Monthly Meeting
Education Night at B.U.
Guy Crosby speaks on Chemistry of Nutrition

Election 2003
Election of candidates for 2004

Book Review
Quantum Leaps in the Wrong Direction,
by C. M. Wynn and A. W. Wiggins

Historical Note
Edward Frankland’s Crusade for Clean Water in the 19th Century
Meeting Report

From the April 10, 2003 Esselen Award Address

The Discovery and Development Of Lipitor, (Atorvastatin Calcium)

Bruce D. Roth, Department of Chemistry, Pfizer Global Research and Development, Ann Arbor Laboratories

Despite decades of research, coronary heart disease is still the number one cause of death in the United States and in many western societies. Because of the importance of this public health issue, the search for drugs to lower levels of total and low-density lipoprotein cholesterol has been the focus of considerable research over the past four decades. A major chapter in this story was the search for potent and efficacious inhibitors of the enzyme HMG-CoA reductase (HMGRI), the rate-limiting enzyme in cholesterol biosynthesis especially during the 1970s and 1980s. Building on the discovery of the fungal metabolite-derived inhibitors, mevastatin, lovastatin, pravastatin and simvastatin, during the late 1970s and early 1980s, a number of totally synthetic inhibitors, including atorvastatin calcium were discovered and developed.

The first indication that the complex hexahydrophthalalene portion of the fungal metabolites could be replaced with a simpler ring system without loss of biological activity appeared in a patent application, then in publication form, from the Merck, Sharpe and Dohme Research Labs. In this disclosure, it was revealed that ortho-biphenyl containing 3,5-dihydroxy-6-heptenoic acids and their lactones were equipotent to the fungal metabolites at inhibiting HMG in vitro. This disclosure led to the hypothesis that the key requirements for potent inhibition of HMGRI were a mevalonolactone, 3,5-dihydroxy-heptanoic or 6-heptenoic acid moiety and a large lipophilic group held in the correct spatial relationship by a spacer or template group. If this were true, then virtually any ring system which fulfilled this requirement would lead to a series of potent inhibitors.

We selected the 1H-pyrrole ring system as our starting template to test this hypothesis, primarily because these could readily be prepared from 1,4-diketones through the classical Paal-Knorr condensation and these 1,4-diketones, in turn, were potentially available possessing a wide variety of 1- and 4-substituents employing the thiazolium salt chemistry developed by Stetter.

In practice, this scheme proved highly effective and a large number of 1,2,5-trisubstituted pyroles were prepared. These could be converted in several synthetic steps to the target 4-hydroxy-pyranones as racemic mixtures of the 4R, 6R and 4S, 6S stereoisomers. These were then ring-opened by base hydrolysis to provide the biologically active dihydroxyacids.

Using this chemistry we next prepared a series of approximately thirty 2,5-disubstituted analogs possessing a range of substituted aromatic, cyclic, branched and straight-chain aliphatic groups to define the optimal substituents at the 2- and 5-positions.

The conclusion from this exercise was that the distance across the pyrrole ring from the tip of the 2-substituent to the tip of the 5-substituent could be no longer than 10 angstroms with the size of the 2-substituent being no more than 5.9 angstroms and the 5-substituent being no more than 3.3 angstroms. Further refinement of this analysis revealed that best potency was contained in the compound possessing a 4-fluorophenyl in the 2-position and an isopropyl in the 5-position of the pyrrole ring. Unfortunately, this compound still possessed only one-tenth of the inhibitory potency of mevastatin.

Taking into account the likely scenario that all of the biological activity was contained in one stereoisomer, we were still considerably short of the target potency and had come to the limit of what could be accomplished using the current synthetic route. In these circumstances, the options are to find alternate series or to attempt to ascertain the source of the deficiency. To this end, a simple molecular modeling exercise was undertaken to compare the differences between our best compound and those reported by Merck.

The simple overlay of these molecules revealed the presence of a methyl group in the Merck compound in a region of space not occupied by our inhibitors.

To determine the importance of occupying this space, bromine and chlorines were introduced into the 3- and 4-positions of our most potent analog. After testing the ability of these compounds to inhibit rat-liver HMGRI, we were gratified to find that both compounds possessed inhibitory potencies comparable to the fungal metabolites.

Although initially we were excited by this finding, the 3,4-dibromo analog was taken into early preclinical development and rapidly found to display considerable toxicity. As it turned out, much of the toxicology had been observed by others and was found to be specific to rodents or was derived from exaggerated pharmacology at high dosage levels and was most severe with very bioavailable inhibitors which achieved high plasma and tissue concentrations. Once again, we were faced with a decision point in the pyrrole series. Since we did not know whether the toxicity observed was related to the mechanism of action, the pyrrole series or the presence of the bromines in the 3- and 4-positions, rather than abandoning the pyrrole series, a two pronged approach was taken of both looking for alternative series and synthesizing 3,4-nonhalogen-substituted pyrones in the hope that these compounds would retain activity, but lack toxicity. Unfortunately, the requirement for a penta-substituted pyrrole also required the development of an entirely new synthetic route to effectively develop the SAR at the 3- and 4-positions, since the existing route was limited only to those substituents that could be introduced by electrophilic substitution.

A possible solution was presented through the 3+2 cycloaddition of azlactones and acetylenes pioneered by...
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Cover: Guy A. Crosby, May speaker

Deadlines: Summer Issue: June 13, 2003
September issue: July 18, 2003
Meeting Report

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Huisgen. This chemistry proved to be a very versatile means of preparing pentasubstituted pyrroles from α-amidoacids and acetylenes containing at least one electron withdrawing group. Using the chemistry developed previously, a series of compounds were made with the already optimized 2-(4-fluorophenyl) and 5-isopropyl substitution and a variety of phenyl, substituted phenyl, ester, amide and nitriles at the 3- and 4-positions.

Due to the difficulty in synthesis, a total of only 20 analogs were prepared, with best activity found in the 3-phenyl, 4-carboxamidophenyl analog. Separation of the two enantiomers by synthesis and separation of the diastereomeric R-α-methylbenzylamides followed by hydrolysis demonstrated that, as expected, all of the biological activity resided in the (+)-stereoisomer. This isomer was later confirmed to be the R,R-stereoisomer by total synthesis and x-ray crystallography and found to possess inhibitory potency approaching that of simvastatin in vitro. Scale-up of this analog and preliminary testing in vivo in animal models of hypercholesterolemia demonstrated that this compound possessed potency and efficacy in vivo comparable to that found with lovastatin. In subsequent studies done under more carefully controlled conditions with larger groups of animals, it was determined that atorvastatin was actually more potent and efficacious than lovastatin at lowering LDL-cholesterol in rabbits and guinea pigs and triglycerides in rats.

Having identified a potent and efficacious HMGR inhibitor, we were now faced with a critical decision, that of whether to develop our compound as the racemate or the pure stereoisomer. We chose to develop atorvastatin as the pure stereoisomer, for several reasons: 1) to avoid the unnecessary burden to the patient of having to metabolize 50% of inert material (the wrong enantiomer) and 2) the desire to avoid having an obvious disadvantage (potency) in a compound entering the marketplace potentially 10 years after the fungal metabolite derived inhibitors.

Having made this decision, we formed two teams of chemists working in parallel towards a chiral synthesis, one in Discovery Chemistry in Ann Arbor and a second in Chemical Development in Holland, Michigan. The first challenge was actually not the chiral synthesis, but scaling the achiral parts of the existing process that would be needed for the ultimate chiral synthesis. Critical to the success of the commercial synthesis was the successful Paal-Knorr cyclization of a highly substituted 1,4-diketone by the Holland Chemical Development group. This breakthrough opened up the possibility of a convergent synthesis employing a fully elaborated side-chain.

Building on the Holland success Ann Arbor was able to develop an enantioselective synthesis of atorvastatin, but because of the linear nature of our route, it was not acceptable for large-scale production. Thus, for the synthesis to be economically viable, the Holland group developed a synthesis wherein they built the entire side-chain with all of the correct stereochemistry in place, then in a completely convergent manner, united it with the appropriate 1,4-diketone using a Paal-Knorr condensation under very carefully defined conditions to produce atorvastatin calcium after removal of protecting groups and formation of the hemi-calcium salt.

Although one might have expected that the decision to take atorvastatin calcium into clinical development would be straightforward, it was not. By the time we completed the preclinical studies needed to file an Investigational New Drug Application (IND) with the Food and Drug Administration (FDA) in late 1989, Mevacor®, Zocor® and Pravacol® had all been approved for marketing by the FDA. Thus, we were faced with the expectation of coming into the marketplace nearly a decade after at least 3 HMGRIs without a clear improvement.

Despite these concerns, the decision was taken by Dr. Ronnie Creswell, then President of Parke-Davis Research, to move atorvastatin calcium into clinical trials in the hope that an improved efficacy profile would be observed in man over the then available drugs. To the delight of all those involved in the discovery and development of atorvastatin calcium, the merits of the drug were rapidly demonstrated in the phase 1 clinical trials in healthy volunteers where reductions in LDL-C approaching 60% were observed at the high dose of 80mg/day (see Table). This data provided the impetus for further development, since this level of efficacy was not achievable with other HMGRIs at approved doses or, in fact, with any other cholesterol-lowering drug.

Since that original study in healthy volunteers, the outstanding potency and efficacy at lowering total cholesterol, LDL-cholesterol and triglycerides of atorvastatin calcium, now

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Red Sox Tickets

May 15, 2003 at 7:05 pm
Red Sox vs. Texas Rangers

Right field box seats (normally @$37)
available for $27. Call Marilou Cashman at 800-872-2054, then send a check to her:
23 Cottage St., Natick, MA 01760.
For information, call:
Wally Gleekman at 617-527-1192 ◊
Biography

Guy A. Crosby, Ph.D., is a consultant, writer, and lecturer on food and nutrition chemistry. He has over thirty years of experience as a scientist and executive in various fields of organic chemistry, including the food, pharmaceutical, and agricultural industries. Dr. Crosby obtained a B.S. degree in chemistry from the University of New Hampshire, followed by a Ph.D. degree in organic chemistry from Brown University in 1969. At Brown his research focused on steroid chemistry, an area of chemistry that had been of great interest since high school. He then worked as a postdoc-

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Monthly Meeting

The 843rd Meeting of the Northeastern Section of the American Chemical Society

Education Night

Thursday, May 8, 2003

Boston University School of Management,
595 Commonwealth Ave., Boston, MA; 4th Floor Executive Dining Room

5:30 pm Social Hour

6:30 pm Dinner

7:45 pm Evening Meeting, Dr. John Neumeyer, NESACS Chair, presiding

Address: Recent Developments in the Chemistry of Nutrition and Their Impact on Human Health – Dr. Guy A. Crosby, Consultant, writer and lecturer on food and nutrition chemistry

Presentation of Awards:

Philip L. LeVins Memorial Prize

James Flack Norris/Theodore William Richards Undergraduate Research Fellowships

Undergraduate Grants-in-Aid

2002 Project SEED students

Excellence in Teaching at the Secondary School Level

Induction of New Members into Aula Laudis

Avery A. Ashdown Chemistry Examination Prizes

Simmons College Prize

Dinner reservations MUST be made no later than noon, May 1. Please call or fax Marilou Cashman at (800) 872-2054 or e-mail at MCash0953@aol.com. Reservations not cancelled at least 24 hours in advance must be paid. Members, $28.00; Non-members, $30.00; Retirees, $18.00; Students, $ 10.00.

THE PUBLIC IS INVITED.

