

THE NUCLEUS

January 1993

Of the Northeastern Section of the American Chemical Society

Vol. LXXI, No. 5

Monthly Meeting

*Robert E. Varnerin on Chemical
Safety Management by
Performance Standards*

From the New Chairman

*Dorothy J. Phillips' Plans
for NESACS in 1993*

Environmental Chemistry Column

*NO_x Removal from
Power Plant Effluents*

Automotive Chemistry

Engine Coolants



Experience the diode-array advantage and save \$1000.



The HP 8452A UV-Visible spectrophotometer lets you capitalize on the benefits of diode-array technology.

- Full spectral acquisition—complete sample information with every measurement
- Single component quantification with results confirmation
- Multicomponent quantification as easy and fast as single component analysis
- Automated multicell enzyme kinetics
- Automated DNA—melt testing

With the HP 8452A, full spectra from 190 to 820 nm can be acquired in as little as one-tenth of a second, with excellent sensitivity. This is at least two orders of magnitude faster than conventional instruments!

To save \$1000, choose a system solution which includes the HP 8452A spectrophotometer, MS-DOS® UV-Visible software, an HP Vectra personal computer and a Hewlett-Packard printer.

To find out how you can experience the diode-array advantage, call **1 800 334-3110 Ext. 196** today. In Canada call **1 800 263-0669**.



The Northeastern Section of The American Chemical Society, Inc.

Office: Sue O'Connor, 8 Winch Park Rd., Framingham, MA 01701. 1-800-872-2054. Any Section business may be conducted via the business office above. Washington, D.C. ACS Hotline: 1-800-227-5558

Officers 1993

Chairman

Dorothy J. Phillips
Waters Division of Millipore Corp.
34 Maple St., Milford, MA 01757
508-478-2000 ext. 2860

Chairman-Elect

James A. Kaufman
Science Division, Curry College
Milton, MA 02186, 333-0500

Immed. Past Chairman

Katie Stygall
Bradford College
Bradford, MA 01830, 508-372-7161 ext. 311

Secretary

Michael J. Hearn
Chemistry Dept., Wellesley College
Wellesley, MA 02181, 235-0320 ext. 3127

Treasurer

James Piper
Simmons College, 300 The Fenway
Boston, MA 02115, 738-2181

Auditor

Anthony L. Rosner

Trustees

Phyllis Brauner Richard Handrick
Adrienne S. Dey

Councilors

Term expires 1/1/94
Michaeline F. Chen
Arno H.A. Heyn
John L. Neumeyer

Alternate Councilors

Term expires 1/1/94
Ernest I. Becker
Doris I. Lewis
Myron S. Simon

Term expires 1/1/95

Catherine Costello
Esther A.H. Hopkins
Patricia L. Samuel
Valerie A. Wilcox

Term expires 1/1/95

Geoffrey Davies
Alfred Viola
vacant at present time
vacant at present time

Term expires 1/1/96

Mary T. Burgess
Thomas R. Gilbert
Truman S. Light
Katie Stygall

Term expires 1/1/96

E. Joseph Billo
Wallace J. Gleekman
Margaret V. Merritt
Frank S. Wagner

All Chairmen of standing Committees, the editor of THE NUCLEUS, and the Trustees of Section Funds are members of the Board of Directors. Any Councilor of the American Chemical Society residing within the section area is an ex officio member of the Board of Directors.



Contents

Monthly Meeting _____	5
<i>Robert E. Varnerin on "Performance Standards — A Proactive Approach to Chemical Safety Management"</i>	
1993 NESACS Committee Chairmen _____	4
Consulting Chemists Meeting _____	4
<i>Milton Gilbert, Esq. on Intellectual Property and Confidential Agreements</i>	
From the New Chairman _____	6
<i>Dorothy J. Phillips on her Plans for NESACS in 1993</i>	
Don't Mellow! _____	7
<i>From Jerry Bell's Norris Award Address</i>	
Environmental Chemistry Column _____	9
<i>How to Knock NO_x by David Ham</i>	
Automotive Chemistry _____	11
<i>Automotive Engine Coolants, Part I by Joseph A. Lima</i>	
Historical Notes _____	12
<i>Tantiusques, a 17th Century Graphite Mine, followed by more sketches of Recently Deceased Members, by Edward R. Atkinson</i>	
ACS Workforce Report _____	15
<i>Domestic Status, Discrimination, and Career Opportunities of Men and Women Chemists</i>	

Cover: Dorothy J. Phillips

Deadline: March, 1993 issue: January 22, 1993

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.

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

Editor: Arno Heyn, 21 Alexander Rd., Newton, MA 02161, Tel or Fax: 969-5712
Associate Editor: Myron S. Simon, 20 Somerset Rd., W. Newton, MA 02165, Tel: 332-5273
Board of Publications: Joseph A. Lima (Chair), Catherine E. Costello, Michael E. Strem
Business Manager: Karen Piper, 19 Mill Rd., Harvard, MA 01451, Tel: (508) 456-8622
Advertising Manager: Vincent J. Gale, 56 Bartlett Island Way, Marshfield, MA 02050, Tel: 837-0424
Contributing Editors: Edward Atkinson, History of Chemistry, Book Reviews; Maryann Solstad, Health; Chris Arumainayagam, Calendar.
Proofreaders: Donald Rickter, M.S. Simon

Copyright 1993, Northeastern Section of the American Chemical Society, Inc.

NESACS

Committee Chairmen for 1993

Archivist: Myron S. Simon
Awards: William O. Foye
Board of Publications: Catherine E. Costello, Joseph A. Lima, Michael E. Strem
Budget: James U. Piper
Chemistry Education: Morton Z. Hoffman
Constitution and Bylaws: Esther A.H. Hopkins
Consultants Group: Debra J. Saez
Continuing Education: Alfred Viola
Esselen Award: Truman S. Light
Hospitality: David M. Howell
Membership: Iclal S. Hartman
NERM Meeting: Thomas R. Gilbert
Nominating: Katie A. Stygall
Norris Award: Marco H. Scheer
Professional Relations: Leon E. Rubin
Program: James A. Kaufman
Project Seed: David Hughes, NOBCCHE
Public Relations/Public Service: Katie A. Stygall/Phyllis A. Brauner
Safety: Frank S. Wagner
Senior Chemists Group: Ernest I. Becker
Speakers Bureau: Mary Ann Solstad
Summer Program: to be appointed ♦

ACS News

Hazardous Waste Management Pamphlet

An updated version of the information pamphlet *Hazardous Waste Management* has been released.

The pamphlet addresses the definitions, legal aspects and regulatory aspects of hazardous waste management. Every chemist and every administrator with responsibility for the purchase and disposal of chemicals or products produced by chemical processes should be familiar with the material in this pamphlet as an introduction to the complex field of hazardous waste management.

Individual copies are available free of charge from the ACS Department of Government Relations and Science Policy, 1155 Sixteenth St., NW, Washington, DC 20036. Please include a self-addressed mailing label. For multiple copies, contact Ms. Wanda Guice at 202-872-4479. ♦

Consulting Chemists' Meeting

The Consultant/Client Relationship
or,
It Takes Two to Tango
January 7, 1993, 7:00 pm
Vista International Hotel
Waltham

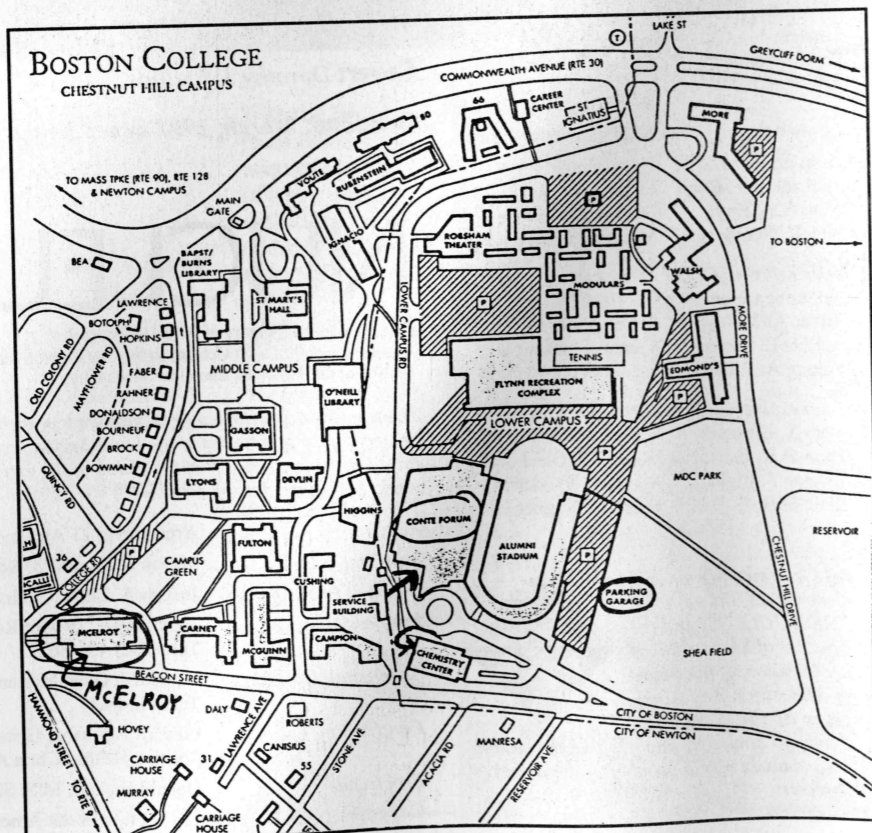
Milton Gilbert, Esq.,
Attorney-At-Law with Pandisco &
Pandisco in Waltham.

