THE NUCLEUS

May 1991 *Of the Northeastern Section of the American Chemical Society* *Vol. LXIX, No. 8*

Monthly Meeting

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Colby Stanton's Report

The Northeastern Section of The American Chemical Society Inc.

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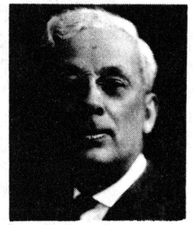

THE NUCLEUS

Dedicated to the Memory of James Flack Norris
Published monthly from October to May by the Northeastern Section of the American Chemical Society, Inc.

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(Photo: N. Savage, Polaroid Corp.)

Edwin Herbert Land 1909-1991

M.S. Simon

With the passing of "Din" Land the chemists of this Section have lost a truly great man of genius, and we are all the poorer for that.

Was Dr.Land a chemist? He always considered himself a physicist, but from his earliest days of research he used the tools of chemistry creatively and productively. His practical knowledge of polymer and inorganic chemistry was instrumental in the successful achievement of his first patent, a sheet polarizer, issued in 1934 when he was 25. From then on the flow of inventions and discoveries never ceased and he collected patents the way other people collect stamps. Only Thomas Edison holds more United States patents than Land's total of 537.

Land is best known for his Polaroid Corporation with its pre World War II products based on the polarizing sheet, and its post World War II products in the field of instant photography. His support of the work of Woodward and Doering in their synthesis of quinine during the war attests to his understanding of the need for fundamental chemical research and his expectation that its results could have practical consequences. He retained Woodward as his chenical adviser from that date on, and Woodward was more than a consultant, he was a member of the Polaroid family, entitled to benefits and vacation time, right up to his death.

Land was vitally interested in the work that his chemists did. While the Chemical Research Department was still small Land would request reports of every day's experiments, and carefully review them. Later he had to be content with daily summaries from his project leaders, with much of the experimental details left out. He remained sufficiently informed, however, so that in a chance meeting with a chemist in the parking lot he could comment in depth on that chemist's work.

The impact of chemistry on photography is huge, and Land's understanding of how chemistry could be used at the interface led to the successes of his new fields of interest. His purely physical invention of vectographs (photographs in which two images were overlapped on the same plane and viewed individually using polarized glasses, resulting in seeing the subject in true three dimensions) generated his interest in colored three dimensional motion pictures. The outcome of this interest was a major research program at Polaroid in the organic chemical field of dichroic dyes and the physical chemical field of polarizable molecules. The original "Polacolor" was a colored three dimensional motion picture material on a single strip of film, using the vectograph principle.

Land recognized the need for good chemical research in another activity, that of hiring the best chemical talent he could find to reduce the ideas of his fertile mind into practice. He was so quick in understanding chemistry that he often was able to come to the nub of the concept as fast as the chemistry was presented.

I was reminded by Dudley Herschbach of a favorite anecdote about Land's penchant for research. Land was riding in a taxi-cab in London, and in conversation with the driver said, "You know, I am an addict." "Here, here, guv'nor, we don't want any dope addicts around here. You just get off at this next corner and we'll forget the meter!" "No, no, you don't understand. I am an addict for scientific research. I have to have my research experiment every day or I suffer!" Land was allowed to continue his trip in the cab, and, I assume, allowed to pay his fare.

Land has been called charismatic, and I have no doubt that this was true. There is no question about the way he inspired those around him to work hard long hours when he had experiments that he wanted done, and the exultation that they as well as he got when his ideas proved fruitful. Many at Polaroid talk about the 3 A.M.telephone calls when a sleepless night had led to interesting ideas, and woe to the researcher in Land's lab who had a teen-ager tying up the telephone in the evening hours. A separate phone had to be installed for Land's use only. And the all weekend sessions when things were "hot?" "Take your weekends in the middle of the week."

Land was a many-sided man and his creativity spilled over from physics and chemistry into social problems and human relations. Long before it was even considered elsewhere he welded the people at Polaroid into a single unit, throwing out the concept of hourly workers having to account for their time while exempt employees had more freedom, and throwing out the time clocks as well. This "Unification" and another of Land's creations, the "Pathfinder Program", in which people were allowed to rotate into various

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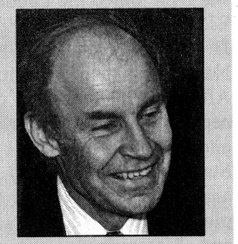
May Meeting



The 734th Meeting of the Northeastern Section of the American Chemical Society

Education Night

Honoring High School and College Teachers and Students

Thursday, May 9, 1991
Simmons College,
300 The Fenway, Boston, MA

2:00 – 4:00 p.m. Hands-on Workshop for High School Chemistry Teachers
Chemistry Lab, Science Building. Katie Stygall.

The following activities take place in the main college building.

5:30 p.m. Social Hour, Special Functions Room

6:15 p.m. Dinner: Fens Dining Room

7:30 p.m. LECTURE, Room C103
"Imaginary Gardens and Real Toads"
Dudley Herschbach, Harvard University

8:30 p.m. Presentation of Awards

Refreshments will be served after the program. Free parking behind Main College Building. Enter from Avenue Loius Pasteur. Dinner reservations should be made no later than May 3. Please call Mrs. Karen Piper at (508) 456-8227 or (800) 872-2054. Reservations not cancelled at least 24 hours in advance must be paid. Members, $21.00; Non-members, $23.00; Students and Retirees, $8.00.
THE PUBLIC IS INVITED.

Note the change in location: The meeting will NOT be at the Newton Sheraton Tara, as previously announced.

Abstract

Imaginary Gardens and Real Toads

Marianne Moore said: "Poetry is about imaginary gardens with real toads in them." That applies just as well to many intellectual cultures and especially to science. This talk offers observations on scientific research, the cultivation of imaginary gardens, and on misconceptions which nurture some ominous real toads. The talk will also describe how my perspective on the teaching and learning of chemistry has evolved in the forty years since I enrolled as a freshman, and in the ten years since I have myself taught freshman chemistry. ◇

Biography

Dudley Herschbach was born in San Jose, California in 1932 and received his B.S. degree in Mathematics (1954) and M.S. in Chemistry (1955) at Stanford University, followed by an A.M. degree in Physics and Ph.D. in Chemical Physics at Harvard in 1958. After a term as Junior Fellow in the Society of Fellows at Harvard, he was a member of the Chemistry Faculty at the University of California, Berkeley, from 1959 to 1963 before returning to Harvard as Professor of Chemistry, where, since 1976, he is now Baird Professor of Science. He has served as Chairman of the Chemical Physics program 1964-1977 and the Chemistry Department 1977-1980, 1980-1983 as a member of the Faculty Council, and from 1981-1986 Co-Master with his wife Georgene of Currier House. His teaching includes graduate courses in quantum mechanics, chemical kinetics, molecular spectroscopy, and collision theory, as well as undergraduate courses in physical chemistry and general chemistry for freshmen, his most challenging assignment.

He is a Fellow of the American Academy of Arts and Sciences, the National Academy of Sciences, the American Philosophical Society, and the Royal Chemical Society of Great Britain. His awards include the Pure Chemistry Prize of the American Chemical Society (1965), the Linus Pauling Medal (1978), the Michael Polanyi Medal (1981), and the Irving Langmuir Prize of the American Physical Society (1983); he shared with Yuan T. Lee and John C. Polanyi the Nobel Prize in Chemistry 1986.

Professor Herschbach has published over 250 research papers. His current research is devoted to molecular beam studies of reaction stereodynamics, intermolecular forces in liquids and a dimensional scaling approach to electronic structure. ◇

Election of 1992 Officers, Councilors and Committees

The ballot for voting for the 1992 candidates for the various Section positions is enclosed with this mailing. Also enclosed are the special ballot envelope and addressed return envelope. Candidates' biographies and statements in this issue begin on p. 9.

BE SURE to vote and return your ballot by the June 1, 1991 deadline.

If you are a Section member and failed to receive the election materials, please call the Section office, 1-800-872-2054 or (617) 456-8227. ◇

MCG Meeting

Medicinal Chemistry Group Meeting

Thursday, May 2, 1991
Boston College
Room 307, Higgins Hall
Chestnut Hill, MA

4:00 p.m. Coffee

4:30 p.m. Lecture

Lisa A. Matsuda, Ph.D. will speak on
The Cloned Cannabinoid Receptor: No Longer a Mystery, but Still a Curiosity

6:00 p.m. Dinner
Ming Gardens, Chestnut Hill

For dinner reservations please call NESACS office, Mrs. Piper, by May 1, 1991, in (617) area: (800)872-2054
all other areas: (508)456-8227.

Members: $10.00 Students: $3.00

Biography

Lisa A. Matsuda, Ph.D.

A native of Salt Lake City, Dr. Matsuda received her Pharmacy B.S. in 1983 from the University of Utah. That same year she remained at the University of Utah and began her graduate work in the department of Pharmacology and Toxicology in the College of Pharmacy. In the laboratory of James W. Gibb, Ph.D., she studied the neurochemical effects of amphetamine-like drugs of abuse and graduated with her doctorate of Pharmacology in 1987. Having obtained a Pharmacological Research Associate Training (PRAT) fellowship (sponsored by the National Institute of General Medical Sciences) she then joined the Laboratory of Cell Biology under the direction of Michael J. Brownstein, MD., Ph.D. at the National Institute of Mental Health. After working two years on cloning receptor proteins using various strategies and techniques, she was promoted to Staff Fellow (1989) and, in 1990, she and her colleagues published the complementary DNA (cDNA) sequence and characterization of a cloned cannabinoid receptor (Nature 346: 561).

