

THE NUCLEUS

April 1988

Of the Northeastern Section of the American Chemical Society

Vol. LXVI, No. 7

Monthly Meeting:

*Esselen Award to be presented
to Drs. Fowler and Wolf*

THE CHEMIST TODAY

By Mary L. Good

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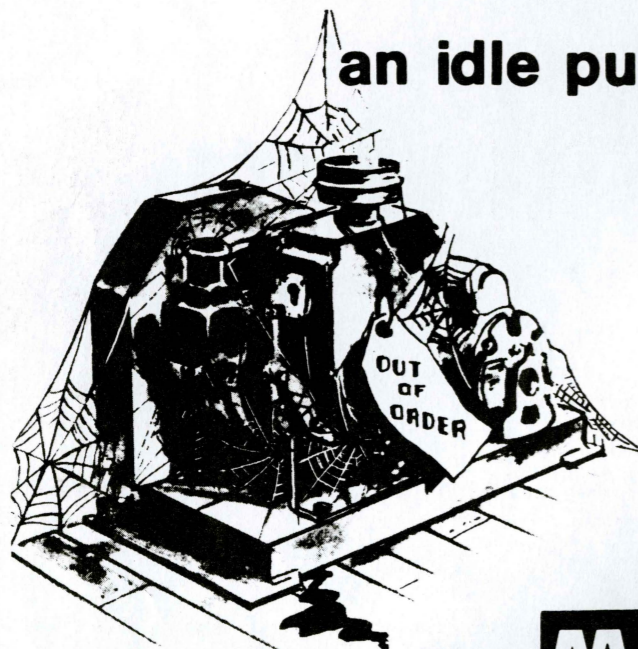
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May Issue Deadline: March 20, 1988

THE NUCLEUS

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NEACS Medicinal Chemistry Group Contributors to the 1987 Program

The officers and members of the NEACS Medicinal Chemistry Group wish to acknowledge the following organizations for their generous support of the 1987 symposium and seminar series:

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These contributions are the primary means of support for the Group's seminar program and have allowed the Group to once again offer a program of the highest quality in 1987.

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We solicit nominations for the Office of Secretary. To nominate a person, to volunteer, or for more information, please contact one of the officers.

Medicinal Chemistry Group Meeting

Co-sponsored by the College of Pharmacy and Allied Health Professions, Northeastern University

Tuesday, April 12, 1988

Northeastern University
Mugar Hall, Room 135
Boston, Massachusetts

Professor Richard A. Glennon
Virginia Commonwealth University

Will Speak On:

"Studies on Structure-Activity-Relationships and Mechanism of Action of Phenalkylamine-Type Designer Drugs."

4:00 p.m. Refreshments

4:30 p.m. Seminar

6:00 p.m. Dinner* with Professor Glennon

Parking is available in the Northeastern University garage on Columbus Avenue. Public transportation: Orange Line (Ruggles), Green Line (Arborway Branch).

*For dinner reservations, please contact Dr. Richard Milius at 437-5192 by April 11, 1988.
Members: \$10.00
Students and Retirees: \$6.00

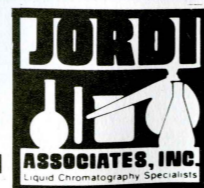
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April Meeting

The 708th meeting of the Northeastern Section of the American Chemical Society

The Esselen Award Meeting

Thursday, April 7, 1988

Harvard University Faculty Club

5:30 p.m. Preprandial Hour

6:15 p.m. Dinner

Harvard University Science Center

8:00 p.m. The Esselen Award
M.S. Simon

8:05 p.m. Gustavus John Esselen
Thomas R.P. Gibb

8:20 p.m. Alfred P. Wolf and Joanna S. Fowler
A.S. Obermayer

8:35 p.m. Presentation of the Gustavus John Esselen Award to Drs. Fowler and Wolf
Gustavus J. Esselen, III

8:40 p.m. "Cyclotrons, Positrons and PET: Rapid Chemistry for Tracing Biochemical Transformations in the Living Body"
Drs. Wolf and Fowler (Abstract, p. 6)

9:40 p.m. Reception for the Awardees

Dinner Reservations (Black Tie Optional) should be made not later than March 29, 1988, by calling Karen Piper at (800) 872-2054 (in Massachusetts), or (617) 456-8227. Persons who make reservations which are not cancelled at least 24 hours in advance will be billed for the dinner price. Members, \$18; Non-members, \$20; Students and Retirees, \$5. THE PUBLIC IS INVITED.



The Esselen Award-1988

Linkage of Chemistry with Medical Studies

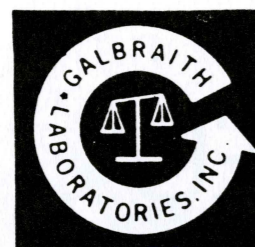
The 1988 Esselen Award goes to Drs. Alfred P. Wolf and Joanne S. Fowler of the Brookhaven National Laboratory for their work on radiopharmaceuticals, and, in particular, their hot atom synthesis work which allows the application of Positron Emission Tomography (PET) to the investigation of diseases in living human beings.

Their work on the rapid synthesis of organic compounds labelled with cyclotron-produced short-lived isotopes, carbon-11, fluorine-18, and nitrogen-13, made biochemically important molecules available for human testing. Such molecules are used in the observation of metabolic processes in the brain, in identification of the focus in seizure disorders, in selecting candidates who will benefit from cardiac bypass surgery, and in selecting appropriate therapeutic intervention and monitoring response to treatment. They can be introduced into the body with minimum trauma and can be detected externally using emission tomography.

This marriage of fundamental studies in organic synthesis and radiochemistry with practical applications in medicine is an important contribution to the public well-being and teaches the benefits to mankind that the chemist's work provides. This year's Esselen Award applauds the efforts of Wolf and Fowler. ♦

He has lectured at the University of Puerto Rico and University of California, Berkeley, also in Greece, Japan, India, Europe and South America and has been the recipient of a number of notable awards including the ACS Award in Nuclear Applications, The George von Hevesy Foundation of Nuclear Medicine's Hevesy Memorial

Continued on page 6



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Biographies

Alfred P. Wolf:

Dr. Wolf is Chairman of the Chemistry Department at Brookhaven National Laboratory, and Director of BNL's PET Program. He has over 325 publications in basic and applied chemistry in the fields of hot atom chemistry, tracer

methodology, radionuclide and radiopharmaceutical research, especially positron emitters, accelerator applications in chemistry and medicine, application of labeled compounds in nuclear medicine, neurology and oncology.