Rights of the entrepreneur to
intellectual property vs.
Confidentiality Agreements.

Dinner preceding the meeting.
Call Debra Saez, (508) 521-1327
by January 5, 1993.

Corporate Patrons
DuPont Merck Pharmaceutical
Company
W. R. Grace & Company
Hoechst Celanese Corporation
Polaroid Corporation
Chemical Research Division

Corporate Sponsors
Aerodyne Research, Inc.
Arthur D. Little, Inc.
Consulting Resources Corporation
Duracell, Inc.
Houghton Chemical Corp.
ICI Resins US
Johnson Matthey Catalog Co., Inc.
Organix, Inc.
Orion Research, Inc.
Physical Sciences, Inc.
Research Biochemicals, Inc.
Strem Chemicals, Inc.
Van Waters & Rogers, Inc. (VW&R)
Waters Division of Millipore



Monthly Meeting

The 749th Meeting of the Northeastern Section of the American Chemical Society, jointly with the American Society of Safety Engineers

Thursday, January 14, 1993
Boston College, Chestnut Hill, MA
Conte Forum, Shea Dining Room

5:30 Social Hour
6:30 Dinner

New Chemistry Building, Room 127, Dr. Katie Stygall presiding

8:00 Robert E. Varnerin, Boston University *Performance Standards — A Proactive Approach to Chemical Safety Management*

Refreshments will be served after the program. Dinner reservations should be made no later than January 8, 1993. Please call Sue O'Connor at (800) 572-2054. Reservations not cancelled at least 24 hours in advance must be paid. Members, \$21.00; Non-members, \$23.00; Retirees, \$12.50; Students, \$8.00. THE PUBLIC IS INVITED.

Anyone who needs special services or transportation, please call Sue O'Connor a few days in advance so that suitable arrangements can be made.

Parking will be provided in the garage off Beacon St.

Next meeting: February 18, Wellesley College Club, Wellesley, MA. Social Hour 5:30, Dinner 6:30, Evening meeting, College Club 8:00: Dr. Ernest I. Becker: *Improving Teaching Chemistry in the Public Schools: Questions! And Answers?*



Photo: Boston Univ.
Photo Services

Biography

Robert E. Varnerin

Robert E. Varnerin is Director of Life Safety for the Charles River Campus of Boston University since 1984. His responsibilities include all phases of occupational health and safety in both the academic and facilities management sectors.

He received his AB and AM from Boston College and a Ph.D. in Physical Chemistry from Catholic University of America. He taught chemistry and was department chair at Fairfield University in Connecticut. In 1970 he became Manager of Education at the Chemical Manufacturers Association (CMA). In 1980, he was manager of chlorofluorocarbon (CF) research and CMA staff representative for an international committee of CF manufacturers. In 1981 he moved to Boston University as Science Administrator in the Department of Chemistry. In 1984 he became the

campus safety officer and established the campus Safety Office. He has been active in the American Society of Safety Engineers (ASSE) both nationally and regionally. For the past five years he has edited the Boston Chapter Newsletter. He has been an ACS member since 1951.

His duties at Boston University include regulatory compliance, fire safety, disposal of hazardous materials, asbestos abatement, occupational health and safety and related concerns.

He was the 1992 "Safety Professional of the Year" in the New England/New York Region of the ASSE and is a candidate for the 1993 ASSE National Safety Professional Award.

He has authored articles and presented papers at various conventions on hazardous waste and safety management. He was a member of a task force to assist the Massachusetts Department of Labor and Industries to update and rewrite safety codes as performance standards. ♦

Abstract

For every accidental death there are about 50,000 near misses!

Traditional regulation by *specific standards* tend to react to accidents and tend to overlook the human element. Perfect facilities and equipment would eliminate only 10-15 per cent of accidents. Legislators, lawyers and inspectors emphasize enforcement and litigation usually after the fact.

OSHA, in response to pleas by chemists, introduced the Laboratory Standard as a *performance standard*.

The Laboratory Standard focuses on reducing the number of near misses, thereby reducing deaths and serious injuries proportionately.

Scofflaws must be subject to prosecution for violations. Yet, most chemists sincerely want to provide a safe and healthy environment. However, they are confused by many specification standards that seem to be counterproductive to their instruction and research. Laboratory and plant managers are equally perplexed that *performance standards* now allow them to specify and justify many details of their safety plan for their own laboratories.

Performance Standards place the responsibility with those who have the authority to direct operations. If anyone in the line of command fails in this responsibility for safety, the corporate commitment to safety suffers.

Concrete examples of success programs and steps required for implementation of safety programs will be presented. ♦

POLYMER PROBLEMS?

- Complete Polymer Deformation
- Good vs. Bad Comparison
- DSC, TGA, IR, UV-Vis, GC, HPLC, NMR
- GPC/SEC Molecular Weights and MWD
- Additive Package Analysis

4 Mill Street
Bellingham, MA
02019

(508) 966-1301



From the New Chairman

by Dorothy J. Phillips

I greet you with extreme optimism for a wonderful year of programs and activities. The country will be turning over a new leaf this year with a Democratic President after 12 years of Republican Administration. Change is always challenging and exciting. I face my new role with a little fear but with much hope and optimism.

During the last year, as Chairman-elect I became aware of the diversity of programs in the Northeastern Section. My first concern was how was I going to manage such a large multi-program Section. I now realize that the success of these many programs lies in the leadership of the Board members and committee chairpersons. Therefore I plan to utilize the skills of these key members to make 1993 as, if not more successful, than previous years.

One of my tasks as Chairperson-elect was to assist in recruiting a new administrative secretary. This was a difficult task because the previous administrative secretary, Karen Piper, had done an exceptional job. The new administrative secretary, Sue O'Connor, came on board in October 1992 giving her time to become familiar with the Section before the officers changed. Sue will be a valuable part of my organization this year.

A major program facing the Section this year is the Northeast Regional Meeting (NERM). The Section will host this Regional Meeting in June 1993. Tom Gilbert as Chairman has assembled a team to assure that the meeting comes off smoothly.

The Education Task Force initiated by Chuck Kolb during his term as Chairman will be supported this year. Mentors will attempt to interest students in the lower grades (3 to 5) in science by carrying out demonstrations in the class room. A major effort will be made to carry these programs to the inner city schools as started by Katie Stygall (Chairperson 1992).

A new program for the Northeastern Section will be Project SEED which is a 24 year American Chemical Society program. Project SEED provides a summer educational experience in the sciences for economically disadvantaged high school students. The program places students in the laboratories of scientists who serve as their preceptors. The added excitement about Project SEED is that it is a joint pro-

gram with the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE). Project SEED and the Educational Task Force are key efforts to meet the challenge of a diverse pool of scientists for the next century.

The undergraduate science and engineering students will also receive extra attention this year. We want to expand the Undergraduate Chemistry Day Program which was held during National Chemistry Week in 1992. The students received many pointers about job searching and possible career paths in the sciences. We will encourage greater attendance of the undergraduates at the monthly Northeastern Section meetings.

YOU are needed to assure that 1993 is a year of growth for the Northeastern Section. We welcome and encourage your participation in the Section's programs. A list of committee chairpersons is included in this issue. Please contact Sue O'Connor (1-800-872-2054) to sign up for the committee of your choice. ♦

QTI Quantitative Technologies, Inc.

ELEMENTAL ANALYSIS
C, H, N, S, X,
24-Hour Turnaround

Inorganic & Trace Analysis
AA, ICP, & Ion Chromatography

Quality Assurance - Technical Excellence

P.O. Box 470, Salem Industrial Pk., Bldg. 5
Whitehouse, NJ 08888 (908)534-4446

CHEMICAL ANALYSIS AND PHYSICAL TESTING



444 W. County Rd. D
St. Paul, MN 55112
612-631-9412
FAX 612-631-8405

- Spectroscopy, AA, FT-IR, Micro IR
- Chromatography, LC, GPC, GC, Ion
- Thermal Analysis, DSC, TGA, DMA, TMA
- GC/MS CHNOS Microscopy Instron

SPECIALTIES

- GPC, high temp, aqueous and all solvents
- FTIR, with Micro capabilities
- Tensile and Puncture, -40°F to 600°F
- Headspace, Pyrolysis GC
- Oxidation Studies, TGA, DSC, TMA
- USP XXII Testing EP Toxicity ESD Testing
- Thermoplastic and Thermoset Formulations
- Gas Permeation Rates, most gases
- Residual solvents, monomers Outgassing

Norris Award Address

from the address of Jerry A. Bell
Don't Mellow!