Dr. Matsuda is very interested in the physiological significance of this receptor and its endogenous ligand. She plans to continue her studies on the cannabinoid receptor mainly at the molecular level in hopes to gain a better understanding of the interactions between this receptor and other neuronal systems in the brain. ◇

Abstract

The THC Receptor Clone: No Longer a Mystery but Still a Curiosity

Biochemical, pharmacological and anatomical data strongly support the existence of a specific receptor for the psychoactive components in marijuana (cannabinoids: a group of C_{21} compounds typical of and present in the plant *cannabis sativa,* its carboxylic acids, analogs and biotransformation products). Cannabinoids induce dose-dependent, stereoselective and G protein-coupled ligand binding and inhibition of adenylate cyclase activity in brain tissues *in vitro* (Holwett et al., 1990). In cells which fail to demonstrate any biochemical response to cannabinoid treatment, transfection of the cDNA, SKR6, resulted in the expression of functional cannabinoid receptors. This cDNA was isolated from a rat cerebral cortex library using a non-targeted strategy for cloning membrane-located receptors. Northern blot analysis of RNA prepared from cell lines (N18TG-2 and NG108-15) which contain endogenous cannabinoid receptors revealed the presence of a single band capable of hybridizing to the SKR6 cDNA. Functionally, this receptor responds to cannabinoids in a man,ner similar to that found in neural cell lines and in brain, in that the psychoactive compounds, Δ9-tetrahydrocannabinol(Δ9-THC), 11-OH Δ9-THC and nabilone significantly inhibit the accumulation of cAMP. *In situ* hybridization histochemistry studies revealed that the gene for this receptor is active in numerous brain regions including, the cerebral cortex, hippocampus, striatum and cerebellum. These findings suggest that this receptor is likely involved in the central nervous system effects of marijuana. ◇

NEACT Summer Conference

The New England Association of Chemistry Teachers announces its 53rd Annual Summer Conference at Rivier College, Nashua, NH, August 12-16, 1991. The theme this year:

Nuclear Technologies

Theme speaker: C.H. Atwood of Mercer College. Topics to be discussed are radiation, nuclear instrumentation, nuclear energy, nuclear biochemistry and medicine, waste disposal.

Upgrade your understanding of nuclear science and technology. A series of lectures by outstanding speakers, tours of nuclear facilities, workshops and exhibits are planned. Field trips, both technical and non-technical will be offered so that participants and their families can enjoy the Nashua and southern New Hampshire area.

Program chairman: Dr. Robert Litman (Chemistry Supervisor at Seabrook). Registrations: Bette M. Beaulieu, Nashua High School, Nashua, NH 03062. ◇

Recent Developments in

Carbon Fiber Research

Professor Mildred S. Dresselhaus (MIT)
Presented at the March meeting on March 14, 1991

The uses of carbon fibers are many, in fields as diverse as aviation, space exploration and sports. Their good mechanical properties cause them to be found, *inter alia*, in aircraft wings, nose cones and tennis racquets. However, carbon fibers are not cheap, a fact which limits their applications.

They are formed by heating polymers such as polyacrylonitrile (PAN) first to 1300°C to carbonize, removing hydrogen and nitrogen, leaving two dimensional structural units, then above 2800°C to get intraplanar two dimensional structural order with a honeycomb network (with interatomic distances in the plane of 1.42Å, the smallest of known materials). The fibers consist of ribbons of graphite-like structures whose interplanar distances are within 2% of those of graphite.

Vapor grown carbon fibers are made in the gas phase. Initially the fibers have a circular cross section without interplanar correlation, like tree rings, but heating above 2300° converts them to graphite crystallites. These materials are very interesting for scientific applications but have in the past been too expensive for large scale applications.

Graphite is a material with extreme properties. It has the highest modulus (stiffness), highest strength, highest thermal conductivity, highest anisotropy, highest melting point. These properties are due to the structure of aromatic carbon honeycomb planes separated from each other by 3.35Å. The planes can slip easily while there is tight coupling in the planes. The result is high electron mobility in the plane and weak coupling across planes. In one direction, high conductivity, at right angles, almost insulating properties. The electrical anisotropy is five orders of magnitude at low temperatures and can be increased to almost seven orders by intercalation.

Strength and stiffness can be chosen to fit a wide range of applications, depending on the fibers' microstructure and how the fibers are lined up. Highly parallel planar structures within the fibers shear easily but are useful for intercalation. Vapor phase fibers are more easily ordered structurally, and have a higher modulus than PAN or pitch based fibers. The modulus can go as high as 700-900 GPa (gigapascals) out of a theoretical limit of 1100 GPa. An intertwined (basket weave) microstructure leads to fibers that resist shear and are useful to achieve highest strength. By constructing wrinkled sheets crack propagation is minimized.

The shape of the nozzle of the extruder is one way to control the properties of the fiber produced. By using slightly turbulent flow with some vortex motion, stronger wrinkled microstructures are made. Straighter, flatter microstructures give a better modulus, but less strength. Composite materials can be made with cores of very strong fibers and surfaces of well ordered layers. The direction of current technology is to double the strength while taking a loss in modulus of only 10-15%. The main players in this country, Carbide and DuPont, have decided for economic reasons to drop carbon fiber research and Amoco has taken over the field. The Japanese now dominate the field. There has been little use of carbon fibers in construction in this country but in downtown Tokyo there are buildings being constructed using isotropic carbon fibers.

Porosity can be introduced into carbon fibers by an activation process to make materials with the highest porosity of any known material. Felt made of disordered porous carbon is a very good thermal insulator, while highly ordered carbon fibers are close to the best thermal conductors. While electrical conductivity can be varied up to fifteen orders of magnitude, variation of thermal conductivity is limited to about four orders of magnitude. Conductivity of up to 60% of bulk values can be reached using parallel arrays of carbon fibers.

The high porosity attainable gives materials of great surface area. While the use of activated carbon goes back many years, for example to use in gas masks in World War I, activated carbon fibers are a recent development. They are formed by heating carbon fibers in an oxidizing atmosphere with water vapor present. Defect sites are oxidized to carbon dioxide, leaving the site for further attack, ultimately generating a pore. Uniform pores of 30Å giving material with a specific surface area of 3000m^2/g can be produced, close to the theoretical limit. Porous carbon fibers of up to 1000 m^2/g have adequate mechanical properties, but by 2500 m^2/g the mechanical properties are very poor, and higher surface area materials crumble. Such materials lend themselves to use in capacitors and, in fact, Matsushita has marketed a range of such units.

Materials with pores of 30Å are useful for introducing electrolytes, for filtration, and the like.

The highly layered structures allow easy intercalation of alkali metals such as potassium. The resulting layers, with strong ionic bonding, have negatively charged carbon layers abutting positively charged potassium layers. Such materials can attain specific conductivities approximating those of copper, rather than the expected very high conduction that had been anticipated on the basis of relative mobilities. Still, such intercalated materials find application in the space program or, for example, as static electricity dischargers on airplane wings.

Intercalation of fluorine gives rise to covalent as well as ionic bonding and the conductivity can be decreased as well as increased by intercalation. Reacting carbon with fluorine can result in insulating materials.

Carbon fibers have also been used

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Carbon Fiber Research

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for unique scientific studies. By using a tightly focussed laser beam a temperature of more than 4500°K gives a molten graphite spot of 1 mm^2 area and 1 μ deep in a graphite surface. Is liquid carbon a conductor or an insulator? To solve this much debated question a carbon fiber 2 cm long and 10 μ in diameter was heated to 5000° in microseconds using 500 volts and 20 amps to generate the ohmic heating. The very short time interval that the liquefied column stayed intact was long enough to make the measurement. The resistance dropped to 30 ohm-cm, showing that liquid carbon is indeed a conductor, in fact it is metallic.

Applications can be varied since carbon fibers can be tailored by heat treatment, intercalation or surface area changes to fill many needs.

Boron nitride fibers are like carbon fibers in their interatomic and interplanar distances, but being a wide gap semiconductor the totally different electronic structure of boron nitride gives rise to different properties. With boron nitride one can make strongly insulating fibers. Intercalation, while difficult, is possible with alkali metals under certain conditions.

Diamond fibers might be possible, but they should be weaker than graphite fibers because of the isotropy of the diamond structures. Progress toward continuous flat diamond surfaces is being made, so that composites with diamond surfaces should be possible.◇

Reported by M.S.Simon

Readers:
Please donate your copies of the *NUCLEUS* to your local High School when you no longer need them.

Dialog Response

Excerpted from a Dialog News Release and reprinted from the November 1990 Minnesota Chemist, publication of the Minnesota Section, ACS

(See p. 19 of the December 1990 *NUCLEUS* for the ACS position)

PALO ALTO, CA 31 August, 1990 – Dialog Information Services, Inc., today rejected as "diversionary tactics" the allegations contained in the American Chemical Society's counterclaim to Dialog's antitrust lawsuit.

"The ACS response fails to change in any way our belief that the Society has violated anti-trust laws," said Dialog's President and CEO, Dr. Roger K. Summit. "We look forward to our opportunity in court to answer ACS's totally contrived allegations concerning royalties."

The ACS charges, filed in Federal District Court in Washington, D.C. Friday, came in response to a suit filed by Dialog June 7. In its suit, Dialog charges the ACS with violating the antitrust laws in an effort to gain a monopoly over distribution of online chemical registry system information.

Dialog's suit seeks full access to the Society's publicly subsidized database of such information on fair and reasonable licensing terms, an end to anticompetitive practices by ACS, and damages for injuries to its business.

In its counterclaim, ACS charges Dialog with breach of contract and fraud for alleged underpayment of royalties on the portions of the database Dialog currently licenses from the Society's Chemical Abstracts Service division.

One part of ACS's claim concerns a Dialog feature called OneSearch℠, with which a searcher can use a single command to search a collection of databases, including those from different suppliers, a feature the Society's own online service lacks. "ACS's court papers appear to claim that they are entitled to royalties on searching done in databases from other suppliers. That is a pretty far-fetched interpretation of their license," Summit said.

"These allegations about royalties are simply a legal tactic to divert attention from the serious anti-trust issues raised in our court claim," Summit added. "We have always paid ACS royalties fully and in good faith. We have been paying tens of millions of dollars of royalties on the CAS database for well over a decade, and only after we filed our lawsuit did the Society notify us that it seeks to pursue these outrageous claims of underpayment."

Summit noted that Dialog's license agreements with the Society, which are still in force, provide for formal audits to settle royalty disputes, and the Society has sought such audit only once. On that occasion, in 1986, the Society's own auditors found that Dialog had actually overpaid the royalties. ◇

Edwin Herbert Land

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jobs until they found where they could be most creative and most satisfied, were examples of Land's sensitivity to his employees' needs and potential for growth. It also developed scientists who, with little more than a high school education, were able to make important contributions in the Polaroid laboratories. As a result of his philosophy Polaroid was always in front in attacking the problems of the American industrial workplace.