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

Parking: Recommendation: Use the T (Green Line, first stop west of Kenmore). There will be no Red Sox home game, so on-street meter parking, especially on Bay State Rd. (parallel, north of Commonwealth Ave.) is a possibility. Limited parking will be available in the garage, under the School of Management Building. Enter from Commonwealth Ave. westbound. Obtain a voucher at the dinner desk for free parking.


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ABSTRACT

Driven by life-extending medical breakthroughs, and the resulting dramatic rise in medical costs, many people in the developed world have become much more interested in diet and health in recent years. The presentation will focus on a few selected topics in nutrition related to cardiovascular disease, cancer, dementia, and obesity. The role played by key nutrients in reducing the risk of these often fatal diseases will be elucidated through a discussion of the chemistry of the nutrients.

The first topic to be discussed will be resistant starch (RS). Until fairly recently it was believed that all dietary starch was rapidly metabolized to glucose. We now know that highly crystalline starch is not digested in the small intestine, but reaches the large intestine mostly intact, where it is fermented by beneficial microorganisms to short chain fatty acids. As a result, RS has been shown to have many beneficial physiological properties, which will be discussed during the presentation.

The essential polyunsaturated fatty acids and their conversion to the physiologically potent eicosinoids will be discussed as the second topic. Recent research has shown that the \( \omega-3 \) fatty acids are potent inhibitors of the conversion of \( \omega-6 \) fatty acids, such as arachidonic acid, to eicosinoids which are involved in a number of adverse effects, including coronary artery disease, increased blood pressure, inflammation, and much more. The role of nutrition in providing a healthy balance of fatty acids in the diet will be discussed.

Elevated levels of the metabolic amino acid homocysteine have been implicated as a risk factor in cardiovascular disease, stroke, and Alzheimer’s disease. The role of vitamins B6, B12, folic acid, and the quaternary ammonium compound betaine in maintaining a healthy level of homocysteine in the body will also be discussed.

Finally, a presentation on nutrition would not be complete without a discussion of the role of nutrition and diet on obesity. The recent discovery of small peptide hormones, which effect
ACS SHORT COURSE

Designed to improve the skills and marketability of practicing B.S., M.S., and Ph.D. chemists.

The NESACS Committee on Continuing Education is pleased to sponsor this newly updated National ACS Two-Day Short Course, at a registration fee less than half of that charged at National ACS Meetings.

LC/MS: Fundamentals and Applications

In this course you will receive an overview of applications for the environmental, biotechnology, pharmaceutical, and chemical industries, and for areas of forensics and toxicology.

This Short Course is designed as a practical overview of LC/MS for researchers, practitioners, technicians and others who are currently using LC, LC/MS, or plan to do so in the future, and those dealing with data produced by LC/MS. Practitioners just embarking on the technique will gain insight to select the appropriate instrument for different applications, and those currently using LC/MS and its data will develop an appreciation for, and an understanding of, the complexities of the data generated. Participants should bring a basic calculator to the course.

DATES and TIME: Monday, May 19, 2003; 8:00 a.m. – 5:00 p.m. and Tuesday, May 20, 2003; 8:30 a.m. – 5:00 p.m.

PLACE: Egan Center, Room 340, Northeastern University, 360 Huntington Ave., Boston, MA

PROGRAM AGENDA:

• Solvent delivery systems, columns, interfaces, ionization methods, and mass analyzers; methods; data evaluation
• What types of instruments are available for various types of analyses
• What are the latest developments in instrumentation
• How to get structural information from LC/MS
• How to deal with multiple-charge ions

• What changes may have to be made when porting LC method to an LC/MS method
• Types of mass analyzers, and which is most suitable for a given analysis by LC/MS
• Steps in the interpretation of collisionally activated dissociation (CAD) data
• How ions are formed in an LC/MS analysis
• Approaches to problem solving with LC/MS

INSTRUCTORS:

O. David Sparkman, Adjunct Professor of Chemistry at the University of the Pacific, Stockton, Cal., a consultant to the NIST Mass Spectrometry Data Center, teaches courses in mass spectrometry and analytical chemistry and manages the mass spectrometry facility. He is on the Editorial Advisory Boards of the Journal of the American Society for Mass Spectrometry and the HD Science GC/MS Update – Part B. He is the author of Mass Spectrometry Desk Reference, and co-developer of the Mass Spectral Interpretation Quick Reference Guide.

Frederick E. Klink, currently a consultant in LC, LC/MS, and other scientific instrumentation, has worked with a variety of industrial clients. He has over 16 years of experience in a variety of technical and managerial positions in the analytical instrument industry. Starting as a life sciences applications chemist in HPLC, he has worked in product development, and product and marketing management for a major HPLC manufacturer.

These are two of the most highly rated instructors in the ACS continuing education program.

PRE-REGISTRATION REQUIRED – Registration Fees:

ACS Members if received before May 2 $500.00; after May 2 $575.00
Non-ACS Members if received before May 2 $600.00; after May 2 $675.00

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

Parking Fee: about $14.00/day University cafeterias will be available for lunches.

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


Name: _________________________________________ Business Affiliation: ______________________________
Mailing ________________________________________ Telephone: ______________________________
Address ________________________________________

Mail with remittance to:
Prof. Alfred Viola, Chair
NESACS Committee on Cont. Ed.
Department of Chemistry
Northeastern University
Boston, MA 02115

(Please make checks payable to NESACS.
(Sorry, we cannot accept credit cards or purchase orders.)
marketed in the United States as Lipitor®, has been reproduced and confirmed in numerous clinical studies and in millions of patients. Due to its enhanced ability to lower LDL-cholesterol in comparison with other available agents, since its launch in 1997, it has rapidly become the largest selling medicine in the world, with 2002 sales of nearly $8 billion. More importantly, if outcome studies turn out as expected, one can predict that millions of years will be added to the total life expectancy of people in the United States and other western societies where elevated levels of plasma cholesterol are still a major problem.

Table. Multiple-Dose Tolerance and Pharmacologic Effect of Atorvastatin Calcium in healthy volunteers

<table>
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<th>Dose (mg/d)</th>
<th>% change (mg/dL) Total Cholesterol</th>
<th>% change (mg/dL) LDL-Cholesterol</th>
<th>% change (mg/dL) Triglycerides</th>
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<tr>
<td>Placebo</td>
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<td>-3</td>
<td>-3</td>
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<td>-16</td>
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</tbody>
</table>

Abstract

the energy balance of the body and appetite, will be touched on. A few guidelines for a healthy diet based on all the topics will conclude the presentation. ☺

Biography

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torial fellow in the laboratory of the late William S. Johnson at Stanford University on the total synthesis of steroids by polyolefinic cyclization.

Deciding to stay in California, he began his professional career as a research scientist with the Alza Corporation, then became Director of Synthesis for Dynapoll, a company also founded by Dr. Alejandro Zaffaroni. During this period he taught graduate courses in organic synthesis at Stanford University as a Consulting Professor of Chemistry from 1972 until 1980. The California phase of his career led to extensive research and publications on some of the very first polymeric reagents, prostaglandin chemistry, new synthetic sweeteners, and other food ingredients.

As for many chemists, Dr. Crosby’s career then took him to New Jersey, where he became Director of Discovery for the Agricultural Chemicals Group of FMC Corporation in 1980. During this time he led the strategic planning effort for the R&D Group, resulting in the adoption of a successful pharmaceutical approach to the discovery of new agrochemicals. In 1989 he was appointed R&D Director for the Food and Pharmaceutical Division of FMC, and served in this position until leaving FMC in 1996 to return to his home state of Massachusetts as Vice President of R&D for Opta Food Ingredients. Opta provided Dr. Crosby the opportunity to become much more involved in nutrition, an area of great personal interest, through the development of a variety of healthy food ingredients, including resistant starch, oat fiber, konjac flour and cellulose gel.

Since January, 2002 Dr. Crosby has been pursuing his personal interests in food and nutrition chemistry as an independent consultant, writer and lecturer. He has over 50 scientific publications and 20 U.S. patents, and is a member of a number of professional organizations, including the American Chemical Society and the American Society for Nutritional Sciences.

guycrosby@attbi.com ☺
In the interest of providing maximum information and expression of opinion by the candidates for election in 2003, the Nominating Committee has prepared this section of the NUCLEUS for mailing concurrently with the ballots. All candidates were asked to submit biographical material and, with the exception of committee member nominees, position statements. To attain uniformity of format, the biographical data have been rearranged, and, where the text exceeded the allotted space, abbreviated. The statements have been reproduced without change. An official ballot, along with a ballot envelope and return envelope have been provided. The election and balloting are being carried out in conformance with Article VIII of the Constitution of the Northeastern Section. The order of candidates for each office on the ballot has been determined by lot. Comments regarding the election may be addressed to the Nominating Committee Chair, Dr. Morton Z. Hoffman (address on p.3).

BALLOT DIRECTIONS: Vote for the candidate(s) of your choice, insert your ballot into the ballot envelope. (Neither the ballot nor ballot envelope may have any writing or identification). Insert the sealed ballot envelope into the return envelope and sign your name on the return envelope only, affix postage and mail.

The ballot must be received by May 31, 2003. 

NESACS News
On the Suit by Brauner Family and Others

The family of the late Phyllis A. Brauner, a long-time member of the Northeastern Section, has joined two other families in reopening a landmark Supreme Court Decision.

Dr. Brauner, who was active with the section until her death in 2000, is honored for her work with the Section by an annual Memorial Lecture during National Chemistry Week and an annual student book award.

The 1953 decision, which stemmed from the 1948 military plane crash that killed Dr. Brauner’s husband and eight other men, established the government’s right to keep secret information whose release it believes could endanger national security.

However, in a petition filed with the Supreme Court on February 26, 2003, the families of the three victims argue that the government was covering up human error, not protecting national security, when it fought to keep the accident report private.

The Supreme Court, Petition For A Writ of Error Coram Nobis To Remedy Fraud Upon This Court, is based on the earlier case, United States v. Reynolds. In this case, three widows of civilian engineers in the crash — one of them William Brauner — sued the government over their husbands’ death. The government refused to release the Air Force report on the crash, citing national security concerns regarding the electronic equipment on board. The ruling out of the Supreme Court remains the legal standard concerning government secrecy.

Nearly fifty years after the Supreme Court decision, the daughter of one of the engineers found the now-declassified report on-line and learned that the military had not only lied to the three widows but the Supreme Court as well. The cause of the accident was human error.

The interest in the current filing has attracted national attention, on National Public Radio and the press. 

Chair-Elect
Ernest V. Groman

Education: Dr. Groman earned a BS in mathematics from the University of California-Berkeley, and continued his postdoctoral studies at Massachusetts General Hospital and Harvard Medical School.

Professional Experience: He is Vice President - Development of Bio-Physics Assay Laboratory, a company dedicated to bringing new methods for measurements in the life sciences. Prior to joining BioPAL, Dr. Groman was a founder and Vice President (R&D) at Advanced Magnetics where he was the inventor of BioMAG®, a colloidal magnetic material used in cell separation and in vitro immunoassays, and brought six drug candidates to Phase 1 trials. Four of these drug candidates were designed for in vivo diagnostics as MRI contrast agents; two were designed as therapeutic agents for hepatitis B and parenteral iron replacement. Two of these drug candidates are for sale, one is awaiting approval, and one is in Phase 2 trials. In addition to pharmaceutical development experience, Dr. Groman has extensive experience in immunodiagnostics where he helped shape the technology and product lines of companies including Clinical Assays, Corning Diagnostics, Serono Diagnostics, Advanced Magnetics and Compucyte. Dr. Groman has published 30 scientific papers, two poems, and is an inventor with 29 issued patents.

