch the late train home.

Because there is so much of interest to report, not only about the early years of our Section, but of the national events that preceded its formation, we shall spend much of the first installment in setting the stage. Later on, we can build upon this base to focus more carefully on the individuals involved, their accomplishments, and the effect that their work has had on later generations.

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The Organization of the Northeastern Section

The first page in the Secretary's book bears the date: February 4, 1898, but this was not the beginning. The American Chemical Society was founded more than twenty year before that, on April 12, 1876. Nor was that a starting date, either. Most observers agree that the real beginning of everything was a suggestion made by Dr. H. Carrington Bolton of the Columbia College School of Mines in April 1874. He wasn't thinking about forming a society at all: serendipity was in charge of things then, even as it is now. What Dr. Bolton wanted to do was to somehow commemorate the discovery of oxygen by Joseph Priestly, one hundred years earlier. It was on August 1, 1774 that the good Doctor Priestley had heated his "mercurius calcinatus per se" with a twelve inch burning lens and for the first time had released some "dephlogisticated air". Because this discovery, followed by Lavoisier's quantitative treatment of it, had led to the oxygen theory of combustion and the subsequent development of all modern chemistry, Dr. Bolton thought that the centennial deserved some sort of observance. After all, because of his rashly liberal views, Dr. Priestley had been driven by an unruly mob from his home and his laboratory in Birmingham, England. He fled with his family to the United States, and so became an American chemist, by adoption, if not by birth.

Enter a woman chemist. Professor Rachel L. Bodley² of the Women's Medical College of Pennsylvania proposed that the centennial celebration should be held at Northumberland, Pennsylvania, where Dr. Priestley had lived and where he was buried. This suggestion was immediately adopted, and plans went forward for a three-day meeting beginning on July 31, 1874. This was the sequence of events that brought seventy-seven of the most influential American chemists, some with wives and children, together in a peaceful little village in the valley of

the Susquehanna. There was no hotel there: the participants were quartered overnight by the villagers, some of whom were direct descendants of Joseph Priestley, himself. Historical papers and technical papers were presented in the tiny public schoolhouse. Cablegrams were exchanged with Birmingham, England, and the commemorative exercises were held beside Priestley's grave. It was a remarkable affair. The friendliness and fellowship and excitement were so great, that there was a strong sentiment to carry on with such meetings. On the second day, the Centennial Day, to be exact, a group met to consider the feasibility of forming a national American Chemical Society with this purpose in mind. There were pessimists present, but nearly everyone went home with great hopes, expecting that a society would soon be formed.

Unaccountably, there was a two year delay, but the plan would not die. Professor Charles F. Chandler, also of the Columbia School of Mines, who had presided at the Centennial Program, finally set things moving again. He uncovered more than one hundred chemists in New York and nearby cities, whose work and training rendered them eligible for membership in a chemical society. With seven confederates, he finally sent out a notice for an organizational meeting to be held April 6, 1876. That meeting was called to order with thirty-five chemists present, and the Society began operations.

Naturally, a society created in this way was a New York based organization. It had non-resident members, but the monthly meetings were held in New York, and there were not many benefits for the out of towners. A Journal was published, but few cared to submit papers, and the Society was most successful as a local organization. Small wonder that other quite similar local organizations sprang up in other parts of the country. There was a constant agitation to get a truly national organization going: for a while it seemed likely that some of these upstart outsiders might be strong enough to take over. But the New York

group had the name and they had the charter and it was apparent that the best solution was to put some new direction in this ineffective organization. The turnabout came in 1889, when the officers sent out a letter asking for suggestions as to the best way that the Society could become more useful to their non-resident members.

Upon receiving this letter, Professor Charles E. Munroe, of Newport, Rhode Island, a charter member, sat down and wrote a detailed and lengthy response. He viewed, quite critically, the situation as it existed for outsiders, and made a number of valuable suggestions. These included the ideas that local Sections should be formed, and that General Meetings should be held outside of New York. Others had independently proposed the same ideas, or at least concurred in them, so on June 6, 1890, the Constitution was changed to legalize such practices. One would have thought then that immediate action would have been taken, but that was not the case. According to Professor Munroe's article in the Fifty-Year History, the Directors waited until July 22 of that same year to decide that (1) there would be a General Meeting outside of New York, that (2) it would be two weeks hence, August 6 and 7, 1890, that (3) it would be in Newport, R.I., and that (4) Charles E. Munroe would be in charge of arrangements! Then they let him know. Instead of collapsing under such summary treatment, he scrambled around, formed a local committee of fourteen and began to make plans. His colleagues included a couple of Harvard professors with summer residences in the area, some army and navy officers stationed nearby, the local high school principal, the secretary of the Newport Natural History Society, and a few younger chemists working in the area.