Dr. Bell's remarks were addressed not only to science and mathematics educators, but to everyone. All pay taxes that support schools; we vote for school committees and on school bond issues; we have children in the schools and/or we may hire people educated by the schools. We all want this to be the best science education, but "how do you exercise the power you have to achieve this goal and what is it you want the education to be like?". In the following, Dr. Bell shared some of his lessons he had learned from colleagues and students during 38 years of teaching.

While tutoring a group of high school students when he was a freshman, he found that students couldn't conceptualize problems such as solubility problems because their chemistry course had no laboratory. The following week he demonstrated the formation of calcium carbonate precipitate by breathing into a clear lime water solution through straws. This simple demonstration opened the students' eyes and they attacked the calculations with new vigor. Ever since, he has been a practitioner and advocate of lecture experiments and demonstrations.

In the mid sixties, while teaching a chemistry honors course at the Univer-

sity of California-Riverside his course followed the trend of general chemistry courses, being really a mini-physical chemistry course. It was demanding and fast-paced, for which he apologized at the end of the course, suggesting that when he mellows with age, he might become less demanding. From the many solicited student comments, one stuck in his mind: This student, after many specific comments and suggestions, asked him "Don't mellow!", i.e. don't lower your expectations.

Later, at Simmons, when asked to teach a biochemistry course to health science majors, he found that students could not apply the knowledge they were supposed to have gained in previous chemistry courses. He learned to pace the course more slowly, eliminate extraneous material and concentrate in depth on the important points. In other words: *less is more*.

After having learned these lessons, he thought he owed it to students to pass on to other teachers some of the lessons taught to him by his students. That is when he began working with teachers at all levels, but particularly grade school and secondary school teachers. These teachers, by and large, are capable teachers, but face great

odds: students who come to school hungry, students who have little guidance in their home, students who are abused at home, students who had to help support their families by after-school work and by leaving school too soon to go to work. But even with these handicaps, teachers can develop more effective ways to facilitate student learning and to reach all students. To do this, teachers should be given more responsibility and authority to do so: they should be treated as professionals. To bring this about, teachers at all levels, from grade school to college, should be willing to share their expertise so they reinforce each other.

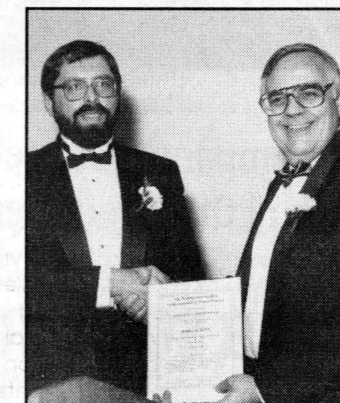
Over the years in working with teachers, and now at the American Association for the Advancement of Science, Dr. Bell has sought to facilitate these roles for teachers. Teachers and school administrators need support and encouragement from the community, *all of us*, to help provide the resources to carry on activities that can reform and transform all education, including science, mathematics, and technology education.

Throughout the address, Dr. Bell performed some of the demonstrations which he uses to make a point. ♦



Jerry Bell and grandchildren

Photos by A. Fingland



Dr. Bell receives Norris Award from Prof. David Haines, Chairman of the Norris Award Committee



Dr. Bell demonstrates the formation of a CaCO₃ precipitate from clear lime water

When you need to hire temporary personnel for your lab, chances are you have two basic requirements.

- 1. They have to be qualified.**
- 2. They have to be available when you need them.**



Call the one company that specializes in filling both of those requirements.



LAB SUPPORT

Science Professionals On Assignment

Boston (617) 229-2505

Environmental Chemistry Column

How to Knock NO_x: Removal of NO_x from Power Plant Effluents

David Ham, President
Envirochem, Inc.

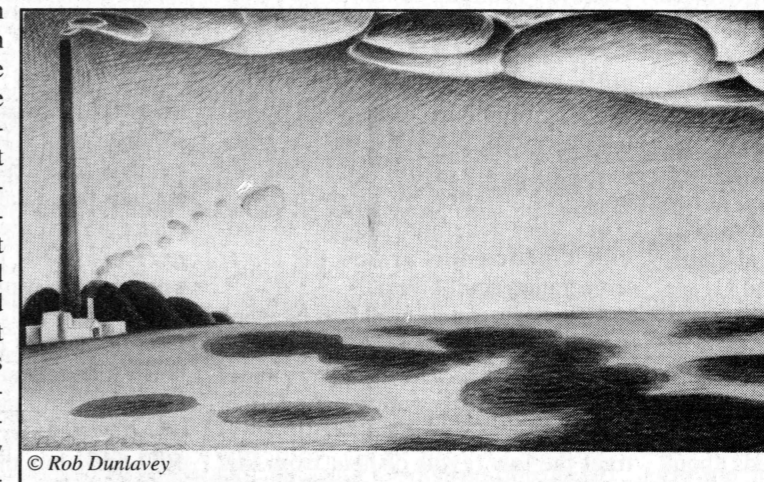
In mid-November the New England Power Company revealed plans to install NO_x reduction equipment on its Salem Harbor power plant. The NO_x controls will satisfy an agreement made with the Massachusetts Department of Environmental Protection in 1984 when the plant was converted from oil to coal.

This \$20-25 million NO_x control installation will be the first in the U.S. to employ the combination of low-NO_x burners and a post combustion control process. Thus, it will provide a full scale test case for this combined approach on a coal fired plant. This precedent may influence decisions of other power companies around the country as they decide how to respond to new federal regulations, coincidentally just now being released by the U.S. Environmental Protection Agency (EPA) under the 1990 Clean Air Act Amendments. This column provides some background on the technologies to be used at Salem Harbor and other sites in response to the increased regulation.

NO_x emissions comprise one of the area's most serious pollution problems. Here the term NO_x refers to the sum of nitric oxide (NO) and nitrogen dioxide (NO₂), although for some cases it should represent the sum of at least a half dozen oxides of nitrogen that participate in the pollution chemistry. NO and NO₂ are toxic compounds, especially harmful for people with such sensitive respiratory systems as asthmatics. Also, these species are central to two major pollution problems, acid rain and urban smog. NO_x emissions are the secondary cause of acid rain, after sulfur oxides (see last month's column for a discussion of SO₂ control). Even though NO_x species produce less acid than SO₂, the nitric and nitrous acids are believed to be the dominant cause of acid rain damage to trees. In addition, nitrogen

oxides share with hydrocarbon emissions the dominant role in the formation of ozone and other compounds that lead to hazardous urban smog in the summer.

Roughly 30% of the NO_x emissions in the U.S. come from vehicles and 60% from stationary fuel combustion by electric utilities, industrial, residential, commercial and institutional sources. Electric utilities now account for about 36% of the total anthropogenic sources. Under the regulations being released by the EPA, utilities must reduce their NO_x emissions by 2 million tons, about a 29% reduction for the utilities or about 10% of the U.S. total. The EPA rules are not yet complete and there is still uncertainty regarding how much NO_x re-

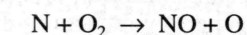
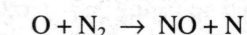


© Rob Dunlavey

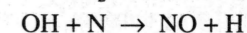
movals will be required under different sections of the clean air legislation.

NO_x Formation

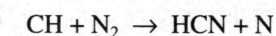
NO_x species are formed by the burning of any fuel, from natural gas to municipal waste. NO is formed by oxidation of the nitrogen in the combustion air at high temperatures via reactions known as the extended Zeldovich mechanism



and



The first of these reactions is the rate determining step due to its high activation energy; thus, formation of this "thermal NO_x" is very sensitive to the peak combustion temperature. NO is also formed via a "prompt NO_x" mechanism, mainly from the reaction



In combustion of coals or heavy oils, organically bound nitrogen in the fuel provides an additional nitrogen source

The author uses the convention common in his field of work: The dot representing the unpaired electron in free radicals is omitted, thus "OH" represents the OH free radical.

continued on page 10

Environmental Chemistry Column

continued from page 9

that can oxidize to yield as much as 80% of the total NO_x depending upon the fuel and the combustor.

In the combustion zone where the gas phase kinetics are very fast, NO_x concentrations can approach a significant fraction of their high temperature equilibrium levels. The combustion product gas cools very rapidly as it exits an engine cylinder or transfers heat to a heat exchanger in a power plant. The NO_x concentrations formed at high temperatures remain high, because the kinetics are not fast enough to follow the rapid cooling and allow equilibrium to be maintained at the lower temperatures. Equilibrium NO_x concentrations are negligible at ambient temperatures where N₂ and O₂ are the favored species. The exhaust gas is mostly NO, typically with ratios of NO/NO_x = 0.9-1.0. In the atmosphere NO is readily converted to NO₂ which is visible as "brown plume" at a stack exit if its concentration exceeds about 20 ppm.