NESACS Service: He has served as program chair and chair of the medicinal chemistry group and is currently a Director-at-Large of NESACS.
Memberships and interests: Dr. Groman is a member of the American Chemical Society (27 years) and belongs to the Carbohydrate Chemistry and Analytical Chemistry divisions. He is a past member of AAAS and American Association of Clinical Chemistry (AACC). Dr. Groman earned a brown belt in kempo karate and enjoys skiing and bird watching.

Statement: I am honored to be offered the opportunity to stand for election to the office of Chair of NESACS. The leadership of NESACS provided by the past and current chairpersons together with committee members has done a very creditable job meeting the challenges of running our society, both in educational and social programs and serving the chemical community. I pledge to continue this responsible leadership. I am committed to serving in the fullest capacity to maintain these high levels of quality within our society. I hope to bring increased corporate involvement in funding and sponsorship to the many diverse activities of our section. Please exercise your right to vote. Thank you.

Amy E. Tapper

Education: B.S., Boston College (1992); Ph.D., Boston University (2003).

Professional Experience: Aquatec, Inc., Colchester, VT (1994-95); Wyeth-Ayerst Pharmaceuticals, Rouses Point, NY (1995); Senior Scientist, Geltex Pharmaceuticals, Inc., Waltham, MA (subsidiary of Genzyme) (2001-).


Other Related Professional Experience/Service: Boston University Younger Chemists Committee-Founder and President (1999-2000); Chair, Career Development Committee (1999-2001); Co-chair, Social Committee (1999-2001); Member of the Graduate Student Organization of Boston University (1998-99); Student member of the Boston University Chemistry Graduate Affairs Committee (2000-01).

Statement: Over the past five years I have taken on leadership positions in the NESACS-YCC as well as on the NESACS board. During this period, I have recognized the need to have more younger chemists involved in the section. The average age of the NESACS board members is approximately 58 years, with 67% of our board over the age of 55. For the future of our local section, it is imperative that we have younger chemists active on committees and the NESACS board. Younger chemists can learn from the experience of our members and bring new ideas to the section. We need to increase the participation of younger chemists both from academia and industry as well as increase our industrial participation as a whole.

Our section is strong as a result of the continued dedication of our members. In 2002, NESACS was awarded a ChemLuminary award for the “Outstanding Performance by Local Section Very Large Size Category”. This award was supported by the exchange initiative between NESACS and the GDCh (German Chemical Society). Beginning in 2001, as a member of the NESACS-GDCh initiative steering committee, we organized a weeklong visit to Boston of 10 German students from the JungChemiker Forum (YCC). The focus of the week was a symposium on education in the US and in Germany, and participation of the German students at the Northeast Student Chemistry Research Conference (NSCRC). At the 2001 NSCRC, I also organized the attendance of the 2001 President of the ACS, Dr. Attila Pavlath. For the past two years, the exchange has been held in Germany, focusing on international education and careers, and the attendance of the US students at an international research conference, the Euregionale. The 4th exchange will be hosted by NESACS in the spring of 2004.

Over the past three years as chair of the NESACS-YCC, we have won three consecutive ChemLuminary awards, and I expect that we will win our fourth at the National ACS Meeting in NY this September.

Many younger chemists may not be aware of the career services, mentoring, and networking functions that are provided by NESACS. As chair, I would continue to support these activities. Over the past three years, I have organized an annual career workshop, which included speakers not only from industry and academia but also government, law, and business. Since 1999, I have also organized an annual social/networking event for younger chemists in the Boston area.

In summary, to maintain the success of our local section I will promote the involvement of younger chemists on NESACS committees and board positions. I will encourage higher attendance of all members at monthly meetings and I will continue to support career development and networking programs, including the exchange initiative with the GDCh.

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Secretary
Michael Singer

Education: B.S., State University of New York at Stony Brook (1986); M.S., Brandeis University (1988); Ph.D., Brandeis University (1993).


ACS Service: Councilor, (1996-2001); Alternate Councilor, (2003-);


Statement: The traditional role of Secretary has been one of limited visibility. This was to take the minutes of the monthly meeting of the Board of Directors and to report back to the membership. During my tenure as Secretary for the NESACS I have been able to increase the visibility of the Section Secretary and increase the efficiency of the position of Secretary. The biggest improvement is in communication by utilizing both email and the section website (www.nesacs.org). As our website undergoes its upgrade I intend to continue to work with the NESACS Webmaster to make the minutes of the NESACS Board of Directors available immediately after their approval by the Board. This empowers our membership to be aware of the current issues facing our section. I have also instituted written report prior to the NESACS meetings. This enables our section committee chairs to submit a written report instead of an oral report at the monthly meetings. This improves the efficiency of the monthly meetings by allowing the committee chairs to provide a more detailed report than can be given orally and permits more time for discussion during the monthly meetings. This also permits more accurate documentation and the creation of a permanent record (archive) for future use by NESACS members.

Trustee
Joseph A. Lima

Education: B.S. New Bedford Institute of Technology (1962); MBA Babson College (1975).


ACS Service: I’ve been a member since student affiliate days.

NESACS Service: My major involvement has been with the Board of Publications for The Nucleus and currently as an NEACS Trustee. Additionally, I’ve served on a number of ad hoc committees.

Statement: Our section is fortunate to have endowment funds available to support our many worthwhile activities. These activities benefit both our members and the “chemical community” in general. If reelected as a Trustee, I will continue to work with the other Trustees to ensure our funds are invested conservatively, managed wisely and used responsibly. May I have your vote?

Councilor/Alternate Councilor
Michaeline F. Chen

Education: Clarke College, B. A.; Boston College, M. S.

serve you as a councilor.

**Catherine Costello**

**Education:** AB degree (chemistry) Emmanuel College; MS and PhD degrees (organic chemistry) Georgetown University.

**Professional Experience:** Prof. of Biochemistry and Biophysics and Founding Director of the BUSM Mass Spectrometry Resource and the Cardiovascular Proteomics Center, Boston Univ. School of Medicine; Associate Director of the MIT MS Resource (1975-95).

**ACS Service:** Councilor for the Northeastern Section (1989-present; Alt., 1986-88), International Activities Committee and chair of its subcommittee on International Outreach/Developing Countries. She has completed many tours for the ACS Speakers Bureau; Standing Council Committee on Constitution and Bylaws (1994-99).

**NESACS Service:** Constitution and Bylaws Committee, current chair; four terms on the Nominating Committee; Bd. of Publications, Member and Chair

**Member:** President of the American Society for Mass Spectrometry (2002-04); member of AAS, the Society for Glycobiology and the Biophysical Society, and serves on NIH review panels and several editorial and advisory boards. She is the author or coauthor of about 180 scientific papers.

**Statement:** I wish to continue to serve as a Councilor for the Northeastern Section in order to keep the interests of our members before the National ACS, to provide input to national policies based on my experience with educational institutions, research funding programs and national and international exchange of scientists and information, and to increase access of our members to the wide resources available to support their work and careers. Although our research often straddles a wide range of activities, it is important that the ACS remain a central feature in our professional lives and in those of our students and colleagues. I strongly support collaborations among academic institutions and between academia and industry and will continue to encourage interdisciplinary research and training and to highlight new opportunities for chemists in diverse areas of work and study, at all stages of their education and careers.

**Mark Froimowitz**

**Education:** B.S. Chemistry, Brooklyn College (1968); Ph.D. Physical Chemistry, New York University (1972).

**Professional Experience:** Postdoctoral fellowship, Brandeis University (1972-73); postdoctoral fellowship, New England Medical Center Hospitals (1973-74); applications analyst, Massachusetts Institute of Technology, Cambridge (1974-76); Instructor, University of Lowell (1976-77); Assistant Biochemist, McLean Hospital (1977-86); Research Associate in Psychiatry (Psychobiology), Harvard Medical School (1977-79); Instructor, Department of Psychiatry (Psychobiology), Harvard Medical School (1979-87); Lecturer, Department of Chemistry, Tufts University (1986); Associate Biochemist, McLean Hospital, Belmont, MA (1987-93); Assistant Professor, Department of Psychiatry (Molecular Pharmacology), Harvard Medical School (1988-93); Senior Scientist, Molecular Design, Pharm-Eco Laboratories (1994-98); Scientific Fellow, Pharm-Eco Laboratories (1998-2002); Research Professor of Chemistry, Massachusetts College of Pharmacy and Health Sciences (2002-).


**Research Interests:** Molecular modeling using molecular mechanical and quantum mechanical methods; conformational analysis using experimental and theoretical methods; and the design and synthesis of pharmaco-
logical compounds with dopamine and opioid activities. About 60 publications and 6 issued patents.

**NESACS Service**: Medicinal Chemistry Group, Secretary-Treasurer (1981-82), Program Chairman (1990); Chairman (1991).

**Statement**: I have been a member of the Northeastern section for well over 20 years. During that time, I have not been active in the section itself though I have been very active in the Medicinal Chemistry Group of the section. I would like to become more involved with the section and to learn about the various issues that it faces today. I have been employed in both academia and industry and, if you choose the elect me, I hope to use my experience to make the right decisions that will benefit the section and the chemical community.

_Wallace J. Gleekman_

**Education**: Bridgewater State College, B.S. (1951); Boston University, Ed.M. (1952); Walden University, Ph.D. (1982).


**NESACS Service**: ACS Task Force on Education. Chair, Chemistry Education Committee; Chair, Summerthing; Chair, Northeastern Section (1981).


**Statement**: On the local level, we should encourage member participation in monthly meetings and increase involvement by our membership on section committees to provide improved member services. On the national level, we should use our section’s tremendous potential to influence ACS policy and activities.

_Lowell H. Hall_

**Education**: BS degree in Chemistry, Eastern Nazarene College (1959); PhD in Physical Chemistry, The Johns Hopkins University (1963).

**Professional Experience**: National Research Council postdoctoral fellowship at The National Bureau of Standards (Washington, DC) for research in single crystal x-ray crystallography in 1963. My first teaching position was at Florida Atlantic University from 1964 until 1967 when I became Associate Professor of Chemistry at Eastern Nazarene College in Quincy, MA. I was appointed Chairman of the Department of Chemistry in 1967 and then Chairman of the Division of Natural Sciences in 1976. I stepped down from these positions in 1999.

**ACS Service**: Committee for the preparation of the Quantum Chemistry section of the ACS Physical Chemistry Standardized Exam, chair for three years

**NESACS Service**: Norris-Richards Summer Scholar Research Committee, member for six years, the last three as Chair.

**Honors**: Lindbach Award for Outstanding Teaching as a Teaching Assistant and elected to Phi Beta Kappa (Johns Hopkins University).

**Statement**: My research program deals primarily with theoretical drug design in which I have developed novel computer-based methods for molecular structure representation. I have published four books and was invited to contribute ten chapters in other books. My research has led to over 100 research papers, many co-authored by my undergraduate stu-
dent. Further, I have created the Molsoft software for computation of topological descriptors of molecular structure, a representation of structure now widely used in the pharmaceutical industry. This approach is now incorporated into software available from MDL, Tripos, ChemSilico and EduSoft.

My career has been largely centered in the undergraduate program in chemistry, including forty years as a chemistry professor. Professional interests have taken me into the arena of consulting in industry and also into the high school area through the Science Fair program in Massachusetts. As a result of my professional experiences, I have three areas of significant interest: First, the undergraduate chemistry program must be continually developed. The excellent efforts of the Division of Chemical Education and the Journal of Chemical Education must be further supported. I have felt that the quality of these activities has provided chemistry faculty with an advantage over many other professions that lack such high quality professional activities. At this time, however, it may be beneficial to step up the curricular activities. Much is happening in the practice of chemistry that is difficult to translate into the undergraduate program, especially in instrumentation and in computational chemistry. To keep pace with these developments, some new approaches to curriculum and teaching may be necessary, including cooperative programs with industry.