He was educated at Columbia University (B.A. 1944, M.A. 1948, Ph.D. 1952) and has spent his entire career on the staff of Brookhaven National Laboratory.

April Meeting Abstract

Cyclotrons, Positrons and PET: Rapid Chemistry for Tracing Biochemical Transformations in the Living Body

Alfred P. Wolf and Joanna S. Fowler
Chemistry Department, Brookhaven National Laboratory
Upton, New York 11973

The rapid growth of positron emission tomography (PET) has been stimulated, in large part, by advances in chemistry. The radiotracers used with PET are most commonly organic molecules labeled with the cyclotron-produced short-lived isotopes carbon-11 ($t_{1/2}$: 20.4 min), fluorine-18 ($t_{1/2}$: 110 min), nitrogen-13 ($t_{1/2}$: 10 min) and oxygen-15 ($t_{1/2}$: 2 min). Research in hot atom chemistry and organic chemistry has led to the development of rapid synthetic sequences by which relatively simple labeled precursors such as $^{11}\text{CO}_2$, H^{11}CN , $^{18}\text{F}^-$, $^{18}\text{F}_2$, and $^{13}\text{NH}_3$ are converted into complex radiotracers such as amino acids, sugars, antipsychotic drugs, alcohols, biogenic amines, and enzyme inhibitors. The use of appropriate radiotracers allows biochemical transformations to be probed in the living human body in health and in disease to provide information which is not accessible using any other existing imaging modality. For example, the measurement of the accumulation of labeled products after the injection of an appropriately designed radiotracer can provide a record of a discrete metabolic process, such as glucose metabolism, neurotransmitter receptor binding, enzyme catalysis or therapeutic drug binding. Although the short half-lives of the positron emitters pose unique challenges for radiotracer development and application, it is because of the short half life that the radiation dose from a study is relatively small and human studies are possible. Thus PET, in combination with highly selective radiotracers, is a unique scientific tool for investigating disease mechanisms at the molecular level. (Support from the Department of Energy (Basic Energy Sciences) and the National Institutes of Health is gratefully acknowledged). ◇

The Gustavus John Esselen Award for Chemistry in the Public Interest

by M.S. Simon

Gustavus John Esselen was a major contributor to the Northeastern Section, serving as Chairman in 1922–23, chairing the ACS National Meetings in Boston in 1928 and again in 1939, and representing this Section in the highest levels of the national organization as a member of the ACS Council Policy Committee.

In 1985 the Esselen Family set up an award to be administered by the Section in honor of Dr. Esselen, and the theme of service to society was chosen. The chemists who win this award do so because their scientific and technical work contribute to the public well-being, and thus demonstrate the positive values of the chemical profession.

The concept of the chemist as a

benefactor to society by his/her scientific work fits well with Dr. Esselen's career and philosophy. He would have been delighted to see the first award in 1987 go to F.S. Rowland and M.J. Molina for their studies on the effect of fluorocarbons on the ozone layer.

The second award, to be given this year to A.P. Wolf and J.S. Fowler, recognizes the importance of chemistry in medical advances. Their work has led to the practical use of positron emission tomography in a variety of medical applications. Again, such valuable chemical research of both fundamental and applied importance fits well with the philosophy of chemistry in the service of society. These awards bring honor to the recipients, and the recipients bring honor to the award. ◇

Biographies

Continued from page 5.

Medal, and the Javits Neuroscience Investigator Award.

He has been a consultant to numerous domestic and international centers dealing with nuclear medicine and has been an editor of the Journal of Labeled Compounds and Radiopharmaceuticals and *Radiopharmaceutica Acta*. He is a member of the American, British and German Chemical Societies, and the Society of Nuclear Medicine of the United States.

Joanna S. Fowler:

Dr. Fowler is a Tenured Chemist in the Chemistry Department of the Brookhaven National Laboratory. She has over 100 publications in the fields of organic synthesis, organofluorine chemistry, radiotracer synthesis with positron emitters, applications of radiotracers to problems in biology and medicine, and mechanistic studies related to the development of radiotracers for positron emission tomography.

She was educated at the Universities of South Florida (B.A., 1964), Colorado (Ph.D. 1967), East Anglia (Post-doctoral Fellow, 1968), and joined the Brookhaven laboratory in 1969 as a Post-doctoral Fellow. She has remained at Brookhaven as Chemist and Tenured Chemist.

Dr. Fowler has been Special Consultant and Member of the Diagnostic Radiology Study Section of the National Institutes of Health, a Reviewer for the Department of Energy, and serves on the Committee on Nuclear and Radiochemistry of the National Research Council. She is a member of the editorial board of the Journal of Nuclear Medicine, is a member of the American Chemical Society and the Society of Nuclear Medicine, where she is on the Board of Directors of the Radiopharmaceutical Science Council. ◇

Murphy's Law at Work

A Flat Denial

by Robert J. Nash
Former Editor
Genesee Valley CHEMunications
Rochester Section, ACS