This group put together a remarkable program without any idea who, or how many, would attend. As a matter of fact, until the final day, when the Fall River Line boat from New York came plowing into its Newport berth, the only registrants known to be coming were the three guests whom

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Professor Munroe had invited to stay at his home. However, there proved to be a large and congenial group aboard, headed by Professor Chandler himself, and the meeting got off to a great start. Rhode Islanders from Providence and Kingston appeared, and there were distant visitors from Medford, Cambridge, New Haven, Ithaca, and points even further afield. Seventeen papers, covering almost every possible branch of chemistry were presented. The U.S. Naval Torpedo Station permitted an inspection of its laboratories and workshops, and its personnel presented an extensive series of demonstrations of high explosives. Not to be outdone, the personnel of the U.S. Naval Training Station put on a parade honoring their distinguished guests. On the second day of the meeting the registrants had their choice of relaxation: they could take a leisurely tour of Newport Harbor in the inspection launch, or they could select a thirty mile run around Conanicut Island in the high speed torpedo boat, "Stiletto".

With this successful venture completed, the chemists of Rhode Island wasted no time in getting behind Professor Munroe, and his colleague, Professor John Howard Appleton of Providence to form the Rhode Island Section. Their charter was granted on January 21, 1891, a full nine months before the New York group could get around to applying for its own local section charter on September 30, 1891.

By present day standards, the Northeastern Section is an old Section, but it is actually the eleventh in line. When it was formed, it immediately won a position as one of the larger and more influential Sections, but there is nothing in the record to tell us why it was seven years behind the leaders. This is particularly hard to explain, because the tenth General Meeting was held in Boston and Cambridge on December 27-28, 1894. This should have been a stimulus, but if one remembers how Professor Munroe, with only two weeks notice, had put together the first General Meeting, one can concede that perhaps this was not as demanding as it would seem to us now. However, the seventeenth General Meeting was also held in Boston. Its date, August 22-23, 1898 is close enough to the February 4, 1898 birthdate of the Section to suggest that there may have been a connection. Perhaps the organizers learned something from their 1894 experience.

Here follows a speculation why the Boston and Cambridge chemists were slow to organize under the banner of the American Chemical Society, material which has been covered extensively in the articles by David Adams and Myron Simon in the February, 1998 "Centennial Issue" of the NUCLEUS.

Our records...begin:

Friday Evening, February fourth (1898) about one hundred and fifty chemists met at the Parker House to establish a local section of the American Chemical Society.



Arthur D. Little

The date 1898 was added later, with a caret by a different hand and in a differently colored ink. However, there can be no doubt concerning it, for the Treasurer's records are carefully dated. A remark attributed by the Secretary to the newly elected Treasurer - that he "already had about ninety dollars" is corroborated by the Treasurer in the very first entry. On the very first page of his book we find "Feb. 26, 1898. Drew \$90.61 from account of \$91.61 with the North End Savings Bank³, Book#13384, which had been made from the unexpended balance of the subscription raised to entertain the American Chemical Society at the Tenth General Meeting held in Boston, Dec. 27-28, 1894. Paid therefrom for this book, \$ 1.75. Deposited with Metropolitan National Bank,⁴ \$88.86"

The Secretary's minutes then go on to tell us that Henry P. Talbot of M.I.T. (in Boston then) was elected Temporary Chairman. He appointed H.J. Williams of Boston ... to be Temporary Secretary. Under their direction the group first voted that they should be governed by a President, Vice President, Treasurer and Secretary, and by an Executive Committee. Then began an election to fill these offices. Arthur A. Noyes of M.I.T. was chosen to be the first president.⁵ Once he had been elected, he took the chair and presided over the selection of L.P. Kinnicutt of Worcester (Polytechnic Institute) as Vice President, Willis R. Whitney of M.I.T. as Secretary, and B.F. Davenport of Boston... as Treasurer. Then follow some details of the nomination and election of the Executive Committee. ...The winners were John Alden of the Pacific Mills in Lawrence, H. Carmichael

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of Boston... Arthur D. Little of Boston...John Shaw of Boston... and H.P. Talbot.⁶

The remainder of the paper has been covered in detail in the article by Myron Simon in the February 1998 issue.