My second area of interest is the high school program in chemistry. The concerns over safety in the laboratory together with financial pressures on local school committees make significant development of laboratory skills very difficult. In a time when concerns over handling chemical materials and also various environmental issues are increasing, it is even more important that high school students be better prepared in these areas. An important related area is development of mathematical skills, especially in problem solving. Since chemistry provides an excellent area for application of basic mathematical principles, closer collaboration between the teaching of math and the teaching of chemistry might be helpful.

A third area of interest for me is the public image of chemistry. Various issues and events have conspired to give chemistry a somewhat negative image. Although the actual nexus of this image problem is difficult to pinpoint exactly, the problem should be addressed in an ongoing effort. I believe we need an excellent public relations campaign to improve the image of chemistry as an industrial enterprise, a way of thinking, and as an attractive profession. We need to find ways to portray the excitement as well as the benefits derived from chemistry. This campaign could be carried out through the schools, colleges and universities as well as in the public media. Perhaps, appropriate materials could be prepared by the ACS for free distribution in the high schools. These materials could be designed with a dual purpose: the excitement of interesting problems and illustration of fundamental principles of chemistry. This campaign could have the effect of attracting the best students into careers in chemistry and related fields.

**Arno H. A. Heyn**

**Education:** B.S., Ph.D., Univ. of Michigan (analyt. chemistry).

**Professional Experience:** Boston University (Instructor to Professor, 1947-84); Prof. emer. (1984); visiting scientist appointments at Brookhaven Laboratory; Eidgen. Techn. Hochschule (Zurich); Kernforschungszentrum Karlsruhe


**NESACS Service:** Currently: Editor of The Nucleus (7/1989-); Const. and Bylaws Comm.; Esselen Award Committee (2000-03), Chair (2003); Awards Committee (Chair 1996-1997); Nominating Committee several times, last: (1996); Chairman sequence (1967-69); Treasurer (1959-62); Member and chairman of numerous committees in the past.

**Honors:** Henry A. Hill Award for Distinguished Service to the Northeastern Section (1986); Sigma Xi (1942)

**Statement:** Having represented the Section at most Council meetings for over 30 years either as Councilor or Alternate Councilor, I am eager to continue serving the Section in this capacity. In the ACS I have stood for a strong voice of the Local Sections in ACS governance. I favor a strong stand by the ACS in support of chemistry as profession. I strongly support activities of the ACS which advance a positive public recognition of chemistry as the central science.

In NESACS, I strongly support and hope to help advance program enrichment and increased communication both with its members and with the general public by excellent educational programs and general interest programs.

**Patricia A. Mabrouk**


**Professional Experience:** N.I.H. Postdoctoral Fellowship, Stanford University (1988-90); Assistant Professor, Northeastern University (1990-97); Associate Professor, Northeastern University (1997-). Cronis Postdoc, 1996-97.

**ACS Service:** Associate member of ACS SEED National Committee (2003).

**NESACS Service:** ACS SEED Coordinator (1998-present); Member of the Theodore William Richards ACS Medal (1999-present); Chair of the Theodore William Richards ACS Medal (2000-present).

**Member:** American Chemical Society; American Association for the Advancement of Science, National Science Teachers Association,
Honors: Sigma Xi

Statement: Due to the large number of colleges and universities in our urban arena, we are in a unique position as a section to positively impact our field for the future. We have a unique opportunity to positively affect student attitudes toward chemistry and so to increase the number of women and minorities in our field and allied fields. As a councilor, I would like to continue and expand our efforts to recruit and retain local undergraduate and graduate students who are studying chemistry and related fields, expand our outreach to high school teachers and college and university faculties, and serve as an active voice for our diverse membership with the national ACS.

Howard R. Mayne


Professional Experience: Professor and Chair, Department of Chemistry, University of New Hampshire, Durham, NH. Postdoctoral, Max-Planck-Institut für Strömungsforschung, Göttingen, Germany (1977-79); Research Associate, University of Toronto (1979-83); Assistant Professor, Eastern Michigan University (1983-85); Assistant Prof; UNH (1985-90); Assoc. Prof. (1990-94); Professor (1994-); Chair (1998-). Visiting Positions: UC Santa Barbara; Northwestern U.

Research: Physical Chemistry, Chemical Physics. Gas phase reaction dynamics; gas-surface interactions; structure, dynamics, and thermodynamics of clusters and polymers; optimization algorithms. Over sixty papers in peer-reviewed journals.

ACS Service: NESACS Alternate Councilor (2002-03); Co-chair, Local Committee, ACS Nationa Historic Chemical Landmark, UNH (1999); General Chair, Northeast Regional Meeting (NERM 2001); Chair, NERM Steering Committee (2001-03)

NESACS Service: National Meeting Committee (2002); Norris Award Committee (2003)

Member: ACS, American Physical Society, Council for Chemical Research, Alpha Chi Sigma

Honors: Outstanding Faculty Award (1990); Outstanding Teacher Award, College of Engineering and Physical Sciences (1990).

Statement: I have been closely involved with NESACS since 1999. I have tried hard to make the chemists in New Hampshire a more integral part of the organization. I co-chaired the committee that dedicated Conant Hall on the University of New Hampshire campus as an ACS National Historic Chemical Landmark in 1999. I chaired the 2001 Northeast Regional Meeting (NERM) in New Hampshire, and hosted the September 2002 monthly NESACS meeting in Portsmouth, NH. If elected, I will work to keep the New Hampshire constituency a vital one, and one that continues to contribute towards the work and strength of the Section.

Julia H. Miwa


ACS Service: Councilor (1999-2001)

NESACS Service: Membership Committee (2000-01)

Member: American Chemical Society, AAAS;

Honors: Pinanski Prize for Excellence in Teaching, Wellesley College (1997); Camille and Henry Dreyfus Faculty Start-up Grant for Undergraduate Institutions National Institutes of Health Postdoctoral Fellowship (1992). Sigma Xi; Phi Beta Kappa.

Research: Synthesis and Conformational Studies of Peptide Analogs with Backbone Modifications; Synthesis and Evaluation of Thiopeptide Analogs of the GCN4 Leucine Zipper Helix; Design, synthesis, and evaluation of inhibitors of HIV-1 protease. Synthesis of a combinatorial library of...
phosphinate inhibitors of thermolysin.  

Statement: My first term as a Councilor for NESACS was very instructive. At local and national meetings, my fellow NESACS Councilors helped me become familiar with the workings of the ACS Council and the challenges facing local sections. If elected to another term, I hope to put this experience to work on behalf of the Northeastern Section.

My particular areas of interest are (a) chemical education and the issues facing academic chemists (job security issues, ACS curricula, and K-12 teacher training are a few of the hot issues in this area) and (b) the status of chemical professionals and of chemistry as a discipline (outreach activities and communication with legislators fall under this heading). If elected, I would seek to work on Council Committees that address these particular issues.

ACS serves a diverse group of chemical professionals. The membership includes male and female professionals of varying ages, races, educational levels, and professional interests. For the most part, ACS Council does not reflect this diversity. The NESACS delegation reflects the diversity of the ACS membership better than most, and this is a direct result of the efforts of our leaders to encourage participation from all members of NESACS. There are many qualified candidates on this year’s ballot, and all will represent NESACS well. I hope the voters will do as they have done in the past and select a varied slate of Councilors to represent NESACS. I would be pleased to serve again as Councilor of the NESACS and to share my experience with any new Councilors elected this time.

Dorothy J. Phillips  


ACS Service: Councilor, (1995-2003); Committee on Committees (2001-03), chair of Industrial Pipeline Task Force; Committee on Membership Affairs, (1997-00), Associate (1996); Committee on International Activities, Associate (1998).

NESACS Service: Chair (1993); Chair-Elect and Program Chair (1992); Project SEED, Committee Chair, (1994-95); Nominating Committee, Chair (1994); Co-chair Centennial Celebration (1998).

Member: ACS since 1973; NOBC-ChE; AAPS. ASMS, ACS Divisions: Agrochemicals; Analytical Chemistry; and Biological Chemistry.

Honors: Sigma Xi; Distinguished Alumni, University of Cincinnati, awarded by both McMickens College of Arts and Sciences and Center for Women Studies; Waters’ Manager Award for Innovation, (1987, 1988).

Related Activities: Delegate with the People to People Ambassador Program to China in 1990 with a group of scientists for technology transfer; Established Waters’ sponsorship of the Distinguished Service Award in Analytical Chemistry given by the Division of Analytical Chemistry; Partners in Mathematics and Science Committee of Alpha Kappa Alpha Sorority Incorporated, coordinating the Northeastern Section’s sponsorship of programs that focus on increasing the math and science interest of minority students in greater Boston; Approximately 70 publications and presentations on HPLC.

Statement for Councilor: The American Chemical Society (ACS) achieves its goals and objectives through the volunteer efforts of its individual members. The members also grow from their volunteer service to the ACS. The Society and I have benefited from my serving three three-year terms as Councilor for the Northeastern Section (NESACS). I wish to serve the ACS to achieve my vision for a more dynamic, global American Chemical Society. I want to continue as Councilor in order to realize my vision for ACS. The combination of my corporate career and ACS service has provided me with a unique set of skills to strengthen the programs and operation of NESACS. I will focus on supporting the diversification of programs, and the development of new leaders for the Section in my next three-year term.

I am a member of the Committee on Committees whose function is to staff other committees in ACS governance. I realized the need for succession planning while serving in this elected position. NESACS would be more effective with a pipeline of potential leaders for Board positions and committee chairs. I will work with the Board on leadership development.

I have participated in programs sponsored by organizations such as the New England Board of Higher Education that nurture minorities interested in chemistry. I can foresee joint activities with these types of organizations, leading to NESAC programs that are broader in scope and target audience.

I ask you to support my serving as a Councilor of NESACS. A stronger section and a more dynamic global American Chemical Society can become a reality.

Michael Singer  

(For the biographical information, see above under Secretary)  

Statement for Councilor: The Northeastern Section of the American Chemical Society has over 6000 members. Our collective voice needs to be heard. During my prior tenure as Councilor for the NESACS I have had the opportunity to bring that voice directly to the attention of the national officers of the American Chemical Society. Maintaining open communication between the local and national officers of the ACS is critical to the growth of our professional organization. As your local elected representative to the National ACS Council I would hope that you send your concerns and issues to me so I may direct them to the appropriate offices of the ACS. I have over the past few years been able to aid in the transfer of knowledge from the National to the Local level ranging from membership.
to expositions to the Employment Clearing House to the Chemistry Olympiad. With your support and vote I pledge to continue to work as a voice for the local membership.

J. Donald Smith

Education: Columbia University, B.A. (1965); Ph.D., University of Chicago (1969); Post-doctoral Fellow, Albert Einstein College of Medicine (1970-74).

Professional Experience: Chancellor Professor Emeritus, Department of Chemistry and Biochemistry, University of Massachusetts Dartmouth. Research Scientist, New York State Department of Mental Hygiene (1974-75); Miami University, Assistant Professor of Chemistry (1975-82); joint appointment Department of Biochemistry, Wright State University School of Medicine (1975-77); University of Massachusetts Dartmouth: Asst. Prof. (1982-84), Assoc. Prof. (1984-89), Professor (1989-97), Chancellor Professor (1997 - 2002); Department Chair (1990-94); Adjunct Professor (2002-).