Land has been generous in the support of undergraduate education in the sciences. His most visible mark at Harvard? The building that looks like an opened SX-70 camera. That's where Harvard undergraduates now learn their chemistry.

Dr.Land left Polaroid in 1982 and set up the Rowland Institute in Cambridge as a center for creative research. Not only did he bring his own work on the theory of color vision, called the Retinex Theory, with him, but he also created the opportunity for chemists at Rowland to develop their own creative work. Was Land a chemist? No, but he was the chemist's friend. ◇

Northeastern Section American Chemical Society

Election of Candidates for 1992

In the interest of providing maximum information and expression of opinions by the candidates for election in 1991, 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 nominees, position statements. Except in cases where editing was necessary to meet space requirements, these statements have been reproduced without change. An official ballot along with a ballot envelope and a 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 on the ballot was determined by lot. Comments regarding the election or election process may be addressed to the Nominating Committee Chair, E. Joseph Billo.

BALLOT DIRECTIONS: Vote for the candidate(s) of your choice, insert your ballot into the ballot envelope, insert the ballot envelope into the return envelope, *sign your name on the return envelope only*, affix postage, and mail.

THE BALLOT MUST BE RECEIVED BY JUNE 1, 1991

Chairperson-Elect

Dorothy J. Phillips

When the nominating committee asked me to run for chair of the Northeastern Section of the American Chemical Society I was honored. I would welcome the opportunity to serve in that capacity.

I am a Chemical R&D Laboratory Manager at the Waters Chromatography Division of Millipore Corporation. I have been a member of the ACS for twenty-five years. During the six years at Waters I have been instrumental in developing and bringing to market several new products for the purification of proteins, peptides and nucleic acids. Several publications and presentations have resulted from the research and development of these new products.

Prior to joining Waters, I worked at Dow Chemical Company in Midland, Michigan for nine years. The education I received at Vanderbilt University (B.A. Chemistry 1967) and at University of Cincinnati (Ph.D. Biochemistry 1974) helped prepare me for my industrial career. I have come to realize that equally important to achieving career goals are the people that one meets along his or her path.

The need for professional contacts as one moves along in a career has prompted me to seek new ways of interacting with the scientific community of New England. If elected chair, I would focus on two areas that I consider very important. The first focus would be to revive the interest in scientific careers through mentors and science awareness programs. The second goal would be to promote technology exchange in our scientific community.

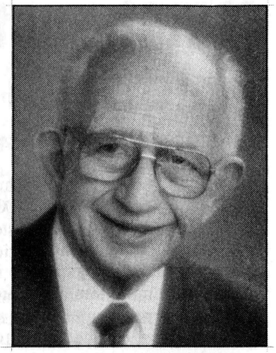
I realize that without mentors I would not have had the support required to move forward either as a scientist or as a manager. Undergraduate and graduate students need role models and mentors to keep them motivated and to enable them to see "the light at the end of the tunnel". In a leadership role I would promote increased interaction between ACS members and student chapters.

There has been a swing in college majors away from science. Several organizations have been trying to reverse this trend by attempting to increase the interest of elementary students in science. Since I came to the Boston area I have personally supported this effort. I have spoken to elementary, junior and senior high students about my background and career. As a participant in the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE) science awareness programs, I have addressed large groups of students in grades six through twelve relating my excitement of being a scientist. I would help the Northeastern Section to continue to sponsor programs and speakers with the goal of reversing the negative trend in the number of science majors.

Recently I accompanied ten other Western biochemists to the People's Republic of China for technology exchange with professionals at universities, research institutes and medical schools. I enjoyed the scientific exchange with my colleagues who were travelling with me and with the Chinese scientists. I feel there needs to be more opportunities where industrial and academic scientists come together in a retreat setting. The participants in such retreats would be expanded to occasionally include people from less technically advanced countries, such as China. Therefore, I would promote and organize technology exchanges between local and international scientists.

I look forward to the opportunity to serve the ACS Northeastern Section members. ◇

George R. Thomas



Biography: Born in Bethlehem, PA on 1 Feb 1920, I graduated from University School in Shaker Heights, OH in 1937 and received a BS degree from Bowdoin College in 1941 and a Ph.D. in Chemistry from Northwestern University, Evanston, IL in 1949. From 1949-54 I was a Post Doctoral Fellow at the University of Illinois, Harvard University, and Boston University. In 1954 I joined the US Army Natick Laboratories, Natick, MA, as Chief of the Textile Dyeing Research Section. In 1956 I was named the Chief of the Chemicals and Plastic Division and in 1960 the Director for R&D, Cothing Organic Materials Laboratory. From 1968 to 1986 I was the Director of the Organic Materials Laboratory located in the Army Materials Technology Laboratory (MTL), Watertown, MA. Over the period 1956-86 we were best known for our pioneering work in the development and application of elastomers, plastics, and advanced composte materials in military equipment. From 1986-1989 I was the Chief Scientist at MTL. "Retiring" in 1989, I became cofounder and the Secretary of the Watertown Arsenal Manufacturing Development Park, Inc., an organization dedicated to development of advanced manufacturing technology systems for industry. I intend to continue in that capacity for the foreseeable future.

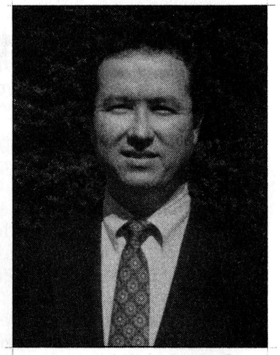
During the course of my career I sought collateral training, attending the 41st Advanced Management Program at the Harvard Business School, the 1st Senior Executive Fellow Program at Harvard's Kennedy School for Government, and the National War College in Washington DC for one year. I've served on a number of DoD and National Academy of Sciences Committees relating to chemistry and organic materials. I am a member of the American Chemical Society and the Society of Sigma Xi, and a Fellow in and member of the American Institute of Chemists and the American Association for the Advancement of Sciences. Applicable career keywords: Visionary, Innovator, Enabler, Implementer.

Statement: First and foremost let me state that being a chemist has not only been my life's work but also a way of life for me - socially, culturally, and professionally. Furthermore I have been well served in all of these aspects by the institution called the American Chemical Society (ACS), and more specifically the Northeastern Section of the ACS (NESACS).

There is an impression that the ACS is an elitist organization, especially at the National level. Whether or not it is "elitist" is not an issue because a lot of very talented chemists rise to the top and handle our affairs at the national level very competently. The result is that the general membership is willing to let the academic and industrial "elite" represent them. Predictably such a situation leads to a democratic apathy on the part of the membership at large. It is when this apathy becomes ingrained in the grass roots, the section level, that I become concerned. For example, we invited all seventeen Section's chairpersons in the Northeast Region and the Regional Director to participate in our 100th year celebration at Newport in 1990. We received responses from none except the Regional Director, Joan Shields. She agreed to attend, to participate in the formulation of and to chair the technical panel on "Education". The response of the Regional Director strengthened my faith in the National. The responses of the Sections should tell us something about the state of affairs in the other Sections in the Northeast. Clearly the Northeastern Section leads the region - let's keep up the good work.

The Northeastern Section is competently managed by a team of well-seasoned veterans who are "holding the fort." Unfortunately, they will ultimately pass from the scene leaving a vacuum in the continuity of preserving our culture. "Holding the fort" is not enough. Chemistry as a science, chemistry as a technology, chemistry in academe, chemistry in industry have been undergoing rapid change during the past decade and it is not clear that the current format is appropriate for the decade to come. As your candidate for chairman-elect I promise you, the membership, that I will bring in new blood and new ideas for the continuation of our Section, making it a hub for your professional, cultural, and social needs in the many and diverse areas of chemistry. ◇

Patrick F. King



This is a rare opportunity for me. Herein I petition your support to join me in an experiment.

My theorem is that the secret for growth and success in the 90's is directly tied to openness between expert groups or organizations.

My plan is to leverage my role as Vice President of Publications for the IS&T (Society for Imaging Science and Technology, formerly SPSE) into the plans for the N.E. Section of the ACS during my tenure as chairman. Examples of overlap:

1. Cross-reference critical points in Publications (i.e. newsletter to newsletter).
2. Invite Imaging Science Chemistry speakers.
3. Plan joint activities between the Boston IS&T Chapter and the N.E. ACS.

My experiment is already in progress in the IS&T from relationships being formed with SPIE (Society for Photographic Imaging Engineers) and TAGA (Technical Association of the Graphic Arts). As examples, we (the IS&T) are beginning a new Journal of Electronic Imaging in 1992, and are planning a new symposium on Electronic Photography for May. My plan is to test these interrelationships in the ACS.

Like most experiments, the postulate must be sound, and early learning and mid-course corrections could yield a very new, exciting set of Societies.

Please join me in our experiment.

Vitae: 1987–present, V.P. Technology, Polaroid Graphics Imaging; 1976–1987, Chemical Research, Polaroid; 1980 – Ph.D., Boston College; 1976 – M.S., The Ohio State University; 1974 – B.S., Boston College; 1982 – Executive Program, Boston College; 1986-1989 – MBA Candidate, WPI. Member: ACS, IS&T (V.P. Publications), R&E Council (Executive Board), TAGA, IT.8 (ANSI Standards). ◇

Candidates for Trustee

Janet S. Perkins

Rehired Annuitant, U.S. Army Materials Technology Laboratory, Watertown, MA 02172-0001

Northeastern Section: Trustee 1979-1988; Director, 1960-present (except 1969, 1977); Section Chairman, 1975; Secretary *pro temp,* 1966; Assistant Editor, THE NUCLEUS, 1967; Editor, Directory 1969, 1972; Program Chairman, 1974; Nominating Committee Chairman, 1976; Recipient of the Hill Award, 1984.

National ACS: Councilor, 1963-1968, 1970-1975, 1978-1980, 1988-1991; Women's Service Committee, Economic Status Committee, Government Chemists Liaison Subcommittee.