Well, as is becoming traditional, the external mailing of the October issue of *CHEMunications* was embarrassingly late. All that expensive typesetting for the Authors' Night center spread, and all that effort to prepare an eye-catching cover (including the last minute addition of safety glasses to the model)—all for naught! Why can't the October issue be timely? Well, the usual major reason is that the issue always contains several important features, e.g. the candidate biographies for the Executive Committee election, an announcement of technical meeting (e.g. Authors' Night) and the Harrison Howe Award. Clearly, the October issue cannot go to press until all of the information on the aforementioned events are in hand, and if the probability of publication is P , then:

$$P = P(C_1 \cap C_2 \cap C_3 \dots \cap C_n) = P(C_1) \cdot P(C_2) \cdot P(C_3) \dots P(C_n)$$

where $P(C_n)$ is the probability of the timely arrival of the n th. contribution. Hence, even if $P(C) = 1$ for some contributions, a single procrastinatory act will be sufficient to drive P towards zero. Unfortunately, since the October issue is the "candidates" issue, P will always tend towards zero, because (a) fourteen candidates will ensure a distribution of procrastinatory tendencies, and (b) at deadline, there will **not** be fourteen candidates—surprise, surprise, it is very difficult to find candidates for some positions. Factors (a) and (b), then, ensure a yearly cliff-hanger for the hapless editor—First there is the wait while erstwhile candidates are cajoled/threatened/bribed, etc. and then there is the last minute pantomime concerning bios. and pics. (One year, in desperation, after repeated failures to obtain a bio. and pic. from one busy candidate, bolstered by the assurance from his secretary that the candidate was still alive, I ran copy from an old *CHEMunications*—and

yes, he won!). And then there are the Harrison Howe recipients who are so busy chasing their Nobel that pleas from Rochester for a bio. and an abstract (sometimes we'd even settle for a date and tentative title) rate low on their scale of activities. All in all then, it's not unusual for a month to be lost from a production schedule based on a generous September 2nd deadline, and all too often there are only a few weeks left in which to wrestle a feature-packed issue through the many stages of printing and distribution. This year followed the above pattern, but by the dint of several wasted weekends, many late nights and early mornings, the October issue was ready for distribution with just one week to spare. A close-run thing, but based on past experience the issue should have circulated just in time for the Authors' Night meeting on November 10.

Unfortunately, this year the USPS decided to add to the sport of "frustrate the editor." As you will notice from our mailing imprint, *CHEMunications* is mailed on a Non-Profit Permit—basically, this allows mailings to be made for the bargain price of 5.2¢/copy, and in return the mailer relieves the USPS of a large degree of sorting. This is achieved by having the mailer sort the mail according to an elaborate scheme published by the USPS, and the sorting procedure is so detailed that it is necessary for the designated mailer to attend a seminar on approved mailing techniques. The USPS even provides extensive documentation with the course, and it is popularly believed that the steps necessary for a "correct" mailing are contained somewhere within the mass of instructions. Unfortunately, the documentation is written for the career USPS employee, not Mr. Everyman (not even Dr. Everyman!), and attains obscurant levels normally achieved only by computer operating system manuals. In fact, the parallel is most apt, since the USPS, like an OS, does not tolerate errors, and incoming mail

is carefully checked for transgressions. Such vigilance, of course, is necessary to ensure a smooth flow of mail, and to prevent any abuse of the inexpensive mailing privileges. Unfortunately, it is virtually impossible to produce a mailing which is 100% accurate, mainly because of the accounting system used by the USPS—a single error in a pack of mail apparently infects the rest of the pack, so that just a few "errors" will be multiplied to impressive levels (rather like the voting rights of Directors, where the select few miraculously control the voting rights of millions of shares). As a result, the preparation of the outside mailing is not simply a matter of sticking 1000 labels on 1000 magazines—no, a multilevel sorting procedure is an important part of the job, involving primary segregation (matching Zip Codes), a secondary segregation (bundling to approved pack sizes—at least ten in a pack), and a tertiary segregation (packing associated packs in official mail sacks). A table loaded with labelled but unsorted *CHEMunications* resembles the Normandy beaches shortly after D-day—rows upon rows of strategic piles: 5-digit Zips, 3-digit Zips, non-Rochester NY, non-New York state, bundles of 10 or more, bundles of fewer than 10. Fortunately, the experience of many years of mailing have been distilled onto a single crib-sheet, thus allowing *CHEMunications* to be mailed and delivered with satisfying promptness (two days being a typical in/out time).

Then came that fateful day in October, when late one evening the *CHEMunications* was impounded for non-compliance by the USPS. What error had triggered this calamity?—were the Zip Codes randomized? No, the error lay simply in the wording of the tags on the four sacks of mail—the tags should have read FLATS, but instead read LETTERS. (For those curious, a FLAT can be distinguished from a LETTER by its aspect ratio—on

Continued on page 15.

April News

New Neuroactive Substance Studied

The Nucleus is indebted to Dr. John L. Neumeyer for information about this important area of research carried out by a group of scientists in Rochester, NY. The work, which was discussed at a recent Society of Neurosciences meeting in Boston, is not yet widely known but should be of special interest to members of the Northeastern Section. Dr. Neumeyer, who is an authority on neuroactive amines and also founder and Chairman of the Board of Research Biochemicals, Inc. in Natick, MA, tells us that he anticipates a brisk business in a whole new class of research biochemicals based on this work in the near future.

Observation of the inexplicable behavior of numerous specimens of certain subspecies of administrator, *Deanus Americanus Horribilis* and *Chairmanus Incompetens*, gave evidence of heretofore undiscovered neurobiological principles. Further research made it possible to localize and study the function of bozoamine (BA), the major neuroactive amine responsible for the observed behaviors.

The structure of bozoamine is shown in Fig. 1. Its functional groups correspond closely to the verbal pronouncements induced by the compound.

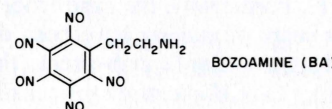


Figure 1

Reaction with a co-factor also found in the administrator brain, idiotic acid (ID), produces the para-noid form of bozoamine (Fig. 2).

This reaction is catalyzed by feelings of unlimited power and the exercise of administrative "prerogatives," resulting in the irreversible formation of the para-noid form of bozoamine. This product is even more potent than bozoamine itself, and is virtually impossible to eliminate from the administrator brain.

Air oxidation of bozoamine in the presence of sufficient quantities of

ethanol results in the formation of apoplexic acid (Fig. 3).

This reaction can be life-threatening when it occurs in individuals who are over the age of fifty.

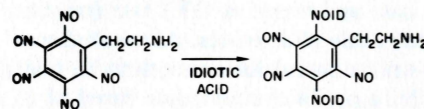


Figure 2

It has been possible to localize bozoamine in brain by immunohistochemistry. Using anti-BA antibody, bozoamine was found in neurons, termed bozons. Sites of high levels of BA and localization of bozons are the Vaguest Nucleus, the Nucleus Ambiguous, and the Nucleus Preposterous. In the periphery, BA innervates the smooth muscle of the gut, producing total obstruction in most circumstances. In the periph-

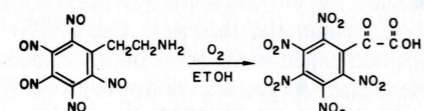


Figure 3

ery, obstruction seems to be the primary function of bozons.