Combustion Modification for NO_x Control

The most economical approach for NO_x control is to avoid its production in the combustion zone by using technologies known collectively as combustion modifications. These approaches include changes in burner design, adjustments and operating conditions to reduce NO_x emissions. Low-NO_x burner designs generally reduce fuel/air mixing rates and alter temperature/time profiles to eliminate regions where combustion occurs rapidly at the highest temperatures. These approaches can produce 30-50% NO_x reductions with little loss in plant output or efficiency. Results vary considerably with specific boiler designs and fuels used. Each boiler manufacturer provides custom modifications that can usually be retrofit to existing equipment. Combustion modifications are almost always the least expensive NO_x

controls and the easiest to retrofit, but more stringent regulations require additional post-combustion processes that treat the entire flue gas to achieve sufficient reductions.

Post-combustion NO_x Control

The dominant NO_x species, NO, is insoluble in water and quite unreactive at flue gas temperatures. Also, NO chemistry is similar to the chemistry of O₂, which is present in much higher concentrations. These properties, and the complex chemistry of NO_x species combine to make removal of dilute NO_x species from flue gases challenging. Equilibrium NO_x levels are negligibly low at stack temperatures, so NO_x reduction can be achieved by initiating reactions to shift the gas composition toward equilibrium. This can be accomplished by introducing a "fuel" that generates radicals to provide kinetic paths toward the lower temperature equilibrium.

Radicals can be produced by using a fuel such as methane in an approach called reburning. But, burning cannot be sustained easily with the dilute fuel and oxygen; also, it is difficult to extract the low levels of heat from this burning to compensate for the additional fuel and maintain system efficiency. It is preferable to employ chemistry that selects NO over the other gases present, H₂O, CO₂, SO₂, and O₂.

Ammonia reacts selectively as a reducing agent for NO compared to O₂, allowing selective reduction processes. The only commercially successful post-combustion NO_x processes use ammonia or a related compound as the radical generating "fuel." NH₃ chemically reduces the NO_x species predominantly to N₂ in both catalytic and gas phase chemistry.

Selective Catalytic Reduction (SCR)

The catalytic reduction of NO_x by NH₃ has been developed since early 1970's, mostly in Japan. This technology has been installed on several hundred full scale power plants around the world, but not in the U.S. SCR processes work best with low sulfur fuels, more common in Japan than in the

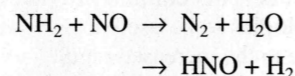
U.S. SCR can achieve greater than 90% removal at high NH₃/NO_x ratios, but the removal is very sensitive to this stoichiometric ratio, and a value above about 0.9 causes unacceptable ammonia breakthrough. Therefore, SCR processes are limited to about 80% removals in practice.

SCR processes are not chosen often in the U.S. because of their high costs. These costs have fallen in the last few years due to improved catalysts and competition among a number of processes suppliers. Some localities dictate SCR under policies of requiring the best available control technology (BACT).

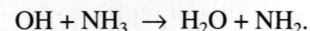
Selective Non-catalytic Reduction (SNR or SNCR)

NH₃ reduces NO selectively in the absence of a catalyst, but the gas phase chemistry requires a much higher temperature. SNR processes generally operate in a temperature window at about 1150K-1300K, temperatures found in, or just downstream from, the boiler tube region in most power plants. In full scale installations SNR processes achieve reduction levels of about 50%-65%, less than for SCR processes but at a lower cost. Exxon provides an SNR process called Thermal De-NO_x.

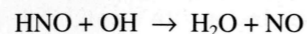
The main reaction for NO_x removal in SNR processes is



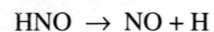
NH₂ is produced predominantly from the reaction of NH₃ with OH,



The temperature window is limited on the low side by radical initiation reactions that produce a mixture of mostly O, H, and OH. Also, low temperature favors the radical terminating reaction



over the chain propagating dissociation reaction



which is essential for successful removal. At high temperatures radical

Automotive Chemistry

Automotive Engine Coolants — Part I, Introduction

by Joseph A. Lima, Vice President, Houghton Chemical Corp.

Many changes have taken place in engine cooling systems since the first liquid cooled engines were developed. Changes in design criteria and materials of construction have complicated the formulation of effective engine coolants.

Initially, automotive engines were designed for operation using water as the coolant. Operating temperatures were lower than those of today's modern automobile engine and cooling systems were in many instances purposely oversized. Typically, engines were constructed of cast iron while copper and brass were used in cooling system heat exchangers (radiators). Today water without glycol, even if containing anticorrosion additives, would cause operating problems.

In a liquid-cooled engine water is circulated through cavities and channels in the block and head, absorbing excess heat generated by the combustion process, and transferring it to air at the radiator. Some of this heat is also used to heat the passenger compartment and to provide warm air for defrosting, etc. This is accomplished by placing a smaller radiator, called heater, in the system. So we have a process generating excess heat, a circulating heat transfer fluid, and liquid-to-air heat exchangers to remove the excess heat. Coolant flow through the system is related to engine speed and controlled by the thermostat which operates a valve.

Now that the system has been defined, let us look at the coolant. Water as our initial coolant has both good and bad qualities: the high thermal conductivity of water, at least until corrosion begins to affect heat transfer surfaces, its easy availability and, initially, its non-toxic nature and lack of environmental problems are pluses. Unfortunately, however, water freezes; therefore the need for **antifreezes**.

The first antifreezes used were

lower alcohols, such as methanol and ethanol. Our company began selling methanol for automotive use in 1926. There are still some antique car buffs who use methanol antifreeze! An obvious problem with the lower alcohols is that they evaporate quickly, resulting in loss of freeze protection. Use of ethylene glycol in place of alcohols as the freezing point depressant solved this problem. It also eliminated the danger of fire due to the flammability of the lower alcohols. Some enterprising "marketing type" quickly saw the promotional advantage of calling it **permanent antifreeze**, causing much confusion over the years, because it certainly is not permanent.

A major function the coolant must perform is mitigating corrosion in the engine and cooling system. Because of this, the use of the word "permanent" has caused unsuspecting motorists serious problems. Consider the system: water, an organic solvent, dissolved oxygen, and lots of dissolved ions in contact with different metals. Yes, it behaves like a battery. The resulting electrolytic corrosion has caused the demise of many an engine, and it is not the only corrosion mechanism at work in a poorly or improperly inhibited system.

To make matters worse, today's engines are smaller and more highly stressed than the older cast iron engines. They are lighter, largely through increased use of aluminum alloys. Aluminum alloys can be found in the block, head, radiator, etc. They allow weight reduction, but complicate the formulation of effective corrosion-mitigating additive "packages" used in Engine Coolant Concentrate, commonly referred to as "Permanent Antifreeze". Cooling systems in these engines require "glycol" Engine Coolant Concentrate/water mixtures to enable higher operating temperatures, such as around 195°F in today's engines, with even higher temperatures under heavy load

conditions, such as hill climbing or high speed driving.

A typical Engine Coolant Concentrate consists mostly of ethylene glycol with buffers and other anticorrosion additives, a small amount of water to dissolve these additives, anti foam, and dye so the mixture will not be mistaken for water. (Ethylene glycol is toxic to mammals). The concentrate is intended to be diluted with water to make the engine coolant solution. A preferred dilution is 50% (v/v) concentrate and water. This provides freeze protection to -34°F and a boiling point of 250°F in a system having a properly functioning radiator pressure cap. Other dilutions may be used or necessary to accommodate extreme climate conditions; however, there are limitations. The lowest freeze point protection achievable is -68°F with 70% (v/v) ethylene glycol. Increasing the proportion of coolant concentrate will actually raise the freezing point of the mixture: undiluted coolant concentrate will freeze at about +8°F. Use of over 70% (v/v) concentrate will also lower heat transport capability of the mixture. Dilutions to less than 35% are not recommended because this dilutes the corrosion mitigating additives to levels too low to be effective.

Approximately 200 million gallons of Engine Coolant Concentrate were sold in the US last year. The American Society for Testing Materials (ASTM) D3306 and Society of Automotive Engineers (SAE) J1034 are commonly used specifications for automotive Engine Coolant Concentrates. Any coolant sold for automotive use must meet the requirements of these specifications. When you purchase Engine Coolant Concentrate for your car read the label carefully. Be sure the product meets ASTM D3306 and SAE J1034 requirements and be certain the producer is reputable.

Both the ASTM and SAE have general publications related to selection and use recommendations for engine coolants. There is a large Coolants Committee in the ASTM (ASTM D15) to develop better standards and test methods. This will be discussed in more detail in later articles. ♦

continued on page 16

Historical Notes

by Edward R. Atkinson, Amherst, MA

In the second issue of this column¹ I discussed my hobby, the history of chemistry, and pointed out that here in New England

"We have sites where chemistry was practiced in the 17th century. Just north of the Connecticut border on the road to New York City you may have noticed the roadside sign identifying **Tantiusques** where John Winthrop, Jr. owned a graphite mine and where King Philip's warriors got their war paint. Some day I would like to study the site, read all available material about it in the files of the Commonwealth and the towns involved and write an article about it—but perhaps one of you will get there first!"