As a Trustee of Section Trust Funds for ten years, I endeavored to stabilize the true value of the Capital Funds and increase the flow of income to the five current Trust Income Funds. As Director (and Trustee) I engineered the addition of new capital to strengthen the General Purpose and the Publications Funds and to establish a capital base for the Hill Award Fund. I advocated use of the new financial instruments of the eighties to increase the output of the funds and gave careful consideration to all proposed changes in the portfolio of the Consolidated Fund from which the five other funds receive pro-rated income. One of my desires was to keep a portion of the capital funds invested in profitable chemical industries. It was a pleasure to work with other trustees and Mr. Robert Sarley of Shearson Lehman Brothers, who was our financial advisor.

After a three-year hiatus during which time I have become semi-retired, I would like to return to the Board of Trustees and would welcome your support.

John L. Neumeyer

Education: B.S. Columbia University (1952); Ph.D. (Medicinal Chemistry) University of Wisconsin (1961)

Professional Experience: Research Chemist, Ethicon (Div. of Johnson & Johnson) 1952-57. FMC Corp, Sr. Research Chemist, 1961-63. Arthur D. Little, Inc., Sr. Staff Scientist (1963-69). Distinguished University Professor, Medicinal Chemistry and Chemistry, Northeastern University 1969-present. Visiting Professor of Chemistry, University of Konstanz, Germany, 1975-7. Visiting Scientist, McClean Hospital, Harvard Medical School, 1985-6. Scientific Director and Chairman, Research Biochemicals, Inc., 1980-present.

ACS Activities: Founder and Chairman Medicinal Chemistry Group, N.E. Section 1964-65. Division of Medicinal Chemistry – Councilor, Executive Committee 1971-81, Vice Chairman 1981, Chairman 1982, Councilor 1983-87. N.E. Section – Councilor 1988-present, Trustee 1989-present, (Chairperson 1991).

Statement: Having served the American Chemical Society in a variety of functions over the past 26 years, most recently as a Councilor and Trustee of the Northeastern Section, I have become keenly aware of the problems and concerns of its members both on the local and national scene. The major responsibility of the Board of Trustees is to oversee and manage the endowment of Trust Funds (now over $1,000,000) and the income from the Trust Funds for the N.E. Section. I have become intimately aware of the time and effort required to manage these funds and to insure the maintenance and growth of capital while allowing enough income to finance the activities of the N.E. Section. I will continue to devote my time, energies and experience in carrying out my responsibilities as a Trustee.

Candidate for Secretary

Michael J. Hearn

The strong examples set by my predecessors in this office served as an encouragement to me when I was elected to this post. During the intervening time I have attained a widening perspective on the principal duties of the Secretary: helping to set the agenda and keeping the minutes of the regular meetings of the Board of Directors, certifying officers and councilors, maintaining good communications between those serving on the Board and the membership, reporting on our activities to Washington; yet it would be inappropriate to leave unmentioned the biggest thing which I have learned in becoming Secretary, the effective way in which the Section functions as the result of the cooperation of many talented and dedicated individuals. The Northeastern Section has had a long tradition of service to its members over many years and a longstanding recognition of the important role of education. It takes much hard work to put into practice the many programs in these areas which the Section sponsors, and I would like to indicate the sense of respect which I have for the people who do that hard work.

Candidate for Auditor

Anthony L. Rosner

b. 1943 Greensboro, N.C. B.S. [Chemistry] Haverford College [1966]; Ph.D. [Biological Chemistry] Harvard University [1972]. Staff Fellow, NIH-NINDS [1972-74]; Research Fellow, Tufts University Medical School [1974-75]; Research Fellow, Research Associate in Pathology, Beth Israel Hospital, Boston [1975-81]; General Director, Estrogen Receptor Assay Laboratory, Beth Israel Hospital, Boston [1976-83]; Technical Director, Clinical Chemistry Laboratory, Beth Israel Hospital, Boston [1981-83]; Technical Director/Clinical Chemist, New England Pathology Services [1983-86]; Administrator in Chemistry, Brandeis University [1986-]; Consultant, Estrogen Receptor Assay Laboratory, New England Pathology Services [1986-]; Lecturer, Department of Chemistry, Brandeis University [1987-88, 1990].

Over the past 16 years I have skillfully and effectively met the challenge of successfully balancing budgets in academic, hospital, and industrial settings. With this background, I would welcome the opportunity to continue to discharge the responsibilities required of the Auditor in the Northeastern Section of the American Chemical Society.

Candidates for Councilor/Alternate Councilor

Truman S. Light

Education: Harvard Univ., S.B.; Univ of Minn., M.S.; Univ. of Rome (Italy), Dr. of Chem.

Professional Experience: Retired as Principal Research Scientist, The Foxboro Co.; Principal Scientist, Avco R&D; Assist. Prof. Boston College.

Service to the Northeastern Section, ACS (NESACS): Chairman of the Analytical Group, 1950's; Chairman of the Section, 1978; Councilor or Alternate, 1969-present; Chairman and member of various committees including Constitution and Bylaws, and Esselen Award Committee.

Statement: Since retiring, I have had appointments as Adjunct Professor at Suffolk University and Boston College, and maintained a Consultant Practice. I participate in the NESACS Board of Directors monthly meetings; as a Councilor I attend the twice-annual national meetings of the American Chemical Society and represent the NESACS at the Council meeting. As of this writing, I am heading for the spring meeting at Atlanta where I will also continue my activities at the National Employment Clearing House by assisting several hundred job seekers with preparing resumes and obtaining appointments with employers who are interviewing there. I have served on the National Committees for Local Section Activities, Constitution and Bylaws and Membership Affairs. Re-election as a Councilor will enable me to continue participation in the National ACS by representing the Northeastern Section.

Catherine E. Costello

Sr. Research Scientist, Dept. of Chemistry, MIT. A.B., Emmanuel College; M.S., Ph.D., Georgetown University. Associate Director, MIT-NIH Mass Spectrometry Facility since 1975. Research interests in the development and application of mass spectrometry-based methods for the structural elucidation of biologically important compounds. ACS activities: Councilor (NE Section), 1988-present; Alt. Councilor 1986-8; board of publications, 1987-present (chairman, 1990); organizing committee, 1990 National Meeting; nominating committee, 1982, 1983, 1987. Have visited more than 50 local sections as an ACS lecture tour speaker, 1974-present.

The Northeastern Section of ACS is one of the largest in the society and was recently recognized as the Outstanding Large Section. I have been happy to participate in the activities of the section and to serve as one of your representatives to the ACS Council. Our section has much to contribute, both at the national and international level, towards the sharing of technology and the education of the present and future generations of chemists. We also stand to benefit from programs conducted by the society as a whole that are aimed at career development of individual chemists and the welfare of the public and the environment. I believe my ACS-related and other professional activities have provided me with a perspective that enable me to assist in this two-way communication and would therefore like to continue serving as your Councilor.

Joseph A. Lima

Credentials: A member of the ACS since student affiliation in 1960. I am a dues paying member of the Northeastern Section, the Division of Chemical Marketing and Economics and serve on the NESACS board of publications. My employment experience is very diverse and yet has always been in the "chemical" area. These experiences range from The Army Chemical Corps to various industrial positions and now as a V.P. at Houghton Chemical. I have a B.S. in Chemistry from SMU and an MBA from Babson.

Statement: It seems to me that today we are faced with a myriad of problems that the public relates to the application of chemistry. Examples even include utilization of "natural" products, in their refinement or modification for use, as well as manufacturing, use and recycling of synthetic (and natural) materials. I think we have a uniquely qualified group to examine these problems and address them. We need a more scientifically literate public and again we can help. As an alternate councilor, I would represent the views of the section and, in addition, would encourage addressing these broader issues. As a result, not only would they improve, but also the public regard for our profession and industry in general.

Geoffrey Davies

University Distinguished Professor and Faculty Fellow, Barnett Institute of Chemical Analysis and Materials Science, Northeastern University, Boston, MA 02115. MAJOR INTERESTS: Inorganic and physical chemistry; materials science; cooperative education. UNIVERSITY DEGREES: B.Sc. (First Class Honors, Chemistry), 1963; Ph.D. (Chemistry) 1966; D.Sc. (Chemistry), 1987, University of Birmingham, England. PREVIOUS POSITIONS HELD: Professor, 1981-88; Associate Professor, 1977-81; Assistant Professor of Chemistry, Northeastern University, 1971-77; Imperial Chemical Industries Fellow, University of Kent, 1969-71; Research Associate, Brookhaven National Laboratory, 1968-69; Postdoctoral Fellow, Brandeis University, 1966-68. HONORS, LISTINGS, CITATIONS: Royal Society Travel Award 1970; Sigma Xi Lecturer, 1973; Visiting Lecturer, Boston Public Library, 1976; Visiting Lecturer, MIT, 1975; Listed in "Who's Who in the East", etc.; Excellence in Teaching Award, Northeastern University, 1981; Certificate of Honour, Alexandria University, 1989; Barnett Award for Innovative Research, 1990; Seven books, 155 papers, 220 invited and contributed technical presentations since 1971. SABBATICAL APPOINTMENTS: Visiting Principal Research Officer, ARC Unit of Nitrogen Fixation, University of Sussex, 1979; Visiting Professor, University of Alexandria, 1986-7. ACS SERVICE: ACS Lecturer, 1974-present; Norris Summer Scholarships, 1982-86; Editor, "Cooperative Education" feature, J. Chem. Educ., 1980-; Participant, NESACS Speakers Bureau, 1989-present.

I support the reconsideration of chemistry curricula, the certification of chemists and graduate programs, improved interfacing of colleges with elementary and high schools and wider cooperative education in the sciences.

Alfred Viola

Education: BA, 1949, MA 1950, Johns Hopkins; Ph.D., 1955, University of Maryland. Professional experience: Boston University, Research Associate, 1955-57; Northeastern University, 1957-present, Professor 1968-present; Visiting Professor, University of Munich, Germany, 1977, Monash University, Australia, 1984. Northeastern Section: Alternate Councilor, 1963-65, 65-68; Norris Award Committee, 1979-82 (Chairman 1981), 1982-86 (Chairman 1985); Councilor 1986-88; Continuing Education Committee, 1989-present (Co-Chair 1989), (Chairman 1990-present); Alternate Councilor, 1990-1

Statement: In my view the problems facing the chemical profession and its practitioners are now more numerous and more profound than at any previous time in the history of the science, but so also are the opportunities for Chemistry to contribute to the health and welfare of society as a whole. There is great need to educate the public as to the truths and misconceptions that surround the world of Chemistry, and thereby address the rampant scientific illiteracy within the public which now hinders scientific progress in this nation. I also feel that it is imperative for the Society to provide continuing education opportunities to our members that enable all of us to stay abreast of the ever evolving advances and changes in the world of Chemistry. I would like the opportunity to continue to represent these viewpoints within the Section and the Council.