Several other compounds are co-localized with bozoamine. One of these is bozorpin (BO), a naloxone-like inhibitor, which results in the production of great pain of the intractable and untreatable variety. The pain, however, is not felt by the administrator brain but is instead inflicted on others, especially those in subordinate positions.

Bombastin (BS) is also co-localized with bozoamine in most higher centers of the brain. Activation of this compound results in loud, self-important vocalizations, especially from more macho specimens of administrator, delusions of grandeur, and feelings of omnipotence. The combined action of BS and BA renders the administrator brain unable to separate fantasy from reality.

Unfortunately, no method has been found yet to prevent bozoamine forma-

tion in administrator brain. BA and BS levels appear to increase inexorably the higher the level the administrator has achieved in its organization. Research on the chemistry and biological activity of bozoamine and related compounds continues and will be reported as it becomes public. ◇

PET Services Offered

Are you one of those unfortunate people who is sought out by mosquitoes in a crowd to be feasted upon?

Or do you find that people avoid being near you at cocktail parties even though you haven't eaten garlic for weeks and are wearing a perfectly clean shirt?

Has that sense of excitement disappeared from your close relationships?

If you are afflicted by any of these or similar problems, a new company, Personal Environmental Testing (PET) Services Inc., may be able to help you. The company was founded by a group of former college chemistry professors who became tired of trying to walk on water in the pursuit of tenure and it has seen phenomenal growth since the day it started business on April 1, 1982.

PET Services president Dr. Thomas Goodnose, formerly of Downeast University, explains that the success of the new venture is made possible by the burgeoning field of human pheromones and semiochemicals. Many recent publications have laid the cornerstones of this fertile research area and the interested reader can refer to some recent reviews of the field.¹⁻⁵

New clients are first referred to the Bodyodors Division of PET Services where trained technicians obtain data from the Standard Tests of Individual Normal Chemistry (STINC) and develop an incredibly detailed profile of the personal chemical environment of each customer.

The simplest problems are those presented by individuals who produce the wrong pheromones, thus attracting non-human species. The PEST Division of PET Services can then prescribe certain antidotes, irreversible chemical inhibitors, or subcutaneous implants of timed release medications. These techniques are nearly 100% effective.

Of course things do go wrong sometimes although the company naturally wishes to keep these cases quiet. The NUCLEUS has learned of the case of a well-known physical chemist at Frankfurter University who received an implant to ward off mosquitoes for the whole summer. On his next camping trip he found to his dismay that incredible numbers of pine bark beetles and male gypsy moths congregated on his person, rendering him invisible for the next thirty-six hours. Even his wife couldn't find him. A PET Services technician had to be flown into the Maine wilderness by the Forest Service to remove the implant.

The most successful division of PET Services is the Chemical Dating Service. This has been a life-saver for certain people who are chronically unable to get a steady date. The exact way in which the Dating Service matches up suitable individuals is of course a trade secret. It is known that computers are used to match the STINC profiles but rumor has it that in especially difficult cases trained dogs are also used to sniff out good matches. The overall success rate of the matches is very high. Dr. Goodnose is fond of recalling the most difficult case thus far: one client, a former dean, could only be matched with a baboon but the couple is now reported to be living very happily at the Boston Zoo.

Dr. Goodnose points out that it is now possible to alter the STINC profiles in subtle ways. This type of manipulation is of immense help to couples who have become incompatible because of aging STINC profiles. He cautions, however, that this type of treatment has to be done with utmost care. The NUCLEUS has determined that Dr. Lowest of Wayland College for Women, who was recently torn to bits by his class, had undergone STINC modification treatment. Evidently idiosyncrasies in body biochemistry can lead to unexpected results.

Another recent mishap involved a client who after treatment was attacked by a flock of rare Drumlin bearded vultures along the Sudbury River and barely escaped with his life. In this case the subject apparently began to smell of cadaverine. Most of these exceptional

cases involve individuals whose bodies produce the rare enzyme stincase and who also happen to be chemists. This raises the question whether the stincase caused these people to become chemists in the first place or whether their body chemistry was changed by prolonged exposure to their work environment. Research on this question is in progress.

PET Services will undoubtedly continue to grow rapidly by offering many new and imaginative services to the public. This is certainly one stock to watch! ◇

References (no kidding, these are for real!):

1. A. Claesson, R.M. Silverstein, "Chemical methodology in the study of mammalian communication," *Chem. Signals Verteb. (Proc.Symp.)* 1976 (Pub. 1977), 71.
2. J.N. Labows, Jr., "Human odors—what can they tell us?," *Perfum. Flavor* 1979, 4(4), 12.
3. B.R. Benjamin, "Animal odors and sexual behavior," *Indian Vet. Med. J.* 1981, 5(1), 1.
4. G.R. Huggins, G. Preti, "Vaginal odors and secretions," *Clin. Obstet. Gynecol.* 1981, 24(2), 355.
5. "Mammalian Seriochemistry: The Investigation of Chemical Signals Between Mammals," by Eric S. Albone, John Wiley & Sons, 1984; reviewed in *Chemical & Engineering News*, February 4, 1985.

Nucleus Sneakers Available

Dr. William E. Adams, Advertising Manager of the Nucleus, has discov-

ered that a whole line of Nucleus brand leather athletic shoes is available from Montgomery Ward. These are private label athletic shoes for both men and women which seem to be built for comfort and durability with "supple garment leather uppers, anti-pronation device for better heel support, rubber sole, terry lining, padded collar, and fully cushioned insole." Various styles are available, usually retailing for \$25 but recently on sale for \$18.95.