Honors: SigmaXi (1968); Dreyfus Scholar/Fellow Award (1997).

Statement: Now that I have ‘retired’ I feel that I am in a position to give much more to the Section than I have been able to do previously. I am particularly interested in working on those Committees which have done so much recently in getting new people active in the section.

Alfred Viola

Education: BA, MA, Johns Hopkins University; Ph.D., University of Maryland.


NESACS Service: Continuing Education Committee (1989-), Co-Chair (1989), Chair 1990-).


Statement: I was honored to receive the Henry A. Hill Award in 1996 for Distinguished Service to the Northeastern Section, but that did not entitle me to rest on my laurels. As Chair of the Continuing Education Committee I have been responsible for bringing National ACS Short Courses to the Section at a fraction of the tuition costs normally associated with these programs. Many of the cutting edge topics covered in such courses were not in any curriculum for Chemists graduating as recently as five years ago. I firmly believe this to be a vital activity which the Section must undertake to provide our membership the opportunity to stay abreast of the ever evolving advances and changes in the world of Chemistry.

In a different vein, I firmly believe that the problems facing the chemical profession and its practitioners are more numerous and profound than at any previous time in the history of the science. But so too are the opportunities for Chemistry to contribute to the health and welfare of society as a whole. We must do more to educate our political leadership whose scientifically uninformed decisions often hinder scientific progress in this nation. We also must address the rampant sci-
Scientific illiteracy within the public at large. There is a need for far greater understanding of the truths and misconceptions which abound about the world of Chemistry. The world of advertising is rampant with misstatements regarding chemicals, or lack thereof, in individual products. Chemistry has long been a positive force in the welfare of society but the general public now perceives it otherwise. I would like to see the A.C.S. address this issue more forcefully.

I would appreciate your vote to provide me the opportunity to continue my activities on behalf of this Section and to represent these views within the Northeastern Section and the National Council.

David Warr

Statement: I am a Professor of Biology and Chemistry and presently Chair of the Department of Natural Sciences at Bristol Community College in Fall River. After earning my Ph.D. in Biochemistry at Boston University and engaging in post-doctoral research at the University of Pittsburgh School of Medicine, I began my teaching career, which has now spanned 32 years. I feel strongly that community college representation, as a councilor would benefit our faculty and staff as well as our colleagues at more traditional colleges and universities. Knowledge of standards and trends in chemical education through the activities of the ACS and its affiliates will enable us to encourage and prepare potential chemists for the future. I would like to participate in that process.

Barbara G. Wood

Education: B.S. (cum laude), Ursinus College (1961); M.S., Drexel University (1970)

Professional Experience: Rohm and Haas Co. Research Information Services Manager (1986-90); Consultant (1990-99); retired (1999-).


NESACS Service: Bd. of Directors (as Councilor) (2002-03).

Honors: Meritorious Service Award, Chemical Information Division ACS (1995); Iota Sigma pi; Beta Phi Mu


Statement: It is a privilege to serve NESACS currently as a Councilor. I now also have an appointment on the Council Committee on Meetings and Expositions (M&E). My background in ACS governance will provide me with the tools to be an effective, contributing member of this committee. Meetings should be more affordable and available to members. Currently programming is a major problem due to the necessity of scheduling and coordinating the large number of required meeting rooms. Better coordination of related programs and special events is needed. Regional meetings, one of my assignments on M&E, may provide some answers to these problems. This is especially true with the current curtailment of travel by many employers. Keeping meetings at a breakeven or positive financially is a major goal of M&E. Registration fees are escalating and are a major expense for attendees. Exposition revenues are rising and may provide some assistance. I am concerned about ACS finances and how your dues dollars are spent. National operated at a deficit in 2002 and expects another deficit year in 2003. ACS’s investments are suffering as are yours and mine. We need to inspect carefully ACS programs and to look to cost benefit analysis. Income from Publications and CAS provides most of the working capital of the Society. We must assure that these programs remain financially sound and available to members. ACS has many competitors out there. At the local level we need programs and meeting sites that serve our members. NESACS National Chemistry Day Program is excellent and a wonderful way to foster interest in chemistry in our children. To sum up, I plan to continue to serve NESACS actively and to represent your concerns with our national organization.

Director-at-Large

Henry Brown

Education: A.B., University of Michigan; M.D., University of Pennsylvania Medical School, Didactic training in surgery.

Professional Experience: Three years as a physician in the United States Navy; Runyon Cancer Research Fellow in Biochemistry at the University of Cambridge in England with Dr. Fred Sanger working on the sequencing of different species of insulin; Surgical Residency with Professor Erwin Schmidt at the University of Wisconsin-Madison; Nakoosa Paper Co. Research Fellow in the Surgical Research Laboratory and later a Faculty Member; Faculty member of the Department of Surgery Harvard Medical School for the past 40 years; Surgical Fellow and Faculty at the Harvard Surgical Unit and Sears Surgical Research Laboratory at Boston City Hospital eventually becoming assistant director until Harvard left that Hospital.

Honors: The usual accolades, writings, visiting professorships, etc. that go with any academic appointment.

Research: During all of the above years at Wisconsin and Harvard on protein nutrition especially hemoglobin, intermediary metabolism of the liver, liver preservation and liver transplantation. Since then served first at the New England Deaconess Hospital
Sarah A. Iacobucci


Professional Experience: Director of Undergraduate Labs, Tufts University; Adjunct Professor, WPI; Lecturer, Assumption College; Lecturer, Northern Essex Community College; Analytical Chemist, Energy & Environmental Engineering

NESACS Service: Chairperson for National Chemistry Week 2001 (Chemistry and Art Celebration) and 2002 (Chemistry and Ancient Egypt Celebration); Phyllis A. Brauner Memorial Lecture Committee, member.

Statement: As Director-At-Large, I would like to be involved in outreach activities that help to educate the general public about chemistry related issues. I would also like to work toward getting more undergraduate and graduate students active in the NESACS, for early involvement in the ACS allows us to see how our participation in the ACS contributes toward helping others and at the same time appreciate how much the ACS has to offer at each stage in our careers.

Stephen Lantos

Education: B.S., University of Michigan (1984); M.A.,Tufts University (1988), Graduate level chemistry coursework at Hope College, Holland MI and Manhattanville College, New York, NY.

Professional Experience: Chemistry Teacher, Brookline High School (past 18 years).

Honors: Northeastern Section’s Aula Laudis Award for Excellence in HS Chemistry Teaching; National Science Foundation grant for summer study; Newell Grant for summer study; Teacher of the Year Award (2002), presented by NEST (Network of Educators in Science and Technology).

Statement: I have been very active in education and leadership roles both regionally and nationally since joining the ACS in 1990, and feel that I share greatly with both local and nationwide committees. As author of the annual Avery Ashdown high school chemistry exam since 1990 and Chairperson, HS Education Committee, NESACS since 1996, I’ve delegated the administration of this section-wide exam with success. My role on the NESACS Board of Directors concerns high school programs throughout the section. More recently, I have served as Coordinator of the United States National Chemistry Olympiad (USNCO) to the section and organized the High School Day Program at the National Meeting in Boston. I currently serve as Chair of the Laboratory Practical Task Force with the responsibility of designing and writing the lab portion of the USNCO each year.

I served in an elected position as Alternate Councilor, NESACS, 1997-1999, attending national meetings and education committees. It would be my honor to serve as Director-At-Large and hope you’ll consider my experience, involvement, and dedication to NESACS with your vote. Thank you.

As an educator, I care deeply about chemical education and awareness. If elected, I will continue to be active and involved in chemical education within the Section and look to increase our participation and involvement at the national level.
Robert S. Umans

Education: A.B. Columbia University, M.S., Ph.D. Yale University; Postdoctoral positions Johns Hopkins University, University of Paris.

Professional Experience: Assistant Professor of Chemistry, Boston University; Assistant Professor of Chemistry, Wellesley College; Adjunct Associate Professor of Chemistry and Assistant Director of Laboratories, Boston College; presently Director of Life Science Laboratories, Chemistry Department, Boston University.

ACS Service: Member since 1969 (Divisions of Biochemistry, Medicinal Chemistry, Chemical Education)


Statement: I see the Director-at-Large position as a way of passing along new ideas from our membership to the Board, and I will solicit suggestions from colleagues, students, and other NEACS members. I am especially interested in new approaches to increasing the number of younger colleagues who are active in the Section, as well as colleagues who teach at the high school level.

Nominating Committee

Patrick M. Gordon


NESACS Service: NERM Chair of the Symposium on Cannabinoids, (1989); Centennial Committee Co-Chair (1998); Member, Board of Publications 1999 to present; Secretary, Board of Publications, 2000; Chair, Board of Publications, 2002; Member, Board of Publications, 2003.

Donald O. Rickter

Education: A.B., M.S. (credentials for teaching Gr. 7-12) University of California-Davis; Ph.D., physical-organic chemistry, Michigan State University.

Professional Experience: U. S. Navy 2 years; H.S. and college teaching 3 years; Polaroid Research 31 years (Scientist and Information Manager); now an independent information consultant

ACS Service: Member of ACS since 1952; Current member of Divisions of Chemical Information and Professional Relations; Alternate Councilor, NESACS (off and on since 1985); ACS Presidential Task Force on K-12 Education (2001).

NESACS Service: Chair-elect 1998; Chair 1999; Nominating Committee Chair 2000; Congressional Science Counselor (8th District, MA, 1974-92); Liaison between Polaroid and NESACS 1974-96; Program Committee 1981 and 1998; Board of Publications 1983-85; ACS and Polaroid exhibit at MA State House June 1992; Nominating Committee 1996; Helped start the NESACS web page 1996; Co-Chair of Professional Relations Committee 1997; Worked to plan State Capitol Days in June 1998 and June 2000; currently: Calendar Coordinator for The Nucleus.

Myron S. Simon

Education: Boston Latin School (1943); Harvard AB (1947), MA (1948), PhD, (with Prof. R.B. Woodward), (1949).

Professional Experience: Research scientist at Polaroid Corporation (1949-88), primarily doing research in the field of instant color photography, obtaining more than 70 U.S. patents, and retiring as Research Fellow and Associate Director of Organic Chemistry. Image-Ination Associates, 1988-96, president.


NESACS Service: Chairman (1985); Chairman-Elect, Program Chairman (1984). Nominating and Budget Committees in 1984, 1985, 1986. Trustee in 1987. Sponsored the Seaborg Proposal to end nuclear testing in 1985, which led to a Presidential Debate at the ACS Chicago Meeting that year. To recognize high school chemistry teachers, sponsored the Secondary School Teaching Prize, now the Theodore William Richards Award for Excellence in Teaching, and the Aula Laudis Society in 1985; Co-founder of the Esselen Award Committee and Member (1985-93), (1995-99), Chairman (1985-88, 1997); Committee on Professional Relations, Chair (1987-92); Tours Committee chair at two ACS National meetings in Boston; NESACS Centennial Committee (1998); Associate Editor of the Nucleus since 1988. NESACS Archivist (1987-).


Dean E. Wilcox


Professional Experience: Dartmouth College: Assistant Professor (1984-90), Associate Professor (1990-96), Professor (1996-), Chair, Chemistry Dept. (1991-); recent invited lectures: “Bioinorganic Chemistry of Nitrogen Oxides” symposium at the 211th National ACS Meeting (3/96); 4th International Meeting on Metallothionein (9/97), “Frontiers in Bioinorganic Chemistry” symposium at the 82nd Canadian Society of Chemists Conference and Exhibition (5/99), “Metal-Peptide Complexes” symposium at the 221st National ACS Meeting (4/01), 9th International Meeting on EPR Studies of Viable Systems (9/01), Metals in Biology Workshop at University of Southern Denmark (9/01), 2003 Current Trends
in Microcalorimetry (7/03).

