

THE NUCLEUS

October 1990

Of the Northeastern Section of the American Chemical Society

Vol. LXIX, No. 1

October 11 Meeting

*Jarvis L. Moyers speaks on
Atmospheric Chemistry*

October 18 Meeting

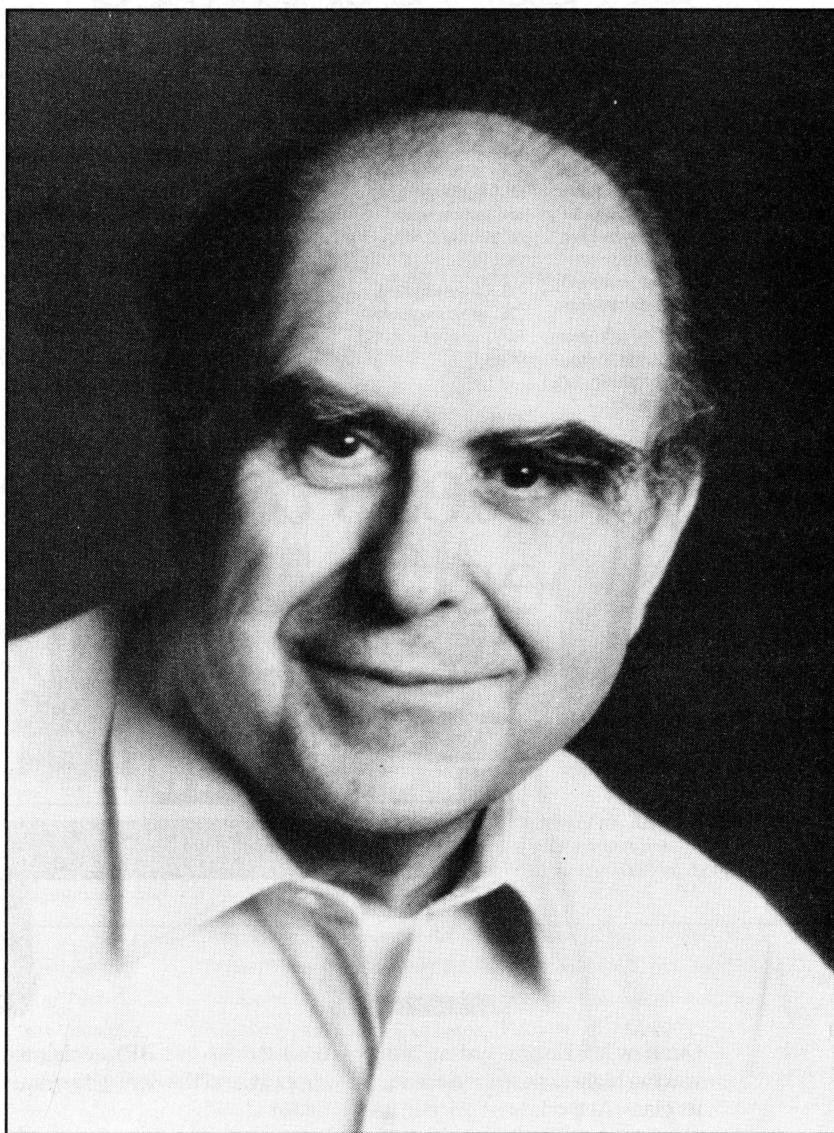
*Henry A. Hill Award to
James U. Piper;
Alfred Bader speaks on
Challenges at Sigma-Aldrich*

Historical Notes

Obituaries

Information Services

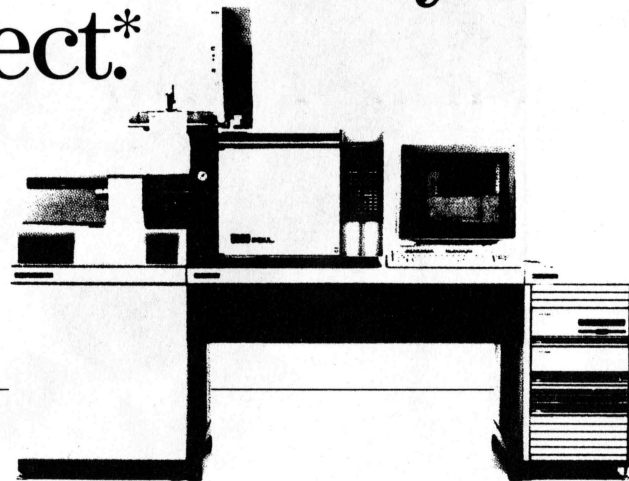
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Cover: Alfred R. Bader, Sigma-Aldrich

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THE NUCLEUS



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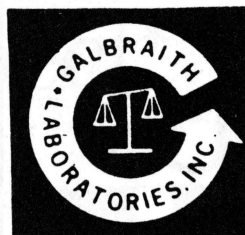


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Corporate Affiliates Program

Our Section has begun a Corporate Affiliates program in order to enhance our activities in two important areas affecting the well-being of the chemical profession.

- To motivate more students to choose chemistry, thereby helping to alleviate the predicted shortfall of chemists
- To improve the image of chemists and their work among the public and among public officials.