Esther A.H. Hopkins

Incumbent Councilor. I have actively promoted the interests of members of the Society especially and specifically the chemists who are a part of the Northeastern Section. As Councilor, I have led and worked on committees, led Task Forces, participated in caucuses and deliberations, spoken for the professional and democratic interests of chemists and of chemistry itself. I ask for your vote so that I may continue.

Boston Univ. A.B.; Howard Univ. M.S.; Yale Univ. M.S. and Ph.D.; Suffolk Univ. J.D. Member, Bar of the Patent and Trademark Office and of Massachusetts; – Deputy General Counsel, Dept. Environmental Protection, Mass. – Past Technology Liaison Manager, Project Administrator, Patent Attorney and Scientist at Polaroid Corp. – Northeastern Section , Councilor, Chairman, Chair of Awards, Long Range Planning, Constitution and Bylaws Committees; Henry A. Hill Award Winner; National ACS, Chair, Council Comm. on Professional Relations; Task Force on Compensation for Employed Inventors; Task Force on Federal Conflict of Interest Regulations; Sec'y Comm. on Comm.; Women Chem. Comm.; Member, Constitution and Bylaws; Canv. Comm. Garvan Medal; ACS Award for Creative Invention, Council Policy Comm.; PROPPACC.

Iclal S. Hartman

Professor of Chemistry and Chairwoman of the Chemistry Department at Simmons College. Chair of the Membership Committee of the Northeastern Section.

James Quick

No statement received.

Donald O. Rickter

Education: University of California, Davis, AB and MS; Michigan State University, Ph.D.

Experience: 2 years as U.S. Navy Hospital Corpsman; 3 years H.S. and college teaching; Polaroid Research (Scientist since 1964; Information Scientist since 1978).

ACS Activities: Member since 1953; Congressional Science Counselor (8th District, Mass.) since 1974; Liaison between the Northeastern Section and Polaroid since 1974; Program Committee 1981; Board of Publications 1983-85; Alternate Councilor 1985-1990.

Statement: Each of us needs to work on communicating better. We can solve many problems as chemists and as citizens when we share our abilities. The public has some negative impressions of chemistry that will not go away if we are silent, neglecting our responsibilities to inform people.

One of my concerns is the future of Chemical Abstracts Service. It is moving away from the understanding and "user-friendliness" of working chemists. Its powerful tools should be more useful than they are now.

The Northeastern Section is unusually rich in talented chemists who need opportunities to interact socially and professionally. They can make their society and their local section great by active participation.

Katie A. Stygall

It is an honor for me to be nominated for the position of Councilor of the Northeastern Section of the American Chemical Society. I am excited about the prospect of representing our section at a national level. I have been active at a local level for five years and have served as chair of the hospitality committee for two years, and as chair of public relations for two years. I am currently program chair and co-chair of the education task force.

If elected, I should like to use my experience in public outreach to contribute to the public outreach programs on a national level. I hope I can contribute fresh ideas and initiative to such programs.

I earned my BSc and Ph.D. from University College London and worked as postdoctoral research fellow at the California Institute of Technology. I have been teaching for the past eight years and currently hold a position at Bradford College. I am also an affiliate of the Institute of Chemical Education.

Patricia L. Samuel

Assistant Professor, Coordinator of General Chemistry, Boston University; B.S., Notre Dame College of Ohio, 1966; M.A., Boston University, 1969; Ph.D., University of Washington, 1977. Member of ACS since 1965; Division of Chemical Education; Program Com., Personnel & Nominations Com., Finance Com., Div.

Patricia L. Samuel (continued)

of Analytical Chemistry, History of Chemistry. Northeastern Section service: Alternate Councilor since 1987; National Chemistry Day Com. 1987; Public Service Com. 1988-present, Chair 1990, 1991.

Statement: Two interrelated challenges facing the profession which are of interest to me are (1) the appreciation of chemistry by the public and (2) attracting more talented students into chemistry. As an educator I confront these questions on a daily basis with my students. I am fortunate to be able to work with some of New England's best secondary school teachers in professional development programs. At the national level I am active in the Division of Chemical Education, whose members come from all levels of the educational system - elementary school, high school, college, and beyond - as well as industry. We must utilize children's curiosity about the natural world and build on it, starting at an early age. For the most part, students' opinions of science have been formed long before they reach high school. To insure the future of the chemical profession we need technically literate citizens as well as chemists. Thus we must provide excellent science education at all levels, during formal schooling and beyond. Cooperation among local school districts, colleges and universities, and industries can advance our common interests. The ACS actively promotes excellence in chemical education, beginning in elementary school. The Public Service Committee of NESACS, on which I serve, carries forward this mission locally. If I am re-elected I will continue to work for increased public support of chemistry and to attract bright young people to chemistry as a career.

Valerie A. Wilcox

Education Associate, Museum of Science, Boston, until March 1991. M.A. Chemistry, Wellesley College (National Science Foundation Institute). B.A. Mathematics, College of New Rochelle. Alternate Councilor, 1986-88, 1989-91. Northeastern Section Public Service Committee, 1987-91. National Chemistry Week Chair for the Northeastern Section, 1987, 1989, 1991 (Section nominated for Phoenix Award, 1989).

As a science educator with special emphasis on increasing science literacy for the general public, I would like to continue my work with Public Service in bringing to our membership and the people of New England such programs as the annual Richards Holiday Lecture, the Student Science Symposium, and the many programs of National Chemistry Week. As an Alternate Councilor, I have attended many National Council meetings and would like to expand my commitment to public education to the national level. I would appreciate your support.

Nominating Committee

Daniel J. Churella

Received a BS in chemistry from the University of Pittsburgh (1973) and both an MS (1976) and PhD (1986) in analytical chemistry from Northeastern University. He has been employed in the research division of Polaroid Corporation since 1977, working in the areas of atomic spectroscopy, trace metals analysis, process analytical chemistry, flow injection analysis, and rheology. He has been a member of the ACS since 1973, and served as the analytical program coordinator for the Northeastern Section.

James N. LePage

1975 BS graduate of Lowell Technological Institute and a 1981 PhD chemistry graduate of Northeastern University. Jim's research at Northeastern was in the field of liquid chromatography under the direction of Barry Karger. His main research focus at Northeastern was in the use of secondary chemical equilibria to achieve special selectivities in reversed phase liquid chromatography and has co-authored several articles and a chapter in a book on this subject.

Jim is Director of Analytical R&D for W.R. Grace's Organic Chemicals Division. His lab is located at OCD's Hampshire Chemical facility in Nashua, NH. The lab provides method development and specialized analytical services to the six R&D and manufacturing facilities operated by the division.

Jim is a lifelong resident of southern New Hampshire and resides with his wife and two children in Hudson, NH.

Michael E. Strem

President, Strem Chemicals, Inc., since founding it in 1964. Education: A.B. Brown University (1958), M.S., Ph.D. University of Pittsburgh (1961, 1964). Current ACS activities: Councilor, Division of Small Chemical Businesses; Chairman, Subcommittee on Ethics, Committee on Professional Relations. Northeastern Section activities: Chairman, 1989.

Timothy R. Carroll

Born in 1960 in California and received his B.S. in Chemistry from Harvey Mudd College, Claremont, California in 1980. While at Harvey Mudd College he worked with Professor Mitsuru Kubota on Manganese and Iridium organometallic complexes. He relocated to the Boston area, and received a Ph.D. in Inorganic Chemistry from M.I.T. in 1984. While at M.I.T. he worked with Professor Alan Davison on Technetium chemistry research, with an emphasis on labelling of antibodies. He joined the DuPont company's research facility in North Billerica, Massachusetts upon graduation, initially as a visiting scientist and then as a research chemist. He is currently Group Leader, Chemistry Research, Radiopharmaceuticals Research and Development in the recently formed joint venture The DuPont Merck Pharmaceutical Company. He resides in Belmont, Massachusetts with his wife Rona and newborn daughter Jessica.

Richards Medal Committee

Cynthia M. Friend

Harvard University: Professor of Chemistry, July 1989-present; Morris Kahn Associate Professor, January 1988-July 1989; Associate Professor, July 1986-January 1988; Assistant Professor, July 1982-July 1986. Research Collaborator, National Synchrotron Light Source, Brookhaven National Laboratories, November 1983-present. Post-Doctoral Research Fellow, Stanford University Department of Chemical Engineering, August 1981-June 1982; research advisor: Professor R.J. Madix. Visiting Researcher, General Motors Research Laboratory, Physical Chemistry Department, January-February 1981; collaborative project with Dr. J. Gland. Ph.D., Chemistry, 1981, Univ. of California/Berkeley; B.S., Chem., 1977, U.C./Davis.

Walter H. Stockmayer

Professor Emeritus, Dartmouth College, Hanover, NH. S.B., MIT '35; Ph.D., MIT '40. Chemistry Depts. MIT 1937-41, 1943-61; Columbia University, 1941-43; Dartmouth College 1961 -. Physical and polymer chemistry. Associate Editor, Macromolecules. ACS Awards: Polymer Chem. 1966, Debye 1974, Richards Medal, 1988.

Stephen J. Lippard

He holds the Arthur Amos Noyes chair in the Department of Chemistry at the Massachusetts Institute of Technology. He was educated at Haverford College (B.A., 1962) and the Massachusetts Institute of Technology (Ph.D., 1965), and taught at Columbia University from 1966-1982. He returned to M.I.T. in 1983. He is a member of the American Academy of Arts and Sciences and the National Academy of Sciences. He is author or co-author of more than 300 articles in professional and scholarly journals, and holds 2 U.S. and several foreign patents. His research activities span the fields of inorganic and biological chemistry. Included are mechanistic studies of platinum anticancer drugs, DNA promoted reaction chemistry, the synthesis of novel polyiron oxo complexes, characterization of the diiron core in methane monooxygenase, reductive coupling of carbon monoxide and related ligands in high coordinate organometallic complexes, and the development of catalysts for stereoselective syntheses using transition metal complexes of dinucleating ligands.