ACS Service: Member since 1978; Organizer of “Coordination Chemistry of Metal Metabolism” symposium at the 224th National ACS meeting (2002).

NESACS Service: Nominating Committee (2000-01).

Member: Current President of the Dartmouth Chapter; member of Society of Biological Inorganic Chemistry; member of International EPR-ESR Society; Board of Editors of Inorganic Chemistry (1995, 1996); organizer of “Metals and DNA”, a memorial symposium for Karen Wetterhahn (9/97); advisory committee for EPR Center for the Study of Viable Biological Systems, Dartmouth Medical School (1997-present);


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**Esselen Award Committee**

*Mukund S. Chorghade*


**Professional Experience:** Research Fellow, National Chemical Laboratory (1973-74); Instructor, Georgetown University (1981-82); Postdoctoral Research Associate., University of Virginia (1982-84); Postdoctoral Research Fellow, Harvard University (1984-85); Senior Research Chemist (1985-89); Project Leader (1989-90), Dow Chemical Co.; Research Scientist/Assistant Director, College de France, Paris and Universite Louis Pasteur (1990-91); Project Manager, Abbott Laboratories, Pharmaceutical Research (1991-95); Senior Director, Chemical Sciences Research & Development, CytoMed, Inc. (1997-98); President, CP Consulting, (1995 to 1997); President, Chorghade Enterprises (1997-), Visiting Scholar University of British Columbia, University of Chicago, Northwestern University and others; Vice President, Chemical Development Sciences, GelTex / Genzyme Pharmaceuticals, (2000-); Reviewer of manuscripts for numerous leading professional journals.

**ACS Service:** Member since 1982. Chairman, Brazosport Section (1990); Organic Division, member; Chairman, Symposium on Industrial Chem., Great Lakes Regional Meeting, (May, 1997); Visiting Speakers Program (1999 to present); Department of Career Services Consultant (2000 to present); Committee Associate, Joint Board Council Committee on International Activities (2002-).

**NESACS Service:** Public Services Committee, Chair; Professional Services Committee, member; Public Affairs Committee, Chair; Public Relations Committee, chair; Associate Editor, *The Nucleus* (2002-)

**Member:** IUPAC (Titular Member of the Chemistry and Human Health and Education Division Committees); AAAS; Indian Society of Bio-Organic Chemists; IUPAC Commission on Biotechnology, Medicinal Chemistry, New Technologies and Special Topics, Titular member; 20th IUPAC Conference on the Chemistry of Natural Products, Chicago, 1996; Chair, Scientific Programs Comm., on Advisory Board for Organic Process Research and Development, and Chimica Oggi; Actively involved with Indian Cultural Coordination Committee, Washington, DC. Leadership roles in several community groups.

**Honors:** Maharashtra Academy of Sciences (Elected Fellow); Andhra Pradesh Akademi of Sciences (Elected Fellow); Royal Society of Chemistry (Elected Fellow); New York Academy of Sciences; American Institute of Chemists (Elected Fellow); Sigma Xi; Diamond Jubilee Fellowship, Univ. Dept. of Chemical Technology, Mumbai, India; B.D. Tilak Distinguished Visiting Fellowship, University of Bombay, India; Listed in American Men and Women of Science, Who’s Who in Science and Engineering.

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**Martin Idelson**

The Esselen Award is a very prestigious honor bestowed by the Northeastern Section of ACS. The selection of an honoree each year is a difficult task because so many of the nominees are outstanding scientists. I have had the privilege of serving on this committee previously and would consider...
it an honor to serve again.
I have been a member of the North-eastern Section for more years than I care to count. As a member I served on the Program Committee and Nominating Committee, and Chair. I have been on the Board for quite a few years.

William Klemperer


NESACS/ACS Service: Councilor, NESACS, 2001-present

Member: American Physical Society; American Chemical Society


Robert S. Langer


Professional Experience: Kenneth J. Germeshausen Professor of Chemical and Biomedical Engineering at the Massachusetts Institute of Technology; Dr. Langer has written 725 articles and 420 abstracts. He also has nearly 500 issued or pending patents worldwide, one of which was cited as the outstanding patent in Massachusetts in 1988 and one of 20 outstanding patents in the United States. Dr. Langer’s patents have been licensed or sublicensed to over 100 pharmaceutical, chemical, biotechnology and medical device companies; a number of these companies were launched on the basis of these patent licenses. He served as a member of the United States Food and Drug Administration’s SCIENCE Board, the FDA’s highest advisory board, from 1995 — 2002 and as its Chairman from 1999-2002.

Honors: Over 100 major awards. National Academy of Engineering, Charles Stark Draper Prize, considered the equivalent of the Nobel Prize for engineers and the world’s most prestigious engineering prize (2002); the only engineer to receive the Gairdner Foundation International Award; 60 recipients of this award have subsequently received a Nobel Prize. Lemelson-MIT prize, the world’s largest prize for invention for being “one of history’s most prolific inventors in medicine.” (2002); elected member of the Institute of Medicine of the National Academy of Sciences (1989), elected to both the National Academy of Engineering and to the National Academy of Sciences (1992). He is one of very few people ever elected to all three United States National Academies and the youngest in history (at age 43) to receive this distinction. Forbes Magazine (1999) and Bio World (1990) have named Langer as one of the 25 most important individuals in biotechnology in the world. Discover Magazine (2002) named him as one of the 20 most important people in this area. Forbes Magazine (2002) selected Langer as one of the 15 innovators worldwide who will reinvent our future. Time Magazine and CNN (2001) named Langer as one of the 100 most important people in America and one of the 18 top people in science or medicine in America. He has served at various times on 12 boards of directors and 30 Scientific Advisory Boards of such companies as Alkermes, Mitsubishi Pharmaceuticals, Warner-Lambert, and Guilford Pharmaceuticals. Honorary doctorates from the ETH (Switzerland), the Technion (Israel), Hebrew University (Israel), and the Universite Catholique do Louvain (Belgium).

Richards Medal Committee

Amir H. Hoveyda

Education: B.A., Columbia University (1981); Ph.D. (with Prof. Stuart L. Schreiber), Yale University (1986-90); Dept. of Chemistry, Boston College (1998-).

Professional Experience: Joseph T. and Patricia Vanderslice Millennium Professor of Chemistry, Boston College; American Cancer Society Post-doctoral Fellow (with Prof. David Evans, Harvard University (1986); Scientific consultant with Schering-Plough; Scientific Advisory Boards of Triad Therapeutics and Materia, Inc.

Honors: NSF National Young Investigator Award (1992); Eli Lilly Young Investigator Award (1992); Pfizer Award in Synthetic Organic Chemistry (1993); Alfred P. Sloan Fellowship (1994); Camille Dreyfus Teacher-Scholar Award (1994); Johnson & Johnson Focused Award (1995); ACS Cope Scholar Award (1998); Novartis Research Award (2001); Award for Excellence in Catalysis (2002).

Research interest: Discovery and development of new stereoselective reaction methods, organometallic chemistry, study of reaction mechanisms, asymmetric catalysis, synthesis of complex natural products and combinatorial chemistry. He has delivered more than 250 invited lectures worldwide and published nearly 100 original research articles.
Stephen J. Lippard

Education: Pittsburgh public schools; B.A. (magna cum laude) Haverford College; Ph.D., M.I.T.

Professional Experience: Arthur Amos Noyes Professor of Chemistry and Head of the Chemistry Department at M.I.T. Postdoctoral, MIT; Asst. Prof. to Professor (1983–), Columbia University; sabbatical leaves at the University of Göteborg in Sweden, the MRC Laboratory of Molecular Biology in Cambridge, England, the Anorganisch-Chemisches Institut der Technischen Universität München, Garching, Federal Republic of Germany, and the University of California, San Diego.

ACS Service: Chaired several symposia at American Chemical Society national meetings; Alternate Councilor for the Division of Inorganic Chemistry; has been Chairman of the Bioinorganic Subdivision, and Chairman of the Inorganic Division.

NESACS Service
Member: He is or has been a member of the American Chemical Society, The Royal Society of Chemistry, The American Crystallographic Association, The Biophysical Society, and the American Society of Biological Chemists, and was elected a Fellow of the American Association for the Advancement of Science.

Honors: Phi Beta Kappa, Sigma Xi; Fellowships from the Woodrow Wilson Foundation, the National Science Foundation, The Alfred P. Sloan Foundation, The Camille and Henry Dreyfus Foundation, the Guggenheim Foundation, and the John E. Fogarty International Center; Henry J. Albert Award of the International Precious Metals Institute for his work on platinum metals and their interactions with nucleic acids, the American Chemical Society Award in Inorganic Chemistry sponsored by Monsanto Company, the Remsen Award sponsored by the Maryland Section of the American Chemical Society, the Alexander von Humboldt Senior U.S. Scientist Award, the John C. Bailar, Jr. Medal of the University of Illinois, the American Chemical Society Award for Distinguished Service in Inorganic Chemistry sponsored by Mallinckrodt Company, the William H. Nichols Medal sponsored by the New York Section of the American Chemical Society, the Frontiers in Biological Chemistry Award from the Max-Planck-Institut für Strahlenchemie, honorary D. Sc. degrees from Haverford College and Texas A&M University, an Honorary Membership in the Italian Chemical Society, a Scientific Membership in the Max-Planck-Gesellschaft, an honorary D. Sc. degree from Haverford College, the Theodore W. Richards Medal of the Northeastern Section of the American Chemical Society, an Honorary Membership in the Irish Royal Academy, and the Basolo Medal of Northwestern University and Chicago Section of the American Chemical Society. He has been elected to the American Academy of Arts and Sciences, the National Academy of Sciences, and the Institute of Medicine.

Related activities: He was editor of the well-known series “Progress in Inorganic Chemistry” from Volume 11 to 40, was an Associate Editor of the journal Inorganic Chemistry, is now an Associate Editor of the Journal of the American Chemical Society, was a Founding member of the Editorial Advisory Board for Chemical Research in Toxicology, and serves or has served on the editorial boards of Accounts of Chemical Research, Anticancer Drug Design, Bioorganic & Medicinal Chemistry, Bioorganic & Medicinal Chemistry Letters, Chemical & Engineering News, Chemical Research and Technology, Chemistry & Biology, Inorganic Chemistry, Inorganic Chemistry Concepts, Inorganica Chimica Acta, Journal of Biological Inorganic Chemistry, Journal of Inorganic Biochemistry, and Topics in Biological Inorganic Chemistry. He is the author or co-author of over 575 publications in the fields of inorganic and coordination chemistry, organometallic chemistry, and biological chemistry. He has co-authored a book with Jeremy Berg entitled “Principles of Bioinorganic Chemistry.” He holds several U.S. and foreign patents. He has given over 60 named lectureships at universities both

Thomas D. Tullius

Education: B.S. (cum laude) in Chemistry, UCLA (1973); Ph.D. in Chemistry (advisor: K.O. Hodgson) Stanford University (1979)

Professional Experience: NIH Postdoctoral fellow, Columbia University, 1979-82) (advisor: S.J. Lippard); Assistant, Associate, Professor of Chemistry, Biology, and Biophysics, The Johns Hopkins University (1982-1997); Professor and Chairman, Department of Chemistry, Boston University, (1997-).