Show your support for the Nucleus by sporting new Nucleus brand sneakers to all Northeastern Section events! Members of the NESACS Board of Directors are especially requested to each acquire a pair of Nucleus brand sneakers before the next Board meeting so that a period of aerobics can be introduced at the beginning of the meeting. This new procedure should be beneficial to all Board members who may feel a little sluggish at the end of the afternoon and if anyone is left a little breathless that will be beneficial too because discussion will be restricted. Soon the Board will be slimmer and trimmer and ready to tackle the challenges of 1988 and beyond. ◇

Editor's Note: If you think this is a joke why don't you call the Montgomery Ward in Portsmouth, NH?



What is a Chemist Today?

New Directions in Chemistry for U.S. Economic Competitiveness

by Mary L. Good
1987 ACS President

(For presentation at the Southeastern Regional Meeting of the American Chemical Society in Orlando, Florida, on November 5, 1987)

I would like to discuss with you an issue that is currently sparking debate in the media, academia, the highest levels of government, and most vigorously, in industry—that of U.S. economic competitiveness. I'd like to talk specifically about the part that chemistry will play in improving our competitive position.

Our nation has entered a new era: a global economy is developing where every country must compete in global markets if it wishes to sustain internal growth and economic stability. The developing nations sell low-cost raw materials and commodity products based on the advantages of low labor costs and minimal government regulation. The developed, industrialized nations compete fiercely with one another for markets. And the newly industrializing nations of the Pacific Rim are fast becoming competitors of the industrialized countries. The issues of tariffs, trade restraints, reciprocal trade agreements, and protectionist legislation are debated daily in the world's capital cities.

The United States' most worrisome competitor is Japan. In fact, former National Security Agency Director Bobby Inman has said that the superpower confrontation he most fears during the remainder of this century is the economic struggle between the U.S. and Japan. Over the past twenty years, Japan has captured from the U.S. a spectacular market share in electronics, motor vehicles, and machine tools. Everyone is familiar with those stories. But what about the stories that are not so often told—those that involve Japan's gains in intellectual property? Of the top ten corporations receiving the largest numbers of U.S. patents in 1986,

four were Japanese, up from three only two years ago. Japanese companies also spend millions of dollars (as quietly as possible) to fund basic research and support Japanese researchers at some of our most prestigious universities.

Recent figures show that the U.S. trade balance in high technology has plunged right along with our trade balance in other manufactured products. In 1980, our high-tech industries produced a trade surplus of \$27 billion. That surplus had dwindled to \$3 billion by 1985. A deficit in high technology of \$2 billion has been projected for 1986. By January 1985, the U.S. became a debtor nation for the first time. By the end of that year, the U.S. had become the world's largest debtor nation—and Japan had become the world's largest creditor nation.

The U.S. trade balance reflects a long-term problem, that of declining productivity. A study done in 1984 by the Brookings Institution shows that the greatest single contributor to making productivity increases is technological innovation (44%). Innovations in technology historically have led to increases in productivity, exports and new jobs. The consensus has arisen among the industrialized nations that technology-based products and services are their best hope for remaining major players in world markets over the next few decades. In fact, Japan's stated national objectives for the 80's include dominance in such high-tech areas as advanced ceramics, polymers, and the commercialization of biotechnology.

The Role of Chemistry—Part of the Solution. It is clear that Japan is after our lead in high-technology. What, then, should we do? A special report in the *Wall Street Journal* of November 10, 1986, entitled "Frontiers of Science—Changing the Ways You'll Live and Work" spells out the prescription:

"Major advances in materials science, genetic engineering, catalytic science, communications, computers, and artificial intelligence are providing a foundation for changing the methods [people

will use] and even the kind of work people will do in twenty years. . . . Advanced materials, specialty polymers, [and] ceramics are the absolute core to advanced technologies of the future. . . . Genetic engineering promises faster plant development and even larger food surpluses. . . . Scientists are increasingly setting out to make new materials—and are succeeding in that task."

The challenge for individual chemists, and ACS too, is to recognize that chemistry, the molecular science, is at the heart of this new technology thrust. The chemical databases that chemists built up so carefully over the years are the foundation for the molecular design programs used so aggressively in the development of new drugs, high performance materials, specialty chemicals, and biotechnology products. The contribution to the gross national product of these chemically-derived products are the mainstay of one of the few areas where the U.S. still has a significant, positive balance of trade. The new directions in materials, biotechnology, specialty chemicals, and computer-assisted chemistry are especially exciting areas for research and development. They are essential for the continued vitality of American industry—and consequently, for American chemistry.

Let's look briefly at the status of the U.S. and Japanese positions with regard to these new directions in chemistry, and compare structuring of the two countries' industries, so crucial to the process of bringing the fruits of chemistry to market.

Comparison of U.S./Japanese Positions in Emerging Technologies—Industry. Japanese industry has many strengths that could give Japan an edge in its drive for technological leadership. Japanese industry is characterized by decentralization and high productivity. In the chemical industry, annual productivity is about \$500,000 per employee, compared with \$125,000 per employee in the U.S. chemical industry. Automation and robotics have been

enthusiastically adopted by broad segments of Japanese industry, reducing labor costs. In the U.S., industrial robots are used almost solely in the automotive and aerospace industries.

Japanese industry's decentralized structure allows vertical integration of a broad range of technologies. Japanese brewing companies, experienced in fermentation technology, are among those pioneering the development and commercialization of higher value-added products of biotechnology. Membership in a Japanese "family" of companies gives each affiliate timely access to R&D results, marketing services, and other expertise.

In the past five years, Japanese chemical companies (with some support from the government) have significantly increased their commitment to R&D, more than matching the 50% increase in R&D made by U.S. companies over the past ten years. Very little of the Japanese R&D budget goes for defense spending, in contrast to the U.S. where about 75% of all R&D funding now is defense-related.

In contrast, U.S. firms tend to have a centralized structure which means most business decisions are made far from the operating units. American companies also tend to rely on acquisitions rather than R&D for growth. However, reflected in recent high-technology acquisitions and labor force reductions, have been somewhat successful in increasing productivity. After a drop in R&D funding during the 1970's, U.S. corporations have invested increasing amounts of money in R&D, even during the recession of the early 1980's. In general, however, an emphasis on short-term profits limits those investments.