¹ This scurrilous pun is almost, but not quite as low as it sounds. The NUCLEUS was only one month old at the time, and must have seemed to many to be a naked little baby, entirely at the mercy of the elements. No copy of this sheet has been preserved, but from the published howls released by the Editor of the NUCLEUS, it must have resembled the Police Gazette more than it did the Atlantic Monthly. If the incident proves anything at all, it shows that the Editor of the NUCLEUS has always had to bear more than his share of vilification.

² [added by the editor] Rachel Bodley six years later resigned in protest after hearing about the infamous "Misogynist Dinner" from which ladies had been excluded, at the 1980 Boston meeting. But that is another story, to be told at another time.

³ Whatever happened to that \$1.00/ that was left behind? Has it been out at compound interest all these years, waiting until now to become a secret answer to the annual anguish of today's Budget Committee? Perhaps, but there is no "North End Savings Bank" listed in the latest Boston Telephone Book [that was in 1973].

⁴ There is no Metropolitan National Bank in the Telephone Book, either.

⁵ Here, in the first two paragraphs, we have ample evidence that extraordinary teachers have always been concerned with the Section's affairs. Dr. Talbot's text: "Quantitative Chemical Analysis" was first published in 1897. This text, first revised by him, and later revised by our own Leicester F. Hamilton and Stephen G. Simpson, has gone through twelve editions [by 1973]. Dr. Noyes' text: "Qualitative Chemical Analysis" was also first published in 1897. This has been through ten editions, the most recent being a revision by Ernest H. Swift of the California Institute of Technology. The Macmillan Company, publisher of both texts, has continuously listed them prominently in its catalogue right up to the present day.

⁶ It is important to note that this election was just the beginning of service to the ACS for many of those elected. Noyes was President of the National Society in 1904, Kinnicutt was Chairman of the Section in 1901, Whitney was President of the Society in 1909, Little was Chairman of the Section in 1899 and President of the Society in 1912 and 1913, Alden was Chairman of the Section in 1900 and Talbot was Chairman of the Section in 1916. One of the losers in the election, J. Russel Marble of Worcester, was Section Chairman in 1913. ◇

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James ended his presentation with a final message: "The hydrogen era is dawning." ◇

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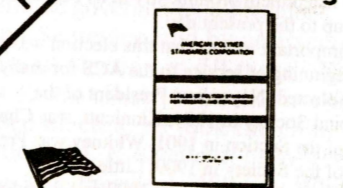
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Mar. 24

Prof. Toyochi Tanaka (Mass. Inst. Tech.)
"TBA"

Brandeis Univ.
Gerstenzang, Rm 122, at 4:00 PM

Zbigniew J. Witzak (Univ. Conn)
"Synthetic Analogs of Cell Surface
Carbohydrates and Antigens as Potential
Anticancer Agents: Dreams or Reality"
Mass. Inst. Tech.
Faculty Club, Glycobiology Dinner Meeting at
6:30 PM
Call (617) 642-0025 for reservations

Prof. Harry Anderson (Univ. Oxford)
"Using Non-Covalent Interactions to Control the
Properties of Conjugated Organic Materials"
Tufts Univ.
Pearson Hall, Rm 106, at 4:30 PM

Mar. 25

Prof. Robert McMahon (Univ. Wisconsin,
Madison)
"Structure and Spectroscopy of Organic Reactive
Intermediates: Relevance to the Organic
Chemistry of the Interstellar Medium"
Boston College
Merkert Chemistry Ctr., Rm. 127, at 4:00 PM

Mar. 26

Prof. Marsha Lester (Univ. Pennsylvania)
"Infrared Spectroscopy and Reaction Dynamics
of 'Activated' Entrance Channel Complexes"
Boston College
Merkert Chemistry Ctr., Rm. 127, at 4:00 PM
Dr. Richard Schwartzstein (Beth Israel Hospital)
"Cardiac Markers and Length of Stay in the
Emergency Department"
NEACC dinner meeting
DoubleTree Guest Suites Hotel, Waltham at
6:00 PM
RSVP Dr. David Drum (617-732-6987, page
11161
e-mail: dedrum@bics.bwh.harvard.edu)

Prof. Alex Jen (Northeastern Univ.)
"Recent Advancement of High Performance
Electrooptic Materials for Device Applications"
Univ. Mass, Lowell
Olney Hall, Rm 428, at 3:30 PM