¹ The NUCLEUS, 54 (4), 8 (1976)

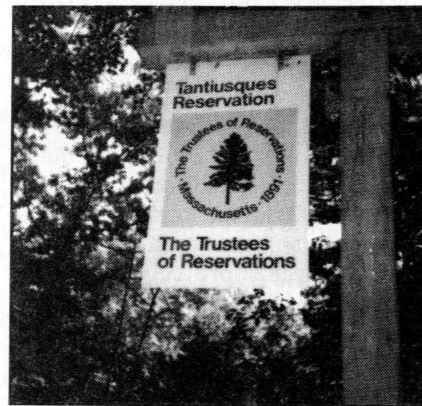


Photo by E. Atkinson

After 16 years of patiently waiting for one of our readers to do the job I decided that I would have to do it myself, although on a somewhat less grandiose scale than I had suggested in my younger days. In writing about Tantiusques (Tan-tee-ooos-kay, according to Dick O'Brien, district manager for the

Trustees of Reservations, current owner of the site) I have avoided digressing into biographical material on the John Winthrops since an article about John Winthrop, Jr. is included in "American Chemists and Chemical Engineers"² For those who are interested, additional material on the Winthrops also can be found³. The last cited reference is to an article on "Chemistry in Old Boston" by Boston University's noted historian, Lyman C. Newell, whose estate supports grants to members of the Northeastern Section.

Tantiusques, also known as Tantiusquis, Tantiusque, Tantousque Tantaskee, and Tantasqua (the last version

² American Chemists and Chemical Engineers, W.D. Miles, ed., American Chemical Society, Washington, DC, 1976.

³ J. Chem. Ed., 2, 163 (1925); *ibid.* 8, 2094 (1931); and *ibid.* 11, 387 (1934)

is currently the name of the regional school district) lies in the region between the center of Sturbridge, MA and the Connecticut border. The mine site, in the Register of Historic Places since 1982, is on Leadmine Road, about a mile west of the vestigial Massachusetts State Rte. 15, now replaced by Interstate Highway 84, and about one mile north of the state border. The name was given by the original owners, the Quabog Indians. After centuries of speculation someone in 1985 asked the Bureau of Ethnology at the Smithsonian Institution just what the name meant. The Bureau replied, "located between two breast-shaped hills", then quickly added "hills are often named after this organ because of their shape". I was immediately reminded of my pubescent days reading about "Breasts of Sheba" in H. Rider Haggard's "King Solomon's Mines," a popular adventure story now sadly stored in the basements of most public libraries. Today only one hill remains and it bears a Friendly's Restaurant.

In the early 1600's (as today) Sturbridge lay on the best routes between Boston and what was to become the U.S.A. The Woodstock Path (north-south) and the Bay Path or Old Connecticut Path (east-west) crossed there. In 1645 John Winthrop, Jr. named a lake on the path Quabage Lake, now better known as Chaugoggagoggmanchauggagogghaubunagungamaugg.

The first white visitor to the site was an Englishman, John Oldham, who reported to John Winthrop, Sr., the second Governor of the Massachusetts Bay Colony, that he had found

plumbago ("black lead" or graphite) near a pond called Quassink (now known as Leadmine Pond) and that the Indian sachems were friendly. Winthrop's son John became the first governor of Connecticut in 1635 and in 1643 he secured from the Massachusetts General Court a grant to "ye hill at Tantousques about 60 miles westward, in which the black lead is, and liberty to purchase some lead of the Indians". Winthrop owned the land for 32 years and opened the mine in 1658. He probably never saw the property. On one occasion when he tried to visit it he got lost in a blizzard and ended up in Springfield. The unfriendly Indians involved in King Philip's War in 1675 used the graphite for war paint.

The original miners were British. To get at the graphite veins they heated the rock with wood fires, then cracked it by pouring on cold lake water. Graphite was collected and packed out to Springfield for shipment by boat down the Connecticut River. The graphite vein was inclined about 70 degrees to the ground surface. The difficulties of mining led some to believe that the Indians had made a good deal when they sold Winthrop the place in exchange for "sundry goods".

For the next 150 years the Winthrop heirs owned the property. In the Proceedings of the American Antiquarian Society, 1901, George H. Haynes published "The Tale of Tantiusques — an Early Mining Venture in Massachusetts". There is no chemistry in his work, but the legal battles involved were a joy to many a lawyer's heart. The Winthrops followed the

caveat of Talleyrand: "Never write a letter; never destroy one". In 1828 a Frederick Tudor of Boston acquired the mine and operated it as a source of material for the manufacture of crucibles. He later made a fortune in the ice business. There is some evidence that the mine was active during the Civil War period. In 1900 a tunnel was dug to intercept the graphite vein. At that time the mine was said to be the oldest "living" mine in the U.S. However, Edward Goodrich Acheson's invention of electric furnace graphite in 1900 made the mining of natural graphite unprofitable. The site has not changed much since 1900. The Trustees of Reservations acquired the site more recently. A map of the area shows many deposits of precious metals within a 10-mile radius. Attempts to mine them economically are much better known to the present natives than are the graphite mining ventures.

If you wish to visit Tantiusques, leave the Mass. Pike at the Sturbridge exit. Proceed on Rte. 20 west to traffic lights, then make a U-turn onto Rte. 131 East, pass under I-84 to the traffic light in the center of Sturbridge. Turn right on Maple Street and go south on the vestigial Rte. 15 for a few miles to Leadmine Road (marked). The site is about one mile west and is marked. About 1.6 miles beyond the site one reaches Leadmine Pond (on paved roads), a popular recreation facility.

In addition to the references cited above I made good use of Brian Burns, "Sturbridge—A Pictorial History", (Downing, 1988) that includes old pic-

continued on page 14

CUSTOM MANUFACTURING
New Capacity Now Available

ChemDesign

ChemDesign Corporation, 99 Development Rd.
Fitchburg, MA 01420, U.S.A., (508) 345-9999

Since 1950
Complete Microanalysis Services

Analysis for all elements • Trace analyses
Environmental Analyses • GLP • CMP

- Instrumental superiority
- Technical competence
- Guaranteed turn-arounds
- Regulatory expertise
- Quality assurance
- EPA certification
- Customized reporting

Serving over 3,500 clients worldwide,
including 60 of the largest 100 U.S. corporations

Accuracy with speed
GALBRAITH LABORATORIES, INC.

Fax: (615) 546-7209 Tel: (615) 546-1335
2323 Sycamore Drive P.O. Box 51610
Knoxville, TN 37921-1750 Knoxville, TN 37950-1610

Call or write for our information packet.

LABORATORY EQUIPMENT
BOUGHT • SOLD • EXCHANGED

CENTRIFUGES
Table-top and floor models
from \$150.00!
ask for our latest equipment listing

American Instrument Exchange, Inc.
21 Canal Street, Lawrence MA 01840
TEL:508-794-3496 FAX:508-794-8431

FREE Polymer Standards Catalog

AMERICAN POLYMER STANDARDS CORPORATION
P. O. Box 901, Mentor, Ohio 44061-0901
Phone: 216-255-2211 Fax: 216-255-8397

PROTECT
Your Expensive Lab Work with Research and Development Record Books

STOCK RECORD BOOKS

- B50D — Fifty pages and fifty duplicates. 1/4 inch sqs. on right pages.
- B100P — 100-1/4 inch sqs. on right pages. 100-10 sqs. per inch on left pages.
- B200P — 208 1/4 inch sqs. on right and left pages.
- B200PH — 208 horizontally lined right and left pages.

Books have instruction and TOC's. Page size is 11 x 8 1/2. Hard extension brown cloth covers. Pages open flat.

\$10.50 each, FOB Chicago
CUSTOM MADE BOOKS TO ORDER
SCIENTIFIC BINDERY PRODUCTIONS
1255 S. Wabash Ave., Chicago, IL 60605
Phone: 312-939-3449 Fax: 312-939-3787

Historical Notes

continued from page 13

tures of the deserted mine tunnel entrance and of other mine equipment.

In preparing the above I did not carry out a conventional literature search. If readers know of other written material on this subject I shall be happy to learn of them so I can apologize to their authors for not having cited them.

I send my thanks to the good ladies at the Joshua Hyde Library, 306 Main St., Sturbridge, MA for bringing the Burns and Haynes works to my attention. ◇

The continuation of the group of brief accounts of recently deceased chemists begun in the October 1992 issue follows.

Emerson H. Newton, 76, died on March 14, 1992. A native of Malden, he graduated from Beverly High School and then received the S.B. in

General Science and Engineering as a member of the Class of 1946 at M.I.T. He was a member of the research staff at Arthur D. Little, Inc. in Cambridge for 32 years before retiring in 1980. His specialty was electrochemistry. He received the Apollo Achievement Award and other awards for his work. Emerson and I had a standing joke about how he acquired one of his best clients, an association that lasted for many years. While he was at lunch one day the president of a chemical company phoned ADL seeking help. I happened to receive the call and assured the president that when Mr. Newton returned from lunch he would be able to help solve the problem. He did.

Daniel Newman, 66, a retired chemical engineer, died on March 19, 1992. A New York native, he received degrees from City College and the Rensselaer Polytechnic Institute. After service as a US Navy officer during World War II he was employed for over 40 years by Stein Hall & Co. as an engineer and salesman. In his later years he was a resident of Brookline.