Japan has clearly stated its national program for the 1980's and has announced its intention to become a world leader in advanced materials (ceramics and polymers) and in the commercialization of biotechnology. The strategy: To build on the consensus already developed among government, industry, and the universities; commit resources to specific areas for ten years; invest in basic research with the object of building a strong fundamental research effort in advanced materials; and revamp the educational system to pro-

duce more innovative scientists.

Advanced Materials. Materials technology is one of the high-tech areas in which we dare not be left behind. Our clothing, our homes, and our cars will depend on new kinds of advanced materials. The question is, from whom shall we buy materials? Finished products? The countries or companies that have a competitive edge in the technologies emerging now will control the markets of the future. In case you are not impressed, Japan already surpasses the U.S. in the application of two important materials: titanium and carbon-reinforced plastics. This is ironic because these technologies were first developed by U.S. companies. Now, we buy the manufactured products from Japan.

In 1981, MITI (Japan's Ministry of International Trade and Industry) initiated the "Research and Development Project of Basic Technologies for Future Industries" to aggressively seek the lead in advanced materials. The project includes thirteen key programs: five in advanced polymers; one in ceramics; one in metal alloys; three in biotechnology; and three in new electronic devices. There is no U.S. equivalent.

Polymers. In the future, there will be scarcely a single item not composed of polymeric materials, at least in part. For the moment, the U.S. leads Japan in most areas of polymer research and development, but Japan is gaining fast. Japan is catching up because, for a long time, U.S. scientists considered polymers a mature field. The golden age of polymers, we thought, was in the 50's and 60's, when high performance materials and plastics were first developed. Now, we need new materials, and in the U.S., only the electronics industry has made a concerted effort to forge ahead in polymer research.

Meanwhile, Japan upgraded the polymer technology it licensed from the U.S. during the 50's and 60's and licensed the improved technology right back to the U.S. during the 70's. For example, UCC and Borg Warner, U.S. companies that pioneered the development of carbon fibers and ABS (acrylonitrile-butadiene-styrene), respectively, now appear to be dependent on Japan's Toray Industries for these products. In the early 80's, Japan

began to establish well-equipped polymer R&D centers and continues to borrow and upgrade new U.S. technology that we have not been able to commercialize.

MITI's R&D programs are geared to tailoring specific properties into polymers. The programs are:

- High-strength/high modulus
- Engineering resins and matrices for composites
- Membranes for gas and liquid separations
- Polymeric materials for electronics
- Biopolymers

Ceramics. Advanced ceramics will improve the materials of the future. These ceramics are not the kiln-fired clays that we are all familiar with, but are inorganic materials fired at even higher temperatures. The properties of these high performance materials depend on their composition and microstructure. They may be carbides, oxides, nitrides, metals, glasses and gemstones. They offer superior strength, corrosion resistance, wear resistance, even flexibility, qualities that will be crucial for the structural materials used in aerospace, construction industries and for most applications of high-temperature superconductors. (The ability to use superconducting materials, which are currently generating so much excitement, will depend on how well we can form ceramic materials into the appropriate shapes.) The U.S. position in advanced ceramics is enhanced by several long-range R&D programs funded by the government to the tune of \$50-70 million/year to develop an all-ceramic heat engine. The National Bureau of Standards also operates several research programs in advanced ceramics.

Since 1984, all sectors of the U.S. economy have demonstrated a commitment to research and development in ceramics. There is growing emphasis on cooperative R&D among industrial research companies. Universities and industry are pulling together to form research consortia. Government and industry have embarked on joint ventures. The engineering research centers initiated by the NSF at major universi-

ties are expected to facilitate rapid technology transfer between industry and academia. The formation of the U.S. Advanced Ceramics Association was a big step in recognizing a new discipline. In this country, the number of conferences, workshops, and technical papers devoted to advanced ceramics has skyrocketed since 1980.

In Japan, the government funds long-range R&D programs on high performance and functional ceramics which they call "fine ceramics." Japanese industry typically funds R&D for these materials up to several times the value of its government contracts. High-tech ceramics are popular with the Japanese public, too. Somehow, the Japanese people have gotten the message that these materials are vital for economic growth in the future. Perhaps this awareness stems from their traditional use of and interest in ceramic materials. A virtual "Ceramic Fever" has swept the country since 1982. As described in a report by the National Academy of Sciences, its symptoms include:

1982: More than 170 firms joined the Japan Fine Ceramics Association.

1983: The Fine Ceramics Fair at Nagoya attracted displays from 70 firms as well as 100,000 visitors.

1984: A book on high-technology ceramics sold more than 75,000 copies in its first three months.

1985: More than 2000 scientists and engineers worked in high-technology ceramics, and about 1000 research engineers worked in structural ceramics. Production of new ceramics is expected to grow by 550% between 1980 and 1990.

A comparison of annual R&D efforts in advanced ceramics reveals that, in those areas where data is available, Japan spends about the same amount as the U.S. for R&D in advanced ceramics for optical uses, and significantly more for the ceramic heat engine. Our best sources claim that Japan has a 10:1 lead in patents on advanced ceramics for electronic applications and a 20:1 lead in ceramics for structural applications.

Continued in next issue.

A Letter from the Chair

by Thomas R. Gilbert

In this issue of the "Nucleus" is a list of the standing and ad-hoc committees that are directly responsible for the variety of activities supported by the Northeastern Section. While membership in the named awards committees is by election, the majority of the committees function with volunteer members who give a few hours of their time a few times each year to keep a particular activity going.

Just about all aspects of our profession fall under the purview of one or more of the committees including such timely concerns as safety in the work place and fair employment (and dismissal) practices. Much of our activity is based on communication: monthly Sectional and topical group meetings that provide members and other professionals with stimulating and informative technical presentations; programs that bring chemistry to the attention of the public in general and particularly to young people who have yet to define their professional goals, and we provide recognition and reward to those researchers who have contributed greatly to our field and to junior investigators just setting out on careers in chemistry.

To maintain these and many other activities and to develop new ones requires the contributions of many. Won't you please consider joining us? Take a minute to go down the list of committees and pick out one whose function seems interesting to you. Make your selection known to our secretary (remember, it's a toll-free call in Massachusetts) and one of us will get back to you with more information.