James B. Hendrickson

Prof. Hendrickson of Brandeis University did his doctoral degree with R.B. Woodward and was postdoctoral fellow with D.H.R. Barton, then was Assistant Professor at UCLA before moving to Brandeis University. He has been a Fulbright Visiting Professor in Ghana and is a longtime successful teacher of organic chemistry at Brandeis. He co-authored a well-received text, "Organic Chemistry" with Cram and Hammond. He served as Chairman of the Northeastern Section in 1984 and as a member of the James Flack Norris Award Committee from 1987-1990.

Esselen Award Committee

Truman S. Light

I was a member of the ad hoc Committee which established the Esselen Award for Chemistry in the Public Interest and have been an elected member of the Committee for the first four years of the Award. The Constitution and Bylaws permit two four-year terms. I should be pleased to be elected to a second term on the Esselen Committee. Those who are interested may read more of my biography under Councilor nominations.

Bill C. Giessen

b. 1932, Sc.D. Goettingen (Germany) 1958, Professor of Chemistry and Associate Director, Barnett Institute of Chemical Analysis and Materials Science, Northeastern University, Boston, MA 02115.

Research in Inorganic and Materials Chemistry; author/co-author of over 200 publications in alloy and crystal chemistry, amorphous metals, magnetic materials, ceramic superconductors and forensic chemistry; co-editor of 7 books; co-holder of 12 patents. William Hume-Rothery Award of Metallurgical/Materials/Minerals Society (TMS) 1990; Klein University Lecturer, Northeastern 1990. Founder of Cambridge Analytical Associates, Inc. (now Cambridge Division, National Environmental Testing, Inc., Cherry Hill, NJ). Special interests: collaborative research modes; industrial technology utilization and technology/transfer; innovations in undergraduate education.

William O. Foye

A.B., Dartmouth College; M.S., Ph.D., Indiana University. Industrial experience at duPont Co.; teaching experience at Univ. of Wisconsin School of Pharmacy and Massachusetts College of Pharmacy and Allied Health Sciences. Currently Sawyer Professor in the Chemistry department of M.C.P.A.H.S.

Have served the Northeastern Section as Chairman (1977), Chair of Awards Committee, member and Chair of Esselen Award Committee, Chair of A.C.S. Congressional Science Counselors Program for the Northeastern Section, and founder of the Speakers Bureau. Also Chair of the Medicinal Chemical Group and Alternate Councilor.

William E. Smith

Director, Chemical Research Division, Polaroid Corporation, 1988-present. B.S. in Chemistry, LaSalle College (1965), Ph.D. Purdue University (1969). NIH postdoctoral fellowship MIT 1969-1970. Various research and research management positions at GE Corporate Labs, Schenectedy, NY (1970-1988). Currently serve as Polaroid representative to ACS Corporate Associates, Council for Chemical Research, and Industrial Research Institute.

Board of Directors

Condensed Minutes, Meeting of February 14, 1991

Officers' Reports:

Treasurer and Budget Committee: The cash balance is adequate at the present. J. Piper presented the 1991 budget and responded to questions. It was MOVED and VOTED to accept the budget as presented.

Past Chairman: E.J. Billo made available copies of the abbreviated Annual Report of the Section for 1990. A complete copy, including the full financial reports and attachments is available for inspection at the Section office.

Committee Reports:

Program: K. Stygall pointed out that the March Section meeting will be at a new location, the Sheraton Tara, Newton Corner.

Awards: The Esselen Award will be presented at the April 4 meeting at Harvard to J. Meinwald and T. Eisner of Cornell University for their work in chemical ecology.

Publications: C. Costello reported for M. Strem. *NUCLEUS* advertising has suffered a decrease because of the present economy. Unemployed members may place free employment ads in the *NUCLEUS,* limited to 3 such ads per year. In order to update the data base for a future directory, a tear-sheet in the March 1991 and a later issue of the *NUCLEUS* will request member data. C. Kolb suggested obtaining phone directories of employers to supplement member data.

Education: C. McGowan announced that the ACS Handbook for Student Affiliate Chapters has been mailed to the 24 chapters in our area. A volunteer to coordinate SEED activities in this area is needed; those who can get their department to undertake this should contact Cynthia McGowan (Wellesley College).

Constitution and Bylaws: A. Heyn stated that the committee is addressing ambiguities in the filling of vacancies in Councilor and Alternate Councilor terms.

Hospitality: D. Howell has accepted the chairmanship of the committee. Because of the high cost of meals at Simmons a change in the location of the regular Section meetings is being considered.

Nominations: E.J. Billo presented the slate of candidates for the 1991 election which will be published in the March *NUCLEUS.* In order to avoid misunderstandings about the length of the term to which Councilors and Alternate Councilors have been appointed, the Secretary is to make sure that the term is stated correctly.

Continuing Education: A. Viola announced that the Waste Management Symposium will be held at Northeastern University on April 27, 1991.

Legislative Affairs: P. Brauner announced that a reception for New Hampshire Legislators will be held at Concord, N.H. on either April 9 or 11, 1991.

Public Service: P. Samuels and V. Wilcox announced the traditional Holiday Lecture in late December, as well as another public lecture addressed primarily to adults at another time of the year and also to become an annual event. Chemistry Week, November 3-9, 1991, will be celebrated by using Student Affiliate volunteers in the Science Museum and presentations of demonstrations in some shopping malls, Children's Museum and the N.E. Aquarium and other locations. V. Wilcox is to be the coordinator.

New Business: A Student Affiliate Workshop is planned with details to be announced at the next board meeting.

In the absence of the Secretary, A. Heyn recorded the minutes. ◇

Summerthing 91

August 17, 1991, Salem, MA

Plan to come to SUMMERTHING! Bring your family and friends to join us and meet other friends and members of Northeastern Section of the American Chemical Society to spend a fabulous day in Salem.

WHALE WATCH – The voyage will take us 15 miles out into the blue Atlantic, passing historic Salem and Marblehead to the whale feeding grounds.

PEABODY MUSEUM – Newly-opened Asian Export Art Wing housing many treasures from the Orient.

SEA PLANTATIONS, INC. – Organisms for bioassay and research, an inside look into a state-of-the-art industry / laboratory which supplies research and commercial testing laboratories along with gourmet restaurants.

VOYAGE OF INDIA STAR – A pirate attack, a thunderstorm at sea, flashes of lightning, a colonial fourth of July, A FABULOUS SHOW!

HOUSE OF SEVEN GABLES – 17th century mansion, made famous by Hawthorne's classic tale.

THE WITCH MUSEUM – Restored home of Jonathan Corwin, judge of the Salem witch trials.

THE PIONEER VILLAGE – Introducing visitors to domestic life in 1630, Salem.

SALEM'S HERITAGE DAYS – Side walk sales, band concerts, special exhibits children's entertainment.

Bring your own lunch, and eat in the park or pick a restaurant on Pickering wharf, but we will have dinner together in a restaurant by the side or on top of the ocean.

SAVE AUGUST 17th – SATURDAY FOR SUMMERTHING 1991! More detailed information will be in our next issue of *NUCLEUS.* ◇

Environmental Chemistry Column

Lazy, Hazy Days of Winter

by C.E. Kolb,
Center for Chemical and Environmental Physics
Aerodyne Research, Inc.

The current concern over global warming induced by rising levels of atmospheric greenhouse gases (see "Deglazing the Atmospheric Greenhouse" in the April, 1991 Nucleus) should not obscure the fact that atmospheric chemical perturbations can also significantly cool the Earth's surface.

Atmospheric cooling arises if significant levels of atmospheric particulates or aerosols intercept incoming solar radiation and scatter it back into space before it can reach the planet's surface. Since small particles are usually much less effective in trapping the Earth's outgoing, long wavelength infrared radiation than they are in scattering the Sun's shorter wavelength incoming visible and ultraviolet radiation, particle scattering almost always leads to surface and near surface cooling. Particles big enough to effectively absorb or scatter infrared radiation are generally too large to stay airborne long enough to cause climatic perturbations.

Global cooling has clearly occurred in the past when volcanic eruptions have deposited large amounts of particles and aerosol precursors in the stratosphere where they persist for several years. The last occurrence of this effect was the minor atmospheric temperature change due to the eruption of the modestly large El Chicón volcano in 1982. The general phenomenon of particulate scattering is also the cause of scientific concern over the "nuclear winter" hypothesis which proposes that major global cooling might be induced by high altitude distribution of smoke from fires started during a nuclear war. Similar concerns have been expressed about the smoke from the burning Kuwait oil fields, but this smoke appears to be restricted to the lower 5 km of the atmosphere, where it can cause only local cooling effects.

It may seem crazy to worry about global cooling effects since 1990 is now officially the warmest year recorded in more than a century of reliable meteorological records and since five of the six preceding warmest years occurred in the 1980's. However, despite this recent warming, atmospheric modelers have long been concerned that the measured rise in atmospheric greenhouse gases does not match the rising temperature data very well at all. The temperature rise is most dramatic between 1920 and 1940 and 1978 to 1990 while the greenhouse gases have been rising steadily for at least a hundred years. Also the temperature rise, to date, has been smaller than that predicted by leading models of the greenhouse effect.

Recently a team of scientists at the University of Washington and Stockholm University has proposed that a significant part of the anticipated greenhouse warming has been obscured by a simultaneous global cooling due to increased levels of atmospheric sulfate aerosols formed primarily from SO_2 emitted during fossil fuel (coal, fuel oil, etc.) combustion. Sulfate aerosols are formed when SO_2 is oxidized to $SO_4^=$ either in the gas phase via reactions involving OH, O_2 and H_2O or in cloud droplets by H_2O_2 or O_3.

The small sulfate aerosols formed either by condensing gas phase sulfate species or by evaporating cloud droplets affect the Earth's radiation balance in two ways. First, they scatter sunlight directly, and second, they serve as cloud condensation nuclei, forming clouds which can also scatter sunlight back into space. The University of Washington/Stockholm University team calculates that the direct scattering of solar radiation due to clean air sulfate aerosol from fossil fuel burning currently causes an average northern hemisphere (n.h.) cooling of -1.3 W/m^2, comparable to the calculated n.h. warming due to the CO_2 produced by fossil fuel and biomass burning of $+1.5$ W/m^2. (The calculated warming due to rising CO_2 is roughly half that due to all of the greenhouse gases.) The 1990 amendments to the U.S. Clean Air Act mandate a significant reduction of the SO_2 emitted by U.S. power plants in order to reduce acid deposition. Stay tuned to see if this reduction makes the greenhouse effect worse!