The program is being spearheaded by Past-President Mike Strem who plans to contact all companies with ACS members in the Northeastern Section.

There are two categories of Corporate Affiliates, depending on the amount contributed:

\$ 250 - 999: Corporate Sponsor
\$1,000 - 5,000: Corporate Patron

As of August 20 the following companies have participated:

Corporate Patron:

E.I. DuPont Medical Products
Corporate Sponsor: Aerodyne, Inc.,
Cambridge Isotope Laboratories,
Duracell, Inc., Morton International,
Orion Research Laboratories, Physi-
cal Sciences, Inc., Research Bioche-
micals, Inc., Strem Chemicals, Inc.

In addition to being recognized in the *NUCLEUS*, Corporate Affiliates will also be recognized in literature promoting public events funded in whole or in part by funds contributed by Corporate Affiliates. A designated person of each Corporate Affiliate will be invited to attend our annual Esselen Award presentation and dinner. More programs are evolving and will be announced later.

We hope that the recent recognition of the Northeastern Section for the excellence of its programs in 1989 will persuade additional companies to join our Corporate Affiliates program to help build on our past successes. ◇

October 11 Meeting

*The 726th Meeting of the
Northeastern Section of the
American Chemical Society*

Thursday, October 11, 1990

Simmons College, 300 The Fenway, Boston, MA
All activities will take place in the Main College Building

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

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

7:30 p.m. Lecture: *The Role of Atmospheric Chemistry in Global Change*
Jarvis L. Moyers, National Science Foundation

Refreshments will be served after the program.

Dinner reservations must be made no later than October 5, 1990. Please call Mrs. Piper at (800) 872-2054 or (508) 456-8227. Reservations not cancelled at least 24 hours in advance must be paid. New Members and 50 Year Members: no charge; Members, \$21; Non-members, \$23; Students and Retired Chemists, \$8. THE PUBLIC IS INVITED.

The meeting on November 8, 1990 will be the James Flack Norris Award in the Teaching of Chemistry Meeting to be held at Simmons College. The awardee is Prof. Joe Schwarcz of Vanier College on "Interactive 'Radio-Chemistry'".

Abstract

Our Changing Environment: The Scientific Challenge for the 1990's

The Earth's environment is a dynamic system that changes on all time and space scales. These changes are caused by both natural phenomena and human activities. It is vital that a scientific understanding of the Earth system be obtained on a global scale by describing how the environment's component parts and their interactions have evolved, and how they may be expected to evolve in the future. Specifically, the immediate challenge is to develop the capability to predict the environmental changes that will occur in the next decade to century, by both natural and human influenced processes.

In recognition of the complexities associated with developing a national

global environmental research effort the Office of Science and Technology Policy established an interagency working group to examine some of the key issues and questions associated with Global Change. For the past two years this working group has been developing a National Global Change Research Program designed to allow meaningful assessments of future changes in the global environment and their expected impacts. This presentation will describe this interdisciplinary research program and the roles various Federal agencies are expected to play. Particular emphasis will be given to the chemistry issues and opportunities that are included in this US Global Change Research Program. ◇

Biography

Jarvis L. Moyers

Jarvis Moyers has been the Program Director of the National Science Foundation's Atmospheric Chemistry Program since 1983. From 1971 to 1983 he was a faculty member in the University of Arizona's Department of Chemistry. Moyers received a B.S. in chemistry from Marshall University in 1965 and a Ph.D. in Analytical Chemistry from the University of Hawaii in 1970. He was active in Atmospheric Chemistry research since graduate school. ◇

Polymer Technology Conference

June 3-5, 1991, Philadelphia, PA
Call for Papers and Posters

The Polymer Division of the American Chemical Society will celebrate its 40th birthday in 1991 by hosting a major technological meeting in several areas of industrial interest. Contributions of papers or posters are invited. For obtaining a list of sessions and session chairmen or registration information, contact the general chairman, J.C. Salamone, Rochal Industries, 499 E. Palmetto Park Rd., Boca Raton, FL 33432.

Topics will include:
Barrier Polymers and Constructions
Enhancement of Polymer Properties through Mechanical and Chemical Means.
High Performance Materials
Applications of Polymers for Biological Systems.
Polymers for Designed Applications
Polymers for Hostile Environments
Recyclable Polymers
Solvent Free Chemistry and Technology



Biography

Bertha K. Madras

Dr. Madras, who is based at the New England Regional Primate Research Center, is an Associate Professor of Psychobiology in the Department of Psychiatry at the Harvard Medical School. Her research interests include various aspects of neuropharmacology, neurochemistry, and biological psychiatry. Dr. Madras was born in Montreal, Canada and received her B.Sc. and Ph.D. (in biochemistry) from McGill University. She has held postdoctoral positions at Tufts University, Cornell University Medical School, and the Massachusetts Institute of Technology. Prior to her present position, Dr. Madras held various faculty positions at the University of Montreal. ◇

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MCG Meeting

Medicinal Chemistry Group Meeting

Tuesday, October 9, 1990

Boston College
Room 307, Higgins Hall
Chestnut Hill, MA

4:00 p.m. Coffee
4:30 p.m. Lecture

Bertha K. Madras