ACS Service: Chair, Nominating Committee, Division of Biological Chemistry of the ACS, 1997–1998

NESACS Service
Member: American Chemical Society, AAS, ASBMB, Biophysical Society, Protein Society, Society for Biological Inorganic Chemistry, Advisory Committee, Research Corporation, 2001-present.

We are sad to report the death on February 10 of Lloyd D. Taylor, a former Chairman of this Section and long time Polaroid Corporation Research Scientist/Senior Research Fellow. A memorial article will appear in a future issue.


Gary R. Weisman

Education: Public schools in Mason, Ohio; B.S. in Chemistry With Distinction, University of Kentucky (1971); Ph.D. Organic Chemistry (mentor: Stephen F. Nelsen) University of Wisconsin-Madison (1976)

Professional Experience: Post-doctoral (mentor Donald J. Cram), University of California, Los Angeles (1976-77); Faculty member, Department of Chemistry, University of New Hampshire (1977-), Professor (1994-); Visiting Assoc. Prof., University of Wisconsin (1986); Visiting Fellow, University of Bristol, England (1987, 1998); Wilsmore Fellow, University of Melbourne, Australia (June-Aug. 1995).

ACS Service: Member (1970-)
NESACS Service: Co-Program Chair, NERM 2001; Director-at-Large (2002-).

Honors: Sigma Xi (1976); Excellence in Teaching Award, College of Engineering and Physical Sciences, University of New Hampshire (1995).

Research Interests: Synthesis, reactions, and special properties of amines and polyamines; ligand design and supramolecular chemistry; stereochemistry, conformational analysis and molecular modeling; intramolecular interactions; use of NMR in structural and conformational analysis of organic and metallo-organic compounds.

End of Election Section.

Book Review

Quantum Leaps In The Wrong Direction


Reviewed by Dennis J. Sardella

Dept. of Chemistry, Boston College

Not long ago, the Sunday edition of a large daily newspaper in the northeastern part of Massachusetts carried a front-page story about a local minister with a fairly large collection of dinosaur fossils, who travels around, using them to teach and preach about creation science. Beyond the large photo of him proudly holding a giant leg bone, perhaps the most striking thing about the story was its complete lack of a sense of irony.

I have no doubt that somewhere in the inner pages of this same paper were horoscopes, which many people would read and at least some would believe. And, of course, one doesn’t have to look much further afield to find advertisements for palmistry, crystal power, psychic advisors and the like.

The fact that at the beginning of the third millennium, in what is arguably the most technologically advanced and highly educated society the world has yet seen, there is a widespread and growing fascination with astrology, psychic phenomena, UFO’s, extraterrestrial life, creationism and the like, is sobering, to say the least, and somewhere between baffling and distressing to most scientifically literate people. That, presumably, is what lies behind Charles Wynn and Arthur Wiggins’ decision to write this book, and the decision of the Joseph Henry Press (a division of the National Academy Press) to publish it. I could not help recalling a cartoon I saw several years ago, in which a man reading the newspaper while watching what appears to be a television comments to his wife “It say here that 70% of Americans are scientifically illiterate,” to which she replies “That’s the Microwave.”

Quantum Leaps In The Wrong Direction takes a critical look at widely held pseudoscientific beliefs, leavening the text with cartoons by Sidney Harris, whose work has enlivened the pages of numerous magazines, including Science, over the years. The book clearly has the general reader in mind, beginning as it does with three chapters devoted to a description of the scientific method and the way in which it can be used to distinguish the point at which true science ends and pseudoscience begins. From there, Wynn and Wiggins devote the next five chapters to what they regard as the most egregious examples of pseudoscience: UFO’s and extraterrestrial life; out-of-body experiences and related phenomena; astrology; and, of course, the ever-popular “scientific creationism”.

In each case, they frame the topic as a hypothesis, summarizing the evidence or observations on which the hypothesis is based, and presenting the relevant biological, chemical and physical background. They then attempt to make predictions based on the hypothesis, and to compare them with experiments to see whether they are borne out.

To choose one example, the chapter on “Out Of Body Experiences And Entities” focuses on several topics (near-death and out-of-body experiences, ghosts, channeling, spirit possession, and astral projection) which Wynn and Wiggins classify under the general heading of spiritualism. Near-death experiences receive the most attention, the authors arguing that the lights, sounds, sense of comfort and mind-body dissociation reported by people can all be explained in terms of neurochemistry without reference to anything nonphysical. They therefore conclude that this eliminates the need for the “soul hypothesis”, based on “Occam’s Razor” (or, more descriptively, the “Parsimony Principle” of maximum economy in explanation).

The remaining material in the chapter receives shorter shrift, being dismissed as instances of either self-delusion or outright fraud. The chapter concludes with a brief section entitled “Immortal-

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ity,” that poses the question “Do we simply cease to exist at the moment of death, or do we persist in some way after death?” and concludes that we certainly “live on” in our descendants’ genetic endowment, in the memories and actions of those whose lives have been impacted by us directly or indirectly, and in the energy that is recycled upon our death. While I do not disagree with this minimalist statement about immortality, which after all, is all that can be scientifically justified, its terseness seems by implication almost to relegate those of us who are both scientifically trained and religious believers to the ranks of (to put it politely) the self-delusional, and this is, in my view, one of the shortcomings of the book.

The penultimate chapter of Quantum Leaps is an omnibus one entitled “Reflections On The Scientific Approach To Reality,” that begins with a brief reprise of topics from the earlier chapters, then moves on to “short takes” on a wide range of disparate topics, including the Loch Ness Monster, spontaneous human combustion, fire walking, psychic surgery, homeopathy, the Piltdown Hoax, crop circles, and Holocaust denials. The flow of material runs almost imperceptibly from things that may perhaps be ascribed to imagination or incorrect inference on the part of well-intentioned but scientifically naive observers, to outright dishonesty on the part of people motivated largely by greed or the intent to deceive. Wynn and Wiggins instead hold up science as the (not a) beacon of truth and the only “road to reality.”

Wynn and Wiggins are at times a bit simplistic in their zeal to debunk pseudoscience, and they seem to blur the distinction between well-intentioned, but mistaken, individuals with hucksters. For instance, I am inclined to agree with them about Bigfoot, yeti and the Loch Ness monster. However, while it is true that there is currently no scientifically credible evidence in favor of their existence, that certainly does not eliminate the possibility of their existing. Indeed, in a recent interview on National Public Radio, Jane Goodall (hardly someone who could be classified as an antiscientific crank) proclaimed her firm belief that there very likely remain large mammals as yet undiscovered in remote areas. Seemingly supporting this contention are recent reports from the Congo of a large, hitherto unknown, primate whose skull features, body size, feces and nesting habits are gorilla-like, but whose DNA and diet are distinctly chimpanzee-like. While I am considerably more skeptical than Goodall, I would have preferred to see Wynn and Wiggins display a bit more circumspection here.

Quantum Leaps concludes with a very brief epilogue which presents the reader with some useful suggestions for authors to read, magazines and websites to consult, and activities to engage in to increase scientific literacy and critical facility. Unfortunately, it is marred by its initial sentence “We wish we had had the opportunity to recommend the following activities to the 39 members of the Heaven’s Gate cult who chose to commit mass suicide,” which I thought was unnecessary, condescending and rather offensive, in essence tarring everyone with the same brush. Scientifically literate people are by no means immune to evil. In fact, it might even be argued that a scientist (or anyone absolutely convinced that only he or she has the key to the truth) might be especially susceptible to it, and that the real issue is whether a person’s mind is closed or open. (Whenever I see the bumper sticker “Question authority”, I am always perversely tempted to ask “Why?”)

Lest I sound unrelentingly negative, let me say that I enjoyed Quantum Leaps In The Wrong Direction (particularly the cartoons!) and agreed with most of what Wynn and Wiggins have to say. They have an entertaining and informative writing style, and a point about pseudoscience that is worth making. However, their tone can at times have an edge of smugness and superiority to it, the result being that the book will probably be read primarily by people who already agree with them, and not by the very people most in need of hearing its message.
A Historical Note

Edward Frankland’s Crusade for Clean Water

By Sharon Bertsch McGrayne*

This excerpt from the author’s book “Prometheans in the Lab” has been reprinted from Chemical Heritage, 2002, 20 (1), 12 ff. by permission of both Chemical Heritage and McGraw Hill Companies.

As six major epidemics of cholera swept the globe during the 19th century, fecally contaminated drinking water killed millions of people. For more than 30 of those terror-filled years, the resolute courage of one chemist, Edward Frankland, protected the public health. Frankland is almost unknown today, but during his lifetime he was one of the most important chemists in Britain.

Frankland discovered the fundamental principle of valency—the combining, power of atoms to form compounds. He gave the chemical bond its name and popularized the notation we use today for writing chemical formulas. He codiscovered helium, helped found synthetic organic and structural chemistry, and was the father of organometallic chemistry. He was also the first person to thoroughly analyze the gases from different types of coal and-dieters take note—was the first to measure the calories in food.

Frankland’s anonymity may be the result of a Victorian-era scandal surrounding his birth. As the British historian Colin A. Russell discovered almost 150 years later, parish baptismal records list the birth of Edward Frankland on 20 February 1825 and identify him as the “son of Peggy Frankland . . . single woman.”

Margaret Frankland, a country girl and daughter of an itinerant calico-printer, had gone to work the year before as a maid for the Gorsts, a wealthy family of distinguished Lancashire lawyers and judges. When she became pregnant by the Gorsts’ 20-year-old son, Edward, she was sent back to her family home outside Garstang to give birth and raise her son. Edward Gorst (equally responsible in the eyes of the law) set aside an annuity of 1,200 pounds for Margaret Frankland and her child—provided that his identity was never revealed.

Considering her lack of education, Margaret was a woman of remarkable intellect, energy, and character. In a county where 40% of the men were illiterate, she taught Edward the alphabet before he was two. As befitted England’s golden age of flogging, she gave him a strict and corporal moral upbringing.

Margaret later opened a small boarding house in the nearby town of Lancaster in northwest England and, when Edward was five years old, married one of her lodgers. At first, as Edward recalled, “Matters did not go quite so smoothly with me at home. My stepfather was rather severe with me, and, with a thin stick, gave me many a beating which I probably well deserved.” Despite this, Edward remained close to his mother and stepfather as long as they lived.

Frankland experienced more physical punishment at the eight schools he attended. Of all his teachers, only James Willasey taught science or encouraged his obvious abilities. Years later, Frankland was still deeply grateful. He regarded Willasey as “a real educator” and raised an annuity to support him in old age. Willasey in turn willed all his possessions to Frankland, who proudly wore his teacher’s seal on a watch fob.

Frankland wanted to become a doctor, but medical school was far beyond his father’s means or his biological father’s inclination. So in 1840, when Frankland was 14, his mother apprenticed him to the next best profession, pharmacy. It was, Frankland complained rather unjustly in his old age, “six years continuous hard labour, from which I derived no advantage whatever, except the facility of tying up parcels neatly.” As an apprentice, he worked more than 70 hours a week, wheeling heavy casks of treacle through town and hauling a 100-pound sack up a steep and narrow staircase. To grind a pound of cocoa, he worked a 20-pound pestle continuously for a day. To make ointment, he spent more than 24 days grinding 6 pounds of poisonous mercury into 14 pounds of lard.

Frankland and other local apprentices benefited greatly from the kindness of three physicians, Christopher Johnson and his two sons, all of whom tutored the youths in chemistry and medicine. The Johnsons even loaned the young students books and converted a cottage into a simple laboratory for them. The Johnsons also found Frankland a job with a chemist in the government Museum of Economic Geology in London, where a museum assistant gave Frankland his first sophisticated instruction in chemical experimentation and processes. A young German friend, Hermann Kolbe, taught Frankland everything that he had learned about analyzing gases from the chemist Robert Bunsen, of Bunsen burner fame.