Paul O. Nicodemus, 77, died on October 25, 1991. He was a native of Pennsylvania and received the B.S. from Penn State and the M.S. from the University of Pennsylvania. After employment at the Wayne Laboratory in Waynesboro, Pa. he became a research chemist with General Electric in Lowell and remained there until retirement in 1976. He was active in lodge affairs and was a past president of Camp Paul for Exceptional Children.

Dennis W. Perkins, 41, died of lymphoma on January 28, 1992. He was a 1967 graduate of Arlington High School and received the B.S. from Northeastern University in 1972 and the M.S. in biochemistry from the University of Wisconsin in 1973. He was employed at Harvard, the Dana-Farber Cancer Institute, and most recently at the Sigma Chemical Co. of Pennsylvania.

Charles J. Sheehan, 49, died on May 12, 1992. He was a 1960 graduate of Quincy High School, received the B.S. in chemical engineering from Northeastern University in 1965, the

S.M. from M.I.T. in 1967 and the M.B.A. in 1974. He became president of the John J. Riley Leather Co. of Woburn and was a member of AIChE and the New England Tanners Association. He was active in church affairs in West Andover, Mass.

Louise Leone Shortell, 95, died on June 16, 1992. She was a Holyoke native who received the B.S. from Simmons College in 1918 and subsequently pursued advanced studies at Boston College, Columbia University, Harvard, and the Sorbonne. In 1920 she joined the Harvard project on blood chemistry at the Boston City Hospital. In 1921 she established a clinical laboratory at the Los Angeles County Hospital to use the new blood research techniques developed at the BCH. After her 1924 marriage to Dr. Joseph Shortell, who later became chief surgeon at the BCH, she devoted her life to volunteer work at the hospital and throughout the Greater Boston area.

Frank William Smith, 71, died on July 30, 1991. A Philadelphia native, he received the B.S. from Villanova University in 1941 and the M.S. from Illinois Institute of Technology in 1942. During the 1943-1949 period he acquired the Sc.D. in chemical engineering at M.I.T., then became chief of the coal carbonization section of the U.S. Bureau of Mines. He was director of research for the ABEX Corporation in New Jersey (1955-1963) and for the Mine Safety Appliance Co. in Pittsburgh, Pa. (1963-1985) becoming vice-president of the latter firm in 1967.

In retirement he remained active, as health permitted, as a consultant and in the affairs of many professional associations. He moved to Merrimack, N.H. in 1988.

John Donovan Strong, 87, a world-famous optical physicist, died on March 21, 1992. His involvement with chemistry and chemists was described in the biography that was published in *The NUCLEUS* (67, No. 6, p. 9 (1989)). Since that time it has been my good fortune to see John almost daily and to exchange views on current activities in chemistry and physics. When Linus Pauling reached age 90 John, who was once a colleague

ACS Workforce Report

Domestic Status, Discrimination, and Career Opportunities of Men and Women Chemists

In 1991 the American Chemical Society conducted a survey on the above topics. After releasing preliminary conclusions in April and May 1992, the complete report was issued in October 1992.

The survey was under the auspices of the ACS Women Chemists Committee and the Committee on Economic Status. The ACS Office of Professional Services conducted the survey, analyzed the results and wrote the report. Copies of the report can be obtained free of charge from the ACS Office of Professional Services, 1155 Sixteenth St., NW, Washington, DC 20036 or by calling (202) 872-4432.

The Executive Summary on page 1 of the report is reprinted by permission of the ACS office.

Executive Summary

Women chemists have made some progress in the field of chemistry over the past decade and a half. The number of degrees in chemistry going to women has increased in all degree levels, the fraction of chemists who are women has increased, and women's salaries relative to men have increased a little. The ACS gathered data in its 1991 Domestic Status Survey in an attempt to determine how domestic constraints, discriminatory attitudes at work, and

at Caltech, sent greetings along with the assurance that he was taking a heaping teaspoonful of vitamin C with his daily Bloody Mary. Linus replied by sending John a copy of his book, "How To Live Longer and Feel Better." I read the book to John, thereby also becoming a convert to the Pauling Vitamin C Doctrine. Strong's autobiography was well along when he died; it is not yet apparent when and if the completed portion will be published. ◇

to be continued

gender differences in career commitment influence the careers of men and women chemists. This report presents the findings of that survey.

The majority of men and women chemists perceive no differences in men's and women's prospects for obtaining jobs, training opportunities, promotion opportunities, or prospects for career progression. But, somewhat more women than men find their sex to be a disadvantage in obtaining a job and obtaining training. Almost a third of women thought their sex was a disadvantage in promotion opportunities, and half of women think their career progression was influenced by the fact that they were women.

Marriage and children do influence careers of men and women. Presence of children, relocation because of a spouse's career and career breaks because of children all result in greater problems obtaining a job for men and women.

Discrimination also influences careers, particularly for women. While not as prevalent or as blatant as in the past, discrimination is still prevalent. Close to half of the women in the sample reported encountering discrimination to the advantage of men. Experience with discrimination is clearly related to perceptions of opportunities. Those who have encountered discrimination are likely to report that training opportunities, promotion opportunities, and prospects for career progression in their current job are influenced by gender.

Sexual harassment is also prevalent. A third of women reported sexual harassment against themselves. Harassment, though, is not, in the absence of discrimination, related to perceptions of opportunities.

Women's lesser progress in career advancement is not a consequence of a lesser interest in pursuing a career.

continued on page 16

Posi-Trap positive flow vacuum inlet traps

*We've got
the perfect trap
for your
system!*

- Positive Flow · No "Blow-By"
- Variety of Elements
- Positive Trapping
- Easy Changing · Easy Cleaning

It's bye-bye to "blow-by" with Posi-Trap. Unlike others, our filter is sealed at both the inlet and the exhaust so that all the particles must flow through the element. We've got the perfect trap for your system, and should your application change, simply choose from our wide variety of filter elements, and you're back on-line! Protect your vacuum pump and system with Posi-Trap from MV Products.

For more information contact

MV PRODUCTS
247 RANGWAY ROAD, PO BOX 359
NO BILLERICA, MA 01862
TEL (508)667-2393 Fax (508) 671-0014

A DIVISION OF MASS-VAC, INC.

ACS Workforce Report

continued from page 15

Women have just as strong an interest in careers and are just as likely to want managerial jobs as men. They are, however, more likely to subordinate their careers to their husbands, possibly because career opportunities are perceived to be, and may in fact be, better for men.

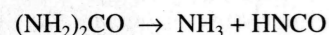
The results of the survey suggest a number of actions that can be taken by employers, advisors, and the ACS to improve the career opportunities of men and women chemists. ◇

Environmental Chemistry Column

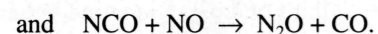
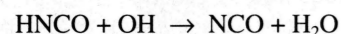
continued from page 10

concentrations increase sufficiently to react with NH_2 , converting it to NH and removing it as a reactant for NO . The NH reacts with O_2 to form NO via HNO , limiting the high temperature NO_x removal.

The process to be employed at Salem Harbor is based upon the same SNR chemistry as the NH_3 processes, but uses urea as the initial additive. Urea is less expensive and easier to handle and inject than ammonia. Urea decomposes at the appropriate temperatures to form ammonia and isocyanic acid,



HNCO contributes to the NO removal partly via the reactions



Conditions must be controlled to ensure that N_2O is mostly thermally decomposed as it is both a greenhouse gas and depletes stratospheric ozone.

The Massachusetts Department of Environmental Protection said knock NO_x , and New England Power is there! ◇

National Chemistry Week 1992

An eventful week - six large events for members of the general public and for our members and six open house events. To start, a one-day symposium for high school teachers and their students at the Boston Museum of Science: "Fantastic Foods for the Future", over two hundred attended. On October 31 the first Annual ACS Northeast Regional Undergraduate Day at Boston University, attended by 125 students, 12 graduate school recruiters and 9 company recruiters. Jim Davis and colleagues gave an exciting evening of chemistry at Harvard University with Hyperchem, chemistry and physics demonstrations. On November 5 we presented the James Flack Norris Award for Outstanding Contributions to Chemistry Education to Jerry Bell (see page 7). He also was the speaker at the symposium for college instructors "College Chemistry: Solutions for the Future".

The open house events: Undergraduates at Bradford College organized a presentation for 100 elementary school children from Haverhill; Don Hilton of UMass Lowell organized three hands-on sessions for middle school children from the Lowell area and Toby Dills of UMass Dartmouth did the same for middle school children from Dartmouth and Fairhaven, MA. Karen Graken of the Chemistry Department at the University of New Hampshire gave a chemistry demonstration to 300 people.

The Police Crime Laboratory and Clean Harbors Co. both gave excellent tours of their facilities attended by local undergraduate students. Students from Needham High School attended a successful open house at the Duracell Company in Needham.

All told, it was a very successful Chemistry Week and all those responsible for its success have our cordial thanks. ◇

Board of Directors

Condensed Minutes,
Meeting of May 14, 1992

Officer's Reports:

Chairman's Report: K. Stygall reported that A. Rosner will be resigning as Auditor because of his relocation to Washington, D.C.