While the global cooling effect of sulfate aerosols is a new (and controversial) topic, their effect on atmospheric visibility has long been recognized. For instance a recent National Academy of Sciences report suggests that increasing haze levels in the Grand Canyon may well be due to sulfate aerosol formed from SO_2 emitted by the huge coal-fired Navajo Generating Station over 110 km from the canyon. The Environmental Protection Agency is planning to force the Navajo Station to install SO_2 scrubbers to reduce the problem.

Atmospheric aerosols, including the ubiquitous sulfates, play a major role in the transmission of visible and shorter wavelength infrared radiation through the atmosphere. In addition to obscuring the vision of tourists at the Grand Canyon (and many other places) they can have a significant effect on the operation of "smart" military systems. For this reason researchers at the Air Force's Geophysics Laboratory (recently renamed the Geophysics Directorate of the Phillips Laboratory) in Bedford, MA have played a leading role in determining their chemical

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ACS News

Chemical Risk: Personal Decisions

This pamphlet was recently published by the ACS in response to the public concern about health effects of chemicals in our food, air, waters and households. Examples of personal options for radon, lead and pesticides are given to illustrate the pamphlet's suggestions.

The pamphlet, written for the non-scientist who is concerned about exposure to chemicals from environmental and household sources, explains concepts of risk assessment and risk management and will be a helpful tool for those involved in the field of risk communication.

Copies of the pamphlet are available free by calling Nancy Todd at the ACS, (202) 872-8725 or by sending a self-addressed mailing label to her at the Department of Government Relations and Science Policy, ACS, 1155 16th St., NW, Washington, DC 20036.

^{23}Na Chemical Shift Imaging as a Probe of Interocular Fluid Dynamics

by Colby Stanton

Abstract

A lanthanide shift reagent, $[Tm(DOTP)]^{5-}$, has been employed in conjunction with ^{23}Na Chemical Shift Imaging (CSI) to study the fluid dynamics of the vitreous of both enucleated calf eyes and *in vivo* rabbit eyes. The structure of the shift reagent has been studied using ^{31}P NMR spectroscopy. Difficulties encountered during administration of shift reagent to rabbits have been examined using ^{23}Na NMR spectroscopy.

Introduction

Shift reagents are commonly used in nuclear magnetic resonance (NMR) spectroscopy and imaging to distinguish intra- and extracellular sodium. In the present project a shift reagent, composed of a lanthanide metal and an organic ligand, was utilized to distinguish different pools of extracellular sodium. The diffusion of the shift reagent through the vitreous has been studied to model both the natural movement of water through the vitreous and the effects of diabetic retinopathy.

Shift reagents are used to induce a shift in the characteristic frequency at which nuclei such as sodium absorb radiation in the radiofrequency range. In this project 1,4,7,10-tetraazacyclododecane-N,N',N",N'"-tetramethylenephosphonate thulium (III), ($[Tm(DOTP)]^{5-}$), was used as a chemical shift reagent (see Figure 1). When introduced into a biological system the shift reagent is prevented from crossing cell membranes by its size and negative charge. As a result, without degradation of cell membranes, the shift reagent simply diffuses through the extracellular space and can therefore be used to distinguish different pools of extracellular sodium. In eyes experiencing diabetic retinopathy, shift reagent will leak from retinal blood vessels into the vitreous.

At the concentrations used in these experiments the induced shift in the sodium frequency is directly proportional to the ratio of the concentrations of $[Tm(DOTP)]^{5-}$ and sodium ions, such that:

$$\text{Na shift} \propto [Tm(DOTP)]^{5-} / [Na^+] \quad (1).$$

The technique used i.e., chemical shift imaging (CSI), yields both spatial and chemical shift information. In these experiments four dimensional CSI was employed, giving three dimensions of spatial information and a fourth dimension of chemical shift information. When used serially, a fifth dimension of time may be incorporated as well[1].

Materials and Methods

I. Preparation of the shift reagent

The $[Tm(DOTP)]^{5-}$ was synthesized by a modification of the method of Buster, *et al*[2].

II. Characterization of the shift reagent

All shift reagents prepared were characterized via serial dilution with 145 mM sodium chloride solution (Sigma Chemical Company, St. Louis, MO) to determine the dependence of induced shift on the ratio of shift reagent concentration to sodium ion concentration. The shift reagent was placed in a 10-mm outer diameter NMR tube, with a 4-mm outer diameter insert (Wilmad Glass, Buena, NJ) containing 145 mM sodium chloride in deuterium oxide (Aldrich) solution as a reference. ^{23}Na NMR spectra were obtained using a Bruker 200/AF 4.7 Tesla (T) spectrometer at Wellesley College. All ^{23}Na spectroscopy and imaging in these experiments was performed at 52.93 MHz. The difference in chemical shift between the sodium chloride reference and the sodium in the solution containing shift reagent was then plotted versus the ratio of $[Tm(DOTP)]^{5-}$ concentration to sodium ion concentration. The dependence of induced shift upon shift reagent concentration was also studied in both whole rabbit blood and in rabbit serum. All dilution experiments were performed at 37°C.

^{31}P NMR spectroscopy was performed at 81.01 MHz using the Bruker 200/AF spectrometer at Wellesley College. An insert containing deuterated phosphoric acid (Sigma) in D_2O was employed as the reference.

III. Preparation of rabbits for imaging

Dutch-belted rabbits weighing between 1.5 and 2.5 kg were anesthetized by intramuscular injection of 0.75 mL/kg of solution containing equal volumes of ketamine hydrochloride, 50 mg/mL (Parke Davis, Morris Plains, NJ) and xylazine hydrochloride, 20 mg/mL (Haver, Shawnee, KS). Additional anesthesia was given as necessary through the course of the experiment, typically 1 mL/ 45 min. The shift reagent was injected into the marginal ear vein.

IV. Source of Calf eyes:

Calf eyes were obtained from Research 87 (Revere, MA) several days before imaging and stored at 5°C.

V. Image acquisition

All ^{23}Na CSI was performed at the Massachusetts Institute of Technology MRI (Magnetic Resonance Imaging) Facility, using a 4.7T 30-cm bore Oxford Magnet and a custom-built spectrometer and gradient coils. The gradient coils used were capable of producing fields of 6 gauss/cm without appreciable eddy currents. An 8-cm. two-turn surface coil, tuned and matched for each sample to the sodium resonance frequency of 52.938 MHz, was used for these experiments. The four dimensional ^{23}Na CSI experiment is a phase encoded CSI pulse sequence with three phase encode gradients. A hard 90° pulse provided the initial excitation of the sample. Typically, 256 data points were collected, with sixteen phase encoding operations in two dimensions and four operations in the third dimension. The 256 points were truncated to 64, due to computer memory limitations. The resulting 64 x 16 x 16 x 4 data matrices were processed by four dimensional Fourier transformation, and the resulting images displayed as four sets of 64 two-dimensional images. Each set represents a slice of the sample of thickness determined by the strength of the third gradient, typically 4 mm. Resolution in the other two dimensions is about 1.5 x 1.5 mm^2. The sweep-width employed in these experiments was 5000 Hz, resulting in a bandwidth of 78 Hz per 16 x 16 image.

Results and Discussion

^{31}P NMR spectroscopy has been employed to give information regarding the the bonding and structure of the shift reagent, a topic made more pressing by the formation of precipitate during the chelation step of synthesis. ^{31}P NMR spectra have been obtained of several batches of shift reagent, some with and some without precipitate formation (see Figs. 2 and 3). The spectra may indicate the presence of two different structures of the shift reagent in solution, with the phosphonate groups of each in different orientations relative to the thulium. The predominant species thus shows two more intense peaks separated by a larger difference in chemical shift than the minor species. Another possible explanation for the spectrum would be the presence of four different species, where all phosphonate groups in each species are identical. Thus far, there is no indication that one explanation should be preferred over the other. In comparing the spectra yielded from the batches with and without precipitate formation, the most intense peak is seen to be more intense in the spectrum obtained from the shift reagent with no precipitate. Also, the second most intense peak is both more intense and further downfield in the spectrum of the shift reagent without precipitate. (The dilution curve obtained from the clear shift reagent sample, when compared to that obtained from the shift reagent which had had precipitate, shows a larger induced shift at each calculated concentration.) Further experimentation has shown that small variations in pH in the physiological range have little or no effect on the structure of the shift reagent, so that the larger shift downfield seen in the clear spectrum may indicate an actual, though seemingly slight, difference in structure. However, all spectra seem to contain the same peaks, leading to the conclusion that the precipitate may be simply the result of impurities and, regardless, may be filtered before injection without significant reduction of induced ^{23}Na shift.

Significant problems have been encountered in administering the shift reagent to rabbits *in vivo*. The behavior of the shift reagent in both whole rabbit blood and serum has been found to be similar to that in water. However, when the blood of an injected rabbit was studied as a function of time after injection, minimal shift was detected after thirty minutes. Thus, the shift reagent seems to be eliminated from the bloodstream of the rabbits or ceasing to complex with sodium more quickly than is observed *in vitro*. A possible explanation for the removal of the shift reagent from the blood may be the enclosure of the shift reagent in interstitial spaces in the rabbit. This hypothesis was examined by imaging the thigh muscle of a rabbit during continuous intravenous injection of the shift reagent. Significant accumulation of shift reagent in the muscle was detected after injection of 11 mL of 135 mM $[Tm(DOTP)]^{5-}$, neither proving nor disproving this hypothesis. Another possible cause of these difficulties may be interaction of free cationic calcium in the blood with the shift reagent, which could remove the shift reagent from solution. However, the free calcium concentration in the blood was found to be identical before and after injection. This finding does not preclude the possibility that the Ca^{2+} may alter the equilibrium between free sodium and sodium interacting with shift reagent.