Although Frankland had not yet studied even algebra, his analytical chemistry skills were advanced enough to land him teaching jobs at several short-lived schools. At one of them [Queenwood College], he befriended a fellow teacher, John Tyndall, who later became a prominent British physicist. The two men made a mutual improvement pact to wake at 4 A.M. each day and study together. Frankland taught Tyndall chemistry, and Tyndall taught Frankland biology and mathematics. Then they left together to earn doctorates, in less than a year, from Bunsen in Marburg, Germany. Bunsen taught Frankland how to analyze substances chemically by first burning them, then measuring the volumes of the resulting gases, and finally getting their proportions by weight.

Armed with a prestigious Ph.D., Frankland returned to England during the winter of 1849-50 to become a professional chemist. Frankland had also found a wife in Germany: Sophie Fick, whom he married on 7 February 1851.

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at St. Martin-in-the-Fields Parish Church. Betraying his mother’s secret to Sophie’s family would have jeopardized his mother’s financial security and perhaps even his own professional future; Frankland therefore falsified his father’s name on the marriage certificate, as “Edward Frankland, solicitor.” A year after Sophie’s death in 1874, Frankland married Ellen Grenside and again had to lie about his parentage on the marriage certificate.

After his marriage to Sophie, Frankland once again set about piecing together bits and pieces to make a secure life. Manchester’s university [Owens College, now Manchester University, where Frankland became professor of chemistry] paid only 150 pounds a year for full-time teaching; as a result, Frankland and other British chemistry professors double as consultants to industry and government, as expert court witnesses, as chemical analysts, as writers and journalists, and as inventors and entrepreneurs. Governments were replacing hereditary retainers with professional civil servants who consulted scientists as neutral experts to resolve conflicts; despite their growing authority, few consulting chemists earned much money.

Frankland tried his hand at anything he could find. He analyzed guano for estate owners; he advised Manchester University to boil and filter its water; he analyzed hard water for railroad concerns about minerals in the boilers of their steam locomotives; he detected lead contamination for water suppliers; and he served as an expert witness in court. With analytical chemistry still in its infancy, scientists could find enough contradictory evidence to support almost any side of an argument. Frankland, for example, once testified against a former client and used privileged information he had learned as the company’s consultant. In another case, he told a polluting Leblanc washing-soda factory to “make the surrounding neighborhood believe you have [gotten rid of all the hydrogen chloride] for without this faith stupid farmers will detect muriatic acid in every diseased ear of wheat or decayed branch of quickthorn, and old fish women will be quite certain that their oysters and mussels are in the last agones of death from the same cause.” Discussing another pollutant, he suggested disingenuously, “Is it possible to take the waste in [boats] and throw it into the Severn [River]?”

As chemists learned how to analyze chemicals more accurately, it became harder to testify so cavalierly on behalf of polluters. Within a few years, Frankland had become one of Britain’s leading chemical experts testifying against industrial emissions. In fact, when he decided in 1857 to move to London to improve his financial prospects, Manchester’s polluting industrialists were delighted to see him go.

Frankland’s hard work paid off at the age of 40, when he was appointed to a prestigious professorship, replacing August Wilhelm Hofmann, who had taught William Perkin, at the Royal College of Chemistry. Even Frankland’s new post was cobbled together with money from different sources. Once more, Frankland was moonlighting. But this time, he would parlay two unprepossessing positions involving chemistry education and public water supplies into powerful weapons for reform.

First, in addition to his regular teaching duties, Frankland was responsible for administering examinations to up to 50,000 mechanics, clerks, apprentices, artisans, and other young adults studying chemistry in Britain’s night classes and upper elementary schools. By indulging his passionate belief in science for the people, he used the examinations as leverage to give students the kind of hands-on education in chemistry that he had wanted as a young man. Before Frankland, students everywhere learned science from books; most never even entered a laboratory. Working tirelessly over a period of 15 years, Frankland gradually changed that and dramatically improved the state of science education in Britain. He compiled a list of 109 experiments that students needed to understand firsthand in order to pass his examinations. He wrote a textbook that became a standard for chemistry instruction, in part because it incorporated his ideas on valency and organic structures and his newly developed notation system.

For teachers, Frankland wrote a training manual and ran summer workshops. Since the government paid instructors four pounds for every student who passed a Frankland examination, teachers eagerly attended his programs. Foreign publications of his books and manuals spread his gospel of laboratory instruction for all.

No sooner had Frankland begun reforming science education, however, than London faced a life-threatening emergency: cholera. The disease, which causes vomiting, fever, and profuse, watery diarrhea, kills half of its untreated victims through dehydration and electrolyte imbalance. Cities were easy prey for cholera during the 19th century as urbanization and industrialization polluted water supplies. Disease and contagion were already widely associated with decaying human and animal waste when Frankland took over as London’s water consultant in 1865 and as virtually the only working member of the Rivers’ Pollution Commission in 1868. Little was known about water pollutants or purity. While some experts thought that decaying matter directly caused disease or indirectly nurtured disease-causing microbes, others regarded feces-rich water as no more than unacceptably disgusting. Until the German bacteriologist Robert Much identified the cholera bacillus in 1883, no one knew how the disease spread from human feces to drinking water to human victim and back again.

As the disease devastated cities, clean-water issues threatened to tear British society apart. Arguing for “the greatest good for the greatest number,” liberals demanded government action. Industrialists and Parliament, on the other hand, argued that government should not interfere with business, even when the public health was at risk. No one objected to pollution in general or to uncontrolled urbanization.
and industrialization but, terrified of cholera, people demanded sanitary water.

For protection, they looked to chemistry. Although no one knew exactly how the disease was spread, it was clear that there was a relationship between cholera and unsanitary water, and chemists had decades of experience certifying the safety of mineral waters at elegant spas.

Frankland, who as a child had fled a cholera epidemic with his mother, charged into his new job like a hanging judge. “My motto, unlike that in criminal cases, has always been assume water to be guilty until it is proved innocent,” he declared. For 30 years Frankland was a strong voice—often the only voice—for clean water. Unfortunately, no one knew for sure what clean water was. Frankland staked out a radical position: whatever the deadly agents were, they were almost certainly introduced into water by sewage, so any trace of sewage raised a red flag. Later he became convinced that some of the microscopic bacteria in water probably caused fatal diseases.

During his first two years as London’s water analyst, Frankland devoted his superb manipulative skills to developing sensitive new techniques for determining the amount of organic nitrogen in water samples. As a working hypothesis, he assumed that the organic nitrogen originated in sewage or manure. Previous methods had underestimated the amount of ammonia and urea, the main nitrogen-rich components of raw sewage. Frankland’s method was laborious and expensive, and it took other chemists six months to learn; but it was state-of-the-art science for the times, and it erred on the side of caution. In widely published, monthly reports to the government, Frankland ran horrifying tables that compared the pure well water sold by one of London’s water companies with the nitrogen-tainted river water sold by seven other companies.

Soon Frankland was the world’s leading authority on water issues. During the 1870s and 1880s, he and his assistants conducted more than 11,000 analyses of water for clients from Asia, South America, India, and Europe. He worked for water companies, gas companies, brick works, breweries, copper mines, hospitals, asylums, schools, the mansions of the landed gentry, and Buckingham Palace. The man who had begun his life as an impecunious pharmacist’s apprentice was becoming, by today’s standards, a millionaire several times over. Frankland’s chemical analyses forced the closing of shallow wells and springs and the abandonment of hundreds of contaminated water sources, both at home and abroad. His recommendations, translated into French and German and published in North America, were widely adopted and used in court cases around the world.

As expert witness in court, Frankland stressed that water’s appearance should not be used as an indication of its safety.

“1 have now examined upwards of 1000 samples from all parts of the United Kingdom and have not yet met with a single case of clear analytical guilt which has not been sustained on further investigation. It is true that my verdict has repeatedly been met with vehement protestations of innocence, but further investigation always proved that these could not be sustained. The other day a gentleman brought to me two samples of well water for examination. I reported both as exhibiting great previous sewage contamination; he protested that it was impossible as the waters were bright and sparkling and possessed a high reputation; a week later he informed me that the source of contamination had been discovered. One of the wells was situated close to a cesspool; the other received the drainage from a dog kennel.”

One day in 1881, two bottles of holy water from Hagar’s Well in Mecca arrived in his laboratory. After analyzing the liquid, Frankland said it was the worst drinking water he had ever seen. Thousands of Muslim pilgrims used it daily, but it was six times more polluted than the worst London sewage. Frankland notified authorities, but the well was not closed for 12 years, despite two cholera epidemics that killed thousands of people in Mecca. Similarly, communities everywhere disregarded Frankland’s advice to treat sewage by spreading it on farmland. Because sewage treatment was expensive, communities concentrated—not on treating their sewage—but on transporting it elsewhere; in saving themselves, they contaminated water supplies downstream.

Unlike many of his competitors, Frankland relied on experiment rather than speculation. When an eminent analyst declared that flowing seven miles downstream was enough to purify sewage, Frankland countered with facts: “I find that percolation through 5 feet of gravelly soil removes much more organic impurity from sewage water than does a flow of 50 miles in a river at a rate of one mile per hour.” Some water company chemists went so far as to claim that microscopic organisms actually purified water. As Frankland sarcastically described a competing water analyst: “You will always find him on the side of joint stock companies and against the public—companies pay well, the public does not pay—Voilà”

Frankland’s relentless campaign for clean water made him many enemies, among them a former student and assistant named James Alfred Wanklyn. For almost 15 years, Wanklyn’s paranoid attacks on Frankland’s character and science dominated Britain’s water policy debates. Wanklyn had grown up in Frankland’s hometown of Lancaster, so Frankland must have lived in dread that local gossip about his parentage would become public scandal. Friends rallied to Frankland’s support. Frankland had joined the newly formed X-Club, whose eight members were united by a “devotion to science, pure and free, untrammeled by religious dogmas,” as one of them explained. Most were close associates of Charles Darwin; they included John Tyndall, Thomas Henry Huxley, and Joseph Hooker. Luckily for Frankland, Wanklyn had quarreled with so many other colleagues that the scientific
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Historical Note

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community eventually blackballed him. As one chemical journal complained, Wanklyn and his supporters suffer from “scientific afflatus,” otherwise known as “hot air.”

After Koch’s momentous discovery of the cholera bacillus in 1883, cheap and effective treatment of sewage became possible. The civil engineering of water and sewerage mains, reservoirs, sand filtration, and chlorination (the last introduced to London’s water during a typhoid epidemic in 1905) made waterborne diseases a thing of the past in much of North America and Western Europe.

Despite these and other advances, the sewage-contaminated water that ravaged the 19th century is still a scourge of poor developing countries at the beginning of the 21st century. Fully 25% of the population in third-world countries still drinks dilute sewage. It was not until the late 1990s that scientists discovered that simply filtering water through fabric—even cloth as cheap as sari cotton—removes most of the cyclops crustaceans that harbor deadly cholera.

Looking back over his life in old age, Frankland must have been pleased. Fecally contaminated water was no longer a principal source of human disease in Western Europe or North America. Chemistry students were conducting experiments in laboratories firsthand. He had published his collected Experimental Researches at great personal expense to document his scientific role for future generations and was writing his memoirs. And by the time he died in Norway in 1899, he could be confident that he had probably foiled any immediate attempts to pry into his private life.

For Further Reading


(In the U.K., this book is titled The Fontana History of Chemistry.)