Treasurer's Report: J. Piper presented the itemization of funds for April and the year to date.

Committee Reports:

Education: C. McGowan reported that the Undergraduate Research Symposium has been a great success. In the fall Boston University will host an event for Student Affiliate Chapters. C. McGowan requested input from the Directors for the pre-proposal to the NSF on the Education Task Force.

Hospitality: D. Howell reported that there were 150 reservations for the May meeting dinner.

Nerm 23: T. Gilbert announced a revision in the title of the meeting: *Chemistry: Where the Sciences Meet*.

Publications: J. Lima reported that advertising income was ahead of budget. He asked the board to decide whether there would be a September issue. The board VOTED to have such an issue and asked the Bd. of Publications to report back on the financial aspects of this issue in the fall.

Program: D. Phillips announced that the September meeting would be a joint meeting with the AIChE.

Public Service: P. Brauner reported on the extensive program of forthcoming events. Many organizations will be participating in Statehouse Day on June 9 by scheduling exhibits or by assisting logistically. The International Picnic will be at Babson this summer. National Chemistry Week in November will feature several programs: An Undergraduate Career Day, "Foods for the 21st Century" at the Museum of Science and "Changing Trends in the Chemistry Curriculum" at Bradford College.

Old Business: The national ACS office has informed the Section that they do not believe that our meetings are subject to the new American with Disabilities law, but legal advice will be sought to clarify the matter.

After lengthy discussion it was VOTED that spouses of Board members who are not themselves on the Board will not receive subsidized dinners at award meetings of NESACS.

New Business: The chairman appointed A. Heyn and M. Schwartz tellers for the forthcoming election.

On a motion by T. Light, it was VOTED to establish an *ad hoc* Committee for Employment Services, Dr. Leon Rubin chairman, and to have a start-up budget of \$300.

E. Garber announced that she will resign as archivist because of her forthcoming move to Florida. By acclamation the Board VOTED its thanks for her outstanding services.

Condensed Minutes,
Meeting of June 11, 1992

Committee Reports:

The Board expressed its thanks to all those who participated in the highly successful Statehouse Day. P. Brauner reported that several hundred school children attended the event, as well as educators, Section members and 25-30 Representatives and Senators.

Constitution and Bylaws: A. Heyn presented the committee's text for amendments of the constitution and bylaws of the Section to respond to recommendations of the national C&B Committee, as well as requests by board members as discussed previously. The Board VOTED to accept recommendations for the amendments to Article III, Sec. 1 and Article V, Sec. 3. The other recommendations to be discussed and voted at the September meeting. For the guidance of the committee a straw poll was taken which showed general, but not unanimous approval of the amendments of Article VI, Sec. 1, Article VIII, Sec. 1, Article XX, Sec. 3 and Bylaw X, Sec. 2.

In accordance with prior agreement, no other business was discussed at this meeting.

Condensed Minutes,
Meeting of September 24, 1992

Officer's Reports:

Chairman's Report: K. Stygall apprised the Board of the many programs planned for Chemistry Week, including "Fantastic Foods of the Future" at the Boston Museum of Science, "Undergraduate Chemistry Day" at Boston University, "An Evening of Chemistry" at Harvard University, the James Flack Norris Award for Outstanding Contributions to Chemistry Education to be given at the Section Meeting on November 5, a workshop "Preventing Pollution in Schools, Research Clinics and Industrial Laboratories" and a symposium "College Chemistry: Future Directions". A final program of events with times and locations will be mailed to Directors later and the usual publicity through the media will take place.

Treasurer's Report: J. Piper presented the itemization for May through August. The Section continues in sound financial shape.

Committee Reports:

Public Relations: There have been some 15 articles about Section events and members in local papers in the region. The *Wellesley Townsman* featured an article about P. Brauner on the occasion of her selection as an outstanding alumna by Boston University's Graduate School.

Trustees: A. Dey reported that income from the funds, because of lower interest rates, will be lower than for past years. The Board should keep this in mind in their budget planning and work closely together with the Trustees.

Other Committees:

Chemical Consultants' Group: D. Saez noted that a roster of the group has been prepared. There will be a workshop on biotechnology in the spring. An October 22 meeting will be on how to obtain services of a patent agent.

Continuing Education: A. Viola announced the workshop planned for November 22 on "Experimental Design".
NERM 23: T. Gilbert reported that the

B.U. Chapter Honored

B.U.'s Student Affiliate Chapter Selected as Outstanding Chapter

The Boston University Student Affiliate Chapter, Chimia, has been selected by the American Chemical Society as an Outstanding Student Affiliate Chapter for its activities in 1991/1992.

Congratulations to the Chapter, its faculty sponsors and advisors, Prof. Morton Hoffman and Asst. Prof. Patricia Samuel and the department for its support. ◇

call for papers has gone out and an abstract has already been received. He thanked M. Burgess for her efforts in making arrangements with Boston area hotels. There will be a clambake on the "Spirit of Boston".

Old Business: Actions on the amendments presented by the Constitution and Bylaws Committee in June: The Board Voted APPROVAL of the amendments of Article XX, Sec. 3, Bylaw X, Sec. 2 and Article VIII, Sec. 1(i). The Board voted to RECOMMIT Article VIII, Sec. 6 to the C&B Committee.

New Business: K. Stygall requested approval for \$1000 in support of Undergraduate Chemistry Day at Boston University as a Chemistry Week event. The Board APPROVED. The Board VOTED to accept the recommendations of the Search Committee on the job description of the Administrative Secretary. The Board referred to the Chemical Education Committee for a specific recommendation the matter of providing support for selected undergraduate students for travel to the national ACS meeting in Denver the coming spring. ◇

SERVICES DIRECTORY

Member News

Additional Local ACS Award Winners

Prof. Elias J. Corey of Harvard University is to receive the 1993 Roger Adams Award in Organic Chemistry. 1993 recipients of the Arthur C. Cope Scholar Award in this Section are **Peter Chen** of Harvard University, **Alexander Klibanov** of the Mass. Institute of Technology and **JoAnne Stubbe** also at MIT. Thus 3 out of the 10 recipients of this award are students at universities in this Section.

The 1993 Nobel Laureate Signature Award for Graduate Education in Chemistry is to be given to **Andrew D. Johnson** at AT&T Bell Labs who worked under the guidance of **Sylvia T. Ceyer**, preceptor, at MIT.

Our congratulations to all of these recipients of 1993 awards.

Another tidbit about a local institution: MIT leads in U.S. patents awarded to universities in the United States: 105 patents in 1991, with the nearest rival being the University of California with 87 patents. Yet, the R&D spending at MIT was 10% under the average of the 13 universities in the listing. ◇

Support Our Advertisers

STRUCTURE PROBE®

SPECIALISTS IN MATERIALS RESEARCH

ANALYTICAL SERVICES Electron Microscopy & Surface Analysis

63 Unquowa Road
Fairfield, CT 06430
(203) 254-0000

SURFACE MODIFICATION MAKES A DIFFERENCE

PLASMA PROCESSING AND MORE...

Advanced Surface Technology Inc. offers a full range of *Surface Modification* services to the biomedical industry. Utilizing unique gas plasma technologies the surfaces of virtually any polymer commonly used in the biomedical field can be tailored to accommodate most applications. Some of the areas where *plasma surface modification* has proven useful include:

- Orthopaedics
- Catheters
- Vascular Grafts
- Implantable Electrodes
- Bioabsorbable Polymers
- Cell Cultureware
- Separation Membranes
- Contact/Intraocular Lenses

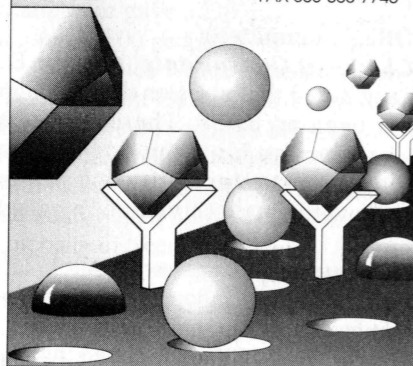
Material interfaces are perhaps the biggest problem facing the biomaterials industry today. Using surface modification allows the scientist to select a material for its desirable bulk properties and subsequently design the correct surface characteristics for the interfaces involved. Some of the surface attributes that can be selectively tailored are:

- Hydrophilicity
- Hydrophobicity
- Protein Binding
- Cell/Molecular Affinity
- Biocompatibility

AST can provide plasma processing, contract research, surface engineering and plasma reactor design services at all levels. Call today to discuss your applications with a surface scientist.



ADVANCED SURFACE TECHNOLOGY INC. Nine Linnell Circle
Billerica, MA 01821-3902
508-663-7652
FAX 508-663-7746



R&D on CAPE COD

Small R&D firm seeks talented and highly motivated professionals who enjoy living and working on Cape Cod. Position requires proven synthetic organic chemistry skills and enthusiasm for laboratory work at the interface between chemistry and material science. US. citizens only.

Send resume & salary history to:
19 Research Road, East Falmouth, MA 02536.