Committees of the Northeastern Section, A.C.S. February, 1988

Constitutional Officers:

Chairman: Thomas R. Gilbert
Chairman-Elect: Michael Edward Strem
Immediate Past-Chairman: Lloyd D. Taylor

Secretary: David M. Howell
Treasurer: James U. Piper
Auditor: Arthur H. Reis, Jr.
Archivist: Esther Garber

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Budget Committee: James U. Piper
Constitution and By-Laws: Truman S. Light

Education Committee: Michael J. Hearn
College and University: Michael J. Hearn

High School: Wallace J. Gleekman
Gustavus J. Esselen Award Committee: Myron S. Simon

Hospitality Committee: Kate Steygal
Membership Committee: Ical Hartman

Board of Publications: Harry W. Orf
Editor, *Nucleus*: Adriene S. Dey
Medicinal Group: James Mangold
NERM Representative: Robert O'Malley

Nominating Committee: Lloyd D. Taylor
Norris Award Committee: Emily P. Dudek

Professional Relations Committee: Myron S. Simon
Program Committee: Michael Strem
Public Relations Committee: Michaeline Chen

Public Service Committee: Phyllis Brauner
Richards Medal Award Committee: Dietmar Seyferth

Safety Committee: James A. Kaufman
Speaker's Bureau: MaryAnn Solstad
Summerthing/Fallfest Committee: Janet S. Perkins

Board of Directors Meeting

Northeastern Section, ACS
January 7, 1988

The new Chair, Thomas Gilbert, opened the meeting at 5:20 p.m. by presenting a pin to Lloyd Taylor in commemoration of his service to us as Chairman during 1987.

Dr. Lloyd Taylor announced during the Annual Meeting that Bette Bridges had resigned as Chair of the High School Education Committee, and thus of the High School Examination Contest, the Chemistry Olympiad, and the Aula Laudis Committee.

Dr. Gilbert set forth his plan to help make the Board meetings go more smoothly. All committees who plan to present a report are asked to call Mrs. Karen Piper at the Section's 800 number to place that Committee's item on the Agenda. The Chairman also talked to the group about the necessity of bringing people with fresh ideas into the committees of the Northeastern Section.

James Piper presented the Treasurer's Report covering the month of December. It was then VOTED to accept this report.

Trustees: Phyllis Brauner is the new member of the Board of Trustees. Janet S. Perkins told the Board that the current net worth of the Section is \$880,000, as of Dec. 31, 1987.

Budget: A preliminary discussion of the 1988 Budget was started, based on the projections made by the outgoing Chairmen of the various committees. Next month, after adjustments, the official vote on the Budget will take place. There are two parts of the Budget: One part based on the regular income to the Section from Dues and from the National allotment; the other which is dependent on offset income from the Trustees, from contributions, etc. For example, the Treasurer, J. Piper, pointed out that income items 14 and 15 (contributions) were not guaranteed. The \$8500 for the publication of the Directory is to come from the Publications Trust Fund Income Account. Income for the NUCLEUS, as budgeted, must come from increased adver-

tising revenue. The Safety Committee was not funded up to its request at this time.

The new Chairman of the Board of Publications, H.W. Orf, announced that Catherine Costello of M.I.T. will be the new member of the Board of Publications. Arno Heyn has retired from this Board but not from his other activities on behalf of the Northeastern Section's Publications. There will be a Meeting of the Board of Publications around Jan. 12. Publication of the Directory is planned in 1988. Some of the costs of putting out a directory were discussed.

Gustavus J. Esselen Award Committee Chairman M. Simon announced that the committee was well on the way toward the selection of the 1988 recipient(s) of the Esselen Award.

Hospitality: Katie Stygall reported that the Committee was all prepared for the Jan. 21 meeting at BC.

Lloyd Taylor, Chair of the Nominating Committee, reported that the committee was having its meeting just following the Board meeting.

Norris Award: E.J. Billo announced that the new Chair of the committee is Emily Dudek.

Program: Dr. Michael Strem described the program for 1988. Jan. 21, Medicinal Chemistry at Boston College.

Feb. 11, Dr. Christine Oliver, Chemical Risks in the Laboratory
Mar. 10, Richards Medal Award, Walter Stockmayer of Dartmouth
Apr. 7, Esselen Award

May 12, Student Night Awards—Honor 50 Year Members
Oct., Professional Relations
Nov., Norris Award

Dec. 8, Medicinal Group, or we may have this in January again.

Public Relations: a new chair is needed.

The Public Service Committee Chairman, Phyllis Brauner, gave her report on the recently held Christmas lectures at the Museum of Science. The Holiday Lectures were oversubscribed.

B. Shkhashiri refused to accept the Honorarium that had been offered, but preferred the money to be used for the benefit of the teachers residing in the Northeastern Section. A committee will decide on the details. Dr. Brauner commented that Framingham State College had contributed \$2500 toward the expenses of Chemistry Day. Likewise, the Lowell Institute contributed toward the Symposium at the Museum of Science, and the Museum, itself, contributed materials and the room at the Museum of Science.

The Richards Committee has selected its awardee for the Richards Medal in 1988: Walter Stockmayer of Dartmouth.

Summary of status of Topical groups:
Analytical: new chair to be announced
Medicinal Chemistry: James Mangold
Retired Chemists: new chair to be announced
Meeting adjourned at 6:25 p.m.

Respectfully submitted,

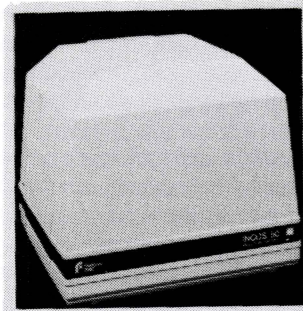
David M. Howell
Secretary

New NESACS Directory Planned

We are in the process of updating our records for an upcoming directory of the Northeastern Section. In the coming weeks you will be receiving a questionnaire which we wish you to complete. Please return the questionnaire promptly so that the directory will contain accurate information.

If you would like to help with this project or have suggestions for the contents of the directory please contact me by phone at (617) 890-3200 or write to me at Foster-Miller, Inc., 350 Second Avenue, Waltham, MA 02254. Thank you.