Mar. 27

Dr. Richard A. Kramer (Novartis
Pharmaceuticals)
"The Story of the Discovery of HIV Protease and
Its Inhibitors"
Boston Univ.
Rafik B. Hariri Bldg, Rm 224, at 2:00 PM

Mar. 31

Prof. Daniel Romo (Texas A&M Univ.)
"Small Heterocycles Doing Big Jobs:
Asymmetric Synthesis and Utilization of
 β -Lactones and β -Lactams in Bioactive Natural
Products Synthesis"
Brandeis Univ.
Gerstenzang, Rm 122, at 4:00 PM

Prof. David E. Cane (Brown Univ.)
"Specificity and Versatility in Erythromycin
Biosynthesis. From Natural to 'Unnatural'
Natural Products"
Tufts Univ.
Pearson Hall, Rm 106, at 4:30 PM

Apr. 1

Prof. Daniel Romo (Texas A&M Univ.)
"Small Heterocycles Doing Big Jobs:
Asymmetric Synthesis and Utilization of
 β -Lactones and β -Lactams in Bioactive Natural
Product Synthesis"
Boston College
Merkert Chemistry Ctr., Rm. 127, at 4:00 PM

Dr. Dale J. Kempf (Abbott Laboratories)
"Peptidomimetic HIV Protease Inhibitors:
Design, Development and Clinical Utility"
Boston Univ.
Rafik B. Hariri Bldg, Rm 224, at 2:00 PM

Prof. Daniel Torok (American Cyanamid)
"TBA"
Univ. Mass, Dartmouth
Science & Eng. Bldg, Rm 305, at 4:00 PM

Apr. 7

Prof. John Greedan (McMaster Univ., Toronto)
"Structural and Magnetic Studies of Battery
Oxides in the Li-Mn-O System"
Tufts Univ.
Pearson Hall, Rm 106, at 4:30 PM

April 9

Prof. Michael Haley (Univ. Oregon)
"Dehydrobenzoannulenes Revisited: A New
Look at an Old Molecular System"
Boston College
Merkert Chemistry Ctr., Rm. 127, at 4:00 PM

Apr. 14

Prof. Mark Lautens (Univ. Toronto)
"Synthesis of Bioactive Compounds via
Cycloaddition and Fragmentation Reactions"
Boston College
Merkert Chemistry Ctr., Rm. 127, at 4:00 PM
Prof. Cynthia Friend (Harvard Univ.)
"The Surface Chemistry of Hydrocarbon
Oxidation: Experiment and Theory of Site
Selective Reactions"
Tufts Univ.
Pearson Hall, Rm 106, at 4:30 PM

Apr. 16

Prof. Erick Carreira (Cal. Inst. Tech.)
"Asymmetric Synthesis with Transition-Metal
Reagents and Catalysts"
Boston College
Merkert Chemistry Ctr., Rm. 127, at 4:00 PM
Prof. Nicholas Turco (Columbia Univ.)
"TBA"
Mass. Inst. Tech.
Room 6-120, at 4:00 PM

Apr. 17

Dr. John J. Kim Wright (Bristol-Myers Squibb
Pharmaceuticals)
"Topics in Stroke, Sleep and Alzheimer's
Disease"
Boston Univ.
Rafik B. Hariri Bldg, Rm 224, at 2:00 PM

Apr. 21

Prof. Steve Regan (Lehigh Univ.)
"Supramolecular Chemistry with a View Towards
Materials Science, Biology and Medicine"
Tufts Univ.
Pearson Hall, Rm 106, at 4:30 PM

Apr. 23

Prof. Mounji Bawendi (Mass. Inst. Tech.)
"Semiconductor Nanocrystallites: from Artificial
Atoms to Heterostructures"
Boston College
Merkert Chemistry Ctr., Rm. 127, at 4:00 PM

Apr. 24

Dr. Neil Moss (Boehringer-Ingelheim
Pharmaceuticals)
"The Design of Inhibitors of Protein-Protein
Association"
Boston Univ.
Rafik B. Hariri Bldg, Rm 224, at 2:00 PM

Apr. 28

Prof. Shinji Murai (Osaka Univ.)
"TBA"
Mass. Inst. Tech.
Room 6-120, at 4:00 PM

Apr. 28

Prof. Marc Snapper (Boston College)
"New Applications for Olefin Metathesis in
Organic Synthesis"
Brandeis Univ.
Gerstenzang, Rm 122, at 4:00 PM

Notices for the Nucleus Calendar should be sent to:

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