POLYMER CHEMIST

Corporate client in New England seeks a Group Leader with a solid academic and industrial background in polymer chemistry. Should have a PhD and experience in product development, from R&D through manufacture. Specific experience in (vinyl) films and sheet or web manufacturing would be a plus.

Dr. Al Frabetti, Applied Resources, Inc.
PO. Box 525, Medford, MA 02155.
FON (617)391-1202, FAX (617)391-8011.

SERVICES

LABORATORY AUTOMATION. Off-the-shelf and custom software for PC and PDP-11. Laboratory instrument interfacing and data acquisition. Inorganic CLP reporting. R.N. Stillwell, Scientific Computer Applications, (617)275-2964.

CUSTOM SYNTHESIS Lab scale synthesis (gram to several kilograms) of organic chemicals, biochemicals, metal alkoxides, metal acetylacetonates, and metal carboxylates. We have the ability to handle air and moisture sensitive compounds. Contact Dr. N. Rice, Oryza Laboratories Inc. 112 Parker Street, Newburyport, MA 01950.
Tel: (508)463-8685 Fax: (508)462-3048.

RECRUITING?

The *NUCLEUS* readership is New England's best source for chemical industry personnel.

The *Nucleus* reaches more than 10,000 readers each month. These readers are in the following areas of activity:

Industry	Management & R&D	67%
Academe	Faculty & Admin	14%
Students	Grad & post-docs	10%
Consulting & Clinical Labs		5%

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

Call Nancy Bedell for more info:
(617) 837-0424

SERVICES DIRECTORY

(TSI) Mason Laboratories

TSI Mason Laboratories, a high quality international testing laboratory serving the pharmaceutical and biotechnology industry, offers the following opportunity:

Analytical Chemists

Develop, validate and apply HPLC and GC methods for analyzing Pharmaceuticals and other chemicals in Biological Samples. Should be experienced in developing proposals, reporting results, and complying with GLP and other FDA requirements. This position requires a PhD with four years experience, or a BS with extensive, directly applicable experience.

Excellent benefit package includes health, dental and life insurance, 401(k) plan, and stock purchase plan.

Please submit resume and salary requirements to TSI Mason Laboratories, Attn: Human Development, 57 Union St., Worcester, MA 01608.

An equal opportunity employer M/F/H/V.

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



Senior Product Manager LCMS Systems

Millipore is the worldwide leader in the separation of liquids combining chromatographic and electrophoretic instrumentation, column and membrane chemistries and information processing. Millipore solves applications ranging from synthesis and sequencing of peptides, to the assurance of product formulations in the chemical industry, to assisting the search for new pharmaceuticals.

We are looking for an individual to monitor the LCMS market, identify emerging trends and assist in the strategic planning/product development process for new LCMS system-level products. Key activities are development and implementation of marketing plans and programs for LCMS systems, including pricing, positioning and promotion on a worldwide basis.

Requires a BS degree in Chemistry, Biology, Engineering, or related field. An advanced degree, particularly in Business, is desirable. Thorough knowledge of HPLC and computer technology and markets, and familiarity with GC-MS or LC-MS are needed.

Located on the West rim of Boston's high-tech circle, Millipore/WCD offers the opportunity to participate in leading-edge product and market development with the competitive salary and benefits of a growing Fortune 500 company. Please mail or FAX your resume to: Millipore Corporation, Waters Chromatography Division, 34 Maple Street, Milford, MA 01757; FAX (508) 478-8452; Attn: Steve Mellor, Human Resources. Millipore is an equal opportunity employer; women and minorities are strongly encouraged to apply.

MILLIPORE

Waters Chromatography



CHEMISTRY OPPORTUNITIES

Midwest Research Institute (MRI), a leading contract environmental and pharmaceutical research organization, has several challenging opportunities at various levels in our Chemical Sciences and Life Sciences Departments.

Senior Chemist -- Develop analytical methods pertaining to determination of the fate of hazardous chemicals in environmental and biological matrices and human exposure scenarios. Responsible for experimental design, data interpretation and project management. Requirements include PhD in Chemistry with a minimum of 3 years experience or equivalent in analytical method development particularly for pesticide residues in environmental and biological matrices.

Senior Chemists -- One position responsible for chemical characterization and methods development studies for animal health care product registration. One position to develop and manage program in pesticide and pharmaceutical metabolism. Both positions require a PhD in related discipline with 5 years relevant working experience.

Senior Scientist/Chemist -- Coordinate sample preparation for department. Must have advanced experience in sample preparation techniques and methods, extractions, cleanup, GPC, GC-screening; management experience in prioritizing and scheduling work for maximum efficiency. PhD in science related degree or BS with 6 years relevant work experience.

Senior Scientist/Chemist -- Manage and coordinate chromatography facility which includes prioritizing and scheduling work efficiently; technical experience in HPLC, IC, GC in commercial, laboratory and proficient in data interpretation and in data reduction. PhD in science related degree or BS with 6 years relevant work experience.

MRI offers competitive compensation, a comprehensive benefits package, paid relocation and unique environment to meet personal challenges and enhance career growth. We have opportunities for Chemists at all levels and those who possess less experience are also encouraged to apply. If you are interested in being a part of this select group of professionals, please fax or send your resume to Jill M. Skaggs, Human Resources Department (BOS) at:

MIDWEST RESEARCH INSTITUTE -- "Serving Science and Society"

425 Volker Boulevard, Kansas City, MO 64110
FON (816)753-7600 FAX (816)7853-8420
EEO/AA, M/F/D/V -- A Drug Screening Employer

Calendar

For additional information, call:

Boston College – (617) 552-3625
Boston University – (617) 353-2537
Brandeis University – (617) 736-2500
Clark University – (508) 793-7116
Dartmouth College – (603) 646-2501
Harvard University – (617) 495-5333
MIT – (617) 253-4080
St. Anselm College – (603) 641-7148
Northeastern University – (617) 437-2822
Tufts University (Chemistry, Medford Campus) – (617) 381-3441
Tufts University (Chemical Eng., Medford Campus) – (617) 627-3900
Tufts University Health Science Campus – (617) 956-6867
UMass Dartmouth – (508) 999-8232
University of New Hampshire – (603) 862-1550

January 11

Prof. Bruce Branchaud (Univ. of Oregon)
“Mechanistic Studies on Galactose Oxidase – A Paradigm for Tyrosine Radical Involvement in Enzymic Catalysis”
Harvard University
Mb-23 at 4:15 pm

January 12

Prof. R.M. Wightman (U. N. Carolina)
“Voltammetric Monitoring of Chemical Secretion from Individual Biological Cells”
Northeastern University
Room 129 Hurtig Hall at 4:00 pm

January 13

Ms. Colleen A. Crovello (Tufts University School of Medicine)
“Protein Phosphorylation in Platelet Activation”
UMass Dartmouth
Room 305 Science and Engineering Bldg. (Group II) at 4:00 pm

January 15

Prof. Dean Wilcox (Dartmouth College)
“The Nickel Enzymes Urease from Jackbean – What Jack Didn't Know about His Magic Beans”
St. Anselm College
Perini Hall – Room 217 at 3:30 pm

January 19

Prof. William Armstrong (BC)
“Polynuclear Manganese Complexes as Models for the Photosystem II Water Oxidation Catalyst”
Northeastern University
Rm. 129 Hurtig Hall at 4:00 pm

January 20

Dr. Willem Leenstra (Univ. of Vermont)
“Bilirubin Secondary Structure Investigated by Spectroscopy and Calculations”
UMass Dartmouth
Rm. 305 Science and Engineering Bldg. (Group II) at 4:00 pm

January 25

Prof. Philip Anfinsen (Harvard Univ.)
“Ultrafast Near-IR Spectroscopy of Myoglobin: Dynamics of Conformational Change”
Brandeis University
Gerstenzang 122 at 4:00 pm

Prof. William Roush (Indiana Univ.)
“Towards the Synthesis of Olivomycin A: Problems in Glycoside Chemistry”
Harvard University
Mb-23 at 4:15 pm

January 27

Dr. John Woods (Loctite Corporation)
“Recent Advances in the Chemistry and Technology of Radiation Curing and Imaging Systems”
UMass Dartmouth
Rm. 305 Science and Engineering Bldg. (Group II) at 4:00 pm

January 29

Prof. Guy Rosenthal (Univ. of Vermont)
“Synthetic Strategies Toward New High-Tech Materials”
St. Anselm College
Perini Hall – Room 217 at 3:30 pm

Notices for the Nucleus Calendar should be sent to:

Chris Arumainayagam
Department of Chemistry
Wellesley College
Wellesley, MA 02181
Telephone (617) 283-3326
Fax (617) 283-3642
e-mail: CARUMAINAYAG@LUCY.WELLESLEY.EDU

Preliminary Notice 1993 James Flack Norris Undergraduate Summer Research Scholarships

Potential applicants, research directors, nominators and recommenders are advised that detailed guidelines and application forms should be reaching the respective department offices by mid-January.

THE NUCLEUS

8 Winch Park Road
Framingham, MA 01701

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