To model the diffusion through the vitreous *in vivo* the diffusion of the shift reagent through the vitreous of enucleated calf eyes was studied as a function of time, to demonstrate that diffusion through a similar medium could in fact be mapped using sodium chemical shift imaging. ^{23}Na images have been obtained showing the slow diffusion over the course of 340 minutes of the shift reagent through an enucleated calf eye. A 0.2-mL aliquot of 135 mM $[Tm(DOTP)]^{5-}$ was injected into the bottom of the vitreous. A hypointense sodium signal of increasing radius demonstrated the diffusion of the shift reagent away from the point of injection.

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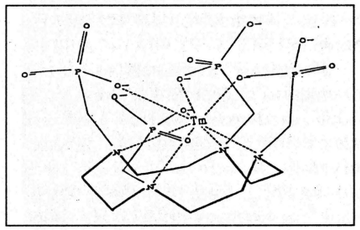

Figure 1. *The proposed structure of $[Tm(DOTP)]^{5-}$, 1,4,7,10,- tetraazacyclododecane-N,N',N",N'"-tetramethylenephosphonate thulium (III) (2).*

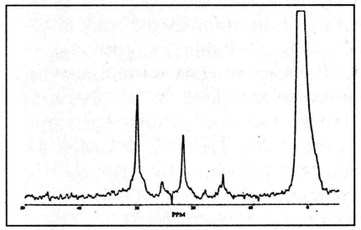

Figure 2. *^{31}P NMR spectrum of the clear supernatant of a solution of 135 mM $[Tm(DOTP)]^{5-}$ which had contained precipitate.*

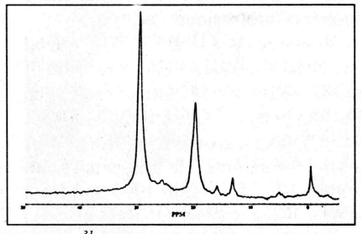

Figure 3. *^{31}P NMR spectrum of 135 mM $[Tm(DOTP)]^{5-}$ which was synthesized without the observation of precipitate formation. Same spectral parameters were employed as had been used for the spectrum shown in Fig. 2.*

Historical Notes

by Edward R. Atkinson, Amherst, MA.

Recent obituaries, part III

Joseph F. Manning, 74, died on July 31, 1990 at his home in East Aurora, N.Y. He was a Boston native who received the B.S. from Tufts University (1935), the M.S. from Holy Cross (1937) and the Ph.D. from Boston University (1941). He then was employed by B.B. Chemical Co. and Angier Co. in Cambridge and UPACO Co. in Boston. During this period he taught an evening course at B.U. on plastics and resins. In 1968 he left this area for employment with Pierce and Stevens Chemical Co. in Buffalo. He retired in 1982.

Herman P. Meissner, 83, professor emeritus of chemical engineering at M.I.T., died on October 24, 1990. He was a native of Hoboken, N.J. who received the S.B. from M.I.T. in 1929 and the Ph.D. from the University of Frankfurt, Germany in 1938. He joined the M.I.T. faculty in 1934 and retired as Lammot du Pont Professor of Chemical Engineering in 1973. During the 1988 festivities associated with the celebration of the 100th anniversary of the founding of chemical engineering at M.I.T., Meissner made a notable contribution by recounting the history of individual members of the department, recorded in the *Technology Review* for January 1989. He was the author of "Processes and Systems in Industrial Chemistry" (1971) and co-author of "Thermodynamics for Chemical Engineers" (1958). He was a member of Alpha Zeta of Alpha Chi Sigma and a number of professional societies.

George A. Michael, 73, retired director of the food and drug division of the Massachusetts Department of Public Health, died on December 8, 1990. George was a Bostonian, the son of immigrant parents. He graduated from English High School in 1935 and from Suffolk University in 1952. He also did graduate work at M.I.T. An honorary doctorate was awarded by the New England College of Pharmacy for his work in writing drug and narcotic laws.

For 25 years before his retirement in 1980 his work for the Food and Drug Division included the writing of the first international frozen food code, signed in Japan in 1972, and the organizing of civil defense units during hurricane seasons. He was an effective supporter of the Northeastern Section when Henry Hill waged a successful battle against the clinical pathologist groups who attempted to limit supervision of medical laboratories in the state to members of their own groups. George was active in community affairs in Marshfield.

Albert Nagel, Jr., 82, a retired safety engineer for Polaroid Corporation, died on July 14, 1990. He was a Boston native, attended school in Walpole, and received the S.B. (1931) and M.S. degrees in chemical engineering from M.I.T. He was an early employee of Polaroid and remained with the company until retirement in 1973. His hobbies included the Boston Power Squadron and the maintenance of his property in Hanover where he had lived for 47 years. He was a member of Alpha Zeta of Alpha Chi Sigma at M.I.T.

Harold M. Scholberg, 80, died on July 4, 1990. He was a native of Minot, North Dakota who received the B.S. (1932) and M.S. (1933) degrees from the University of North Dakota and the Ph.D. (1938) from the University of Chicago. He was employed by Sherwin Williams Paint Co., American Can Co., and 3M, the last named for 14 years. During the last 25 years of his life he operated a consulting business from his home in Bedford, Mass. where "he experimented, wrote about, and argued about the thermodynamics of surfaces," according to Mrs. Scholberg. During this period he had brief professional associations with Moleculon, Inc., Boston College, Tufts University, and Stewart Radiance.

Walter Smith, 85, a retired chemical engineer, died on September 14, 1990. He was a Boston native and a chemical engineering graduate in the Class of 1928 at M.I.T. He enjoyed 45 years of professional life at Arthur D. Little, Inc. in Cambridge, most of which were involved with techniques for air cleaning and pollution control. Included was the development of several patented techniques for the maintenance of dust-free areas needed for work with radioactive substances, computer assemblies, etc. He wrote several A.S.T.M. standards and was made a Fellow of the Society and received its Award of Merit. He also was a Fellow of the A.I.Ch.E. and an honorary member of the Air Pollution Control Association.

Walter Smith's early days at ADL were recorded in E.J. Kahn's history of ADL, "The Problem Solvers." Dr. Little assigned him the job of finding out why the company cook was billing the company for six eggs per capita every day. Walter counted the eggshells in the garbage and showed that the cook was stealing eggs. He also was part of the team that showed how to reduce the cooking time of Cream of Wheat from thirty to five minutes. Walter paid his way through M.I.T. by working at ADL evenings. When he wanted to extend his education to include the M.S. degree, Dr. Little and his fellow employees created a scholarship fund for Walter. All were later reimbursed, with 5% interest, by Walter when he obtained the degree and joined the full-time ADL staff. ◇

^{23}Na Chemical Shift Imaging

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Acknowledgments

This work was supported by a James Flack Norris Grant of this Section and by the Wellesley College Chemistry Department and the National Science Foundation's REU program. In addition, this project would not have been possible without the work and help of Drs. Nancy Kolodny, Susan Kohler, and David Weinberg, and of Tracey Burr and Ann Celi. Finally, the author would like to thank Mitchell Albert of SUNY Stoneybrook for his helpful advice.

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1. N. Kolodny, Personal communication.
2. D. C. Buster, M. M. C. A. Castro, C. F. G. C. Geraldes, C. R. Malloy, A. D. Sherry, and T. C. Siemers, *Magn. Reson. Med.* **15**, 25 (1990).
3. A. D. Sherry, C. R. Malloy, F. M. H. Jeffrey, W. P. Cacheris, and C. F. G. C. Geraldes, *J. Magn. Reson.* **76**, 528 (1988).

Colby Stanton was a 1990 Norris Summer Scholar at Wellesley College

Environmental Chemistry Column

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composition, atmospheric distribution and optical properties. A summary of this work can be found in the Air Force's 1985 Handbook of Geophysics and the Space Environment. These data will now be widely used for global climate studies as well as for the design of military optical systems.

On-going studies of the effects of sulfate and related atmospheric aerosols on both visibility and global climate require much more information on the chemistry and physics of aerosol formation, cloud condensation, and atmospheric removal. It may also eventually require a revision of the lyrics of the old Nat King Cole song describing the "lazy, hazy days of summer." ◇

Calendar

For additional information, call:
Brandeis University – (617)736-2500
Harvard University (Chemistry) – (617)495-5333
M.I.T. – (617)253-1596
Northeastern University – (617)437-2822
Tufts University Health Sciences Campus – (617)956-7000

Wednesday, May 1

Professor Salo Gronowitz (U. of Lund, Sweden)
"Synthetic Uses of Ring-opening and Cycloaddition Reactions of Thiophene-1,1-dioxides"
Harvard University Mb-23 at 4:15 pm

Monday, May 6

Professor Robert Armstrong (UCLA)
"Synthetic Studies and DNA-Binding Properties of the Antitumor Antibiotic Carzinophilin"
Harvard University Mb-23 at 4:15 pm

Tuesday, May 7

Dr. Sharon Cambell-Burke (Dupont)
"NMR Studies on the RAS Oncogene"
Tufts University Health Sciences Campus
DeBlois Auditorium A at 4:00 pm

Dr. Rainer Dressler (Air Force Geophysics Lab)
"Detailed dynamics of suprathermal ion-molecule reactions: Chemiluminescence measurements of ion-water reactions"
MIT Room 4-370 at 4:00 pm

Tuesday, May 14

Professor Robert Moss (Rutgers)
"Dynamics of Lipids in Synthesis Liposomes: Translation Across Membranes"
Northeastern University
Hurtig Hall Room 129 at 4:00 pm

Dr. Steve McKnight (Carnegie Institute)
"Transcription Factors: How a Reductionist Approach has Illuminated a Fundamental Biological Problem"
Tufts University Health Sciences Campus
DeBlois Auditorium B at 4:00 pm

Mr. James Murphy (MIT)
"Rydberg states of alkaline earth monohalides"
MIT Room 4-370 at 4:00 pm

Tuesday, May 28

Professor Philip W. Phillips (MIT)
"New Mechanism for Electron Transport in Conducting Polymers"
Northeastern University
Hurtig Hall Room 129 at 4:00 pm

Wednesday, June 5

Professor Mercouri G. Kanatzidis (Michigan State U.)
"Synthesis of Conductive Polymers in Organized Media: Insertion into Layered Metal Oxides"
Northeastern University
Hurtig Hall Room 129 at 4:00 pm

Notices for the Nucleus Calendar should be sent to:
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