Mark A. Drury,
Circulation Manager and
Directory Editor



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Calendar

continued from page 16

Wednesday, April 27

Dr. David Chandler (University of California)
"Electrons in Liquids: Geometrical Perspectives"
Harvard University
Mallinckrodt Room MB-23 at 4:00 P.M.

Thursday, April 28

Professor W.P. Jencks (Brandeis)
Title to be announced
Boston College
Gasson Hall Room 305 at 4:00 P.M.

Notices for the NUCLEUS Calendar should be sent to:
Marilyn J. Schneider
Department of Chemistry
Wellesley College
Wellesley, MA 02181
Phone: 235-0320, ext 3031
(Note: Material should be sent so that it arrives before the first of the month prior to the month for which the event is scheduled.)

Murphy's Law

Continued from page 7.

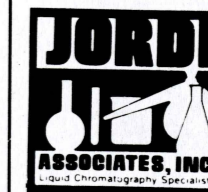
its side, *CHEMunications* is a LETTER; standing up it is a FLAT). This error caused the mailing to fail a preliminary audit, and triggered an exhaustive in-depth audit (literally piece-by-piece). For reasons too arcane to explain here, this latter audit uncovered enough "errors" to warrant impoundment, and the Authors' Night came and went before the mail could be re-tagged and re-bagged to USPS standards. And you thought that the slogan "Mail early for Christmas" was only for Christmas cards! ♦

Editor's Note: It was most amusing to read this article which appeared in the Nov./Dec. 1983 issue of CHEMunications, the last of 32 issues under the editorship of Bob Nash. While the exact circumstances described here have not yet happened to the Nucleus, we have certainly had our share of totally unforeseen and unpreventable screw-ups during the past nine years. Like the time the bindery decided to staple together three copies all in one bunch—needless to say there were not enough copies for the mailing! The mathematical formula for the probability of timely publication of an issue is most instructive for would-be editors.

The Nucleus is looking for a new Advertising Manager. Any interested member of the section please call the administrative office at 800-872-2054.

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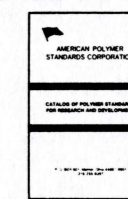


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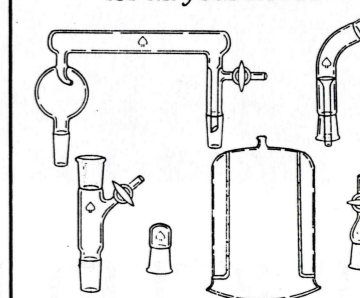
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Southeastern Massachusetts University –
(617) 999-8246/8232
Boston College – (617) 552-3605
Harvard University (Chemistry) –
(617) 495-4070

Monday, April 4

Professor Frank Solomon (MIT)
“Functional Domain and Evolution
of Tubulin Proteins”
Boston University
Science Center Room 107 at 4:00 P.M.

Tuesday, April 5

Dr. Dan Raleigh (MIT)
“Multiple Pulse and Two-Dimensional
NMR in Rotating Solids”
Massachusetts Institute of Technology
Room 4-370 at 4:00 P.M.

Dr. Margaret A. Wechter (Naval
Research Laboratory/SMU)
Title to be announced
Southeastern Massachusetts University
Science & Engineering Building Room
305 at 11:00 A.M.

Wednesday, April 6

Dr. Michael Grunze (University
of Maine)
“Chemical Characteristics of
Polymer/Metal Surfaces”
Harvard University
Mallinckrodt Room MB-23 at 4:00 P.M.

Thursday, April 7

Professor Warren Giering (Boston
University)
“Redox Promoted Alkyl to Acyl
Migratory Insertion Reactions”
Boston College
Gasson Hall Room 305 at 4:00 P.M.

Dr. Edwin Vedejs (University of
Wisconsin)
“Local Conformer Control in Organic
Synthesis”
Massachusetts Institute of Technology
Room 4-270 at 4:00 P.M.

Monday, April 11

Professor Thomas Brill (University
of Delaware)
“Simultaneous Thermal Profiling. Rapid
Scan FT-IR Studies of Fast Thermal
Decomposition Processes”
Brandeis University
Gerstenzang 122 at 4:00 P.M.

Professor Raymond Funk (Pennsylvania
State University)
“On the Way to Periplanone-A . . .”
Boston University
Science Center Room 107 at 4:00 P.M.

SYMPOSIUM: College Science
Teaching

Dr. David N. Harpp (McGill
University)
“Classroom Demonstrations in Science
Teaching”

Dr. Leonard W. Fine (Columbia
University)
“The Role of History in Teaching
Chemistry”

Worcester Polytechnic Institute
Location to be announced

Tuesday, April 12

Professor Dan Kivelson (U. of
California, Los Angeles)
“From the Continuum Towards the
Molecular: Translational, Rotational
and Reactive Motions in Liquids and
Glasses”
Massachusetts Institute of Technology
Room 4-370 at 4:00 P.M.

Wednesday, April 13

Dr. Gene Mazenko (University of
Chicago)
“Growth of Order in Quenched Systems”
Harvard University
Mallinckrodt Room MB-23 at 4:00 P.M.

Thursday, April 14

Professor Gerrald J. Diebold (Brown
University)
Title to be announced
Boston College
Gasson Hall Room 305 at 4:00 P.M.

Monday, April 18

Professor Weston Borden (University
of Washington)
“Unnatural Product Chemistry –
Synthesis and Study of Some
Pyramidalized Alkenes”
Harvard University
Mallinckrodt Room MB-23 at 4:15 P.M.

Wednesday, April 20

Dr. Gerald T. Babcock (Michigan State)
“Kinetics and Spectroscopy of Tyrosyl
Radicals in Photosynthetic Oxygen
Evolution”
Harvard University
Mallinckrodt Room MB-23 at 4:00 P.M.

Thursday, April 21

Professor Sylvia Ceyer (MIT)
Title to be announced
Boston College
Gasson Hall Room 305 at 4:00 P.M.

Monday, April 25

Professor Barry Carpenter (Cornell
University)
Title to be announced
Brandeis University
Gerstenzang 122 at 4:00 P.M.

continued on page 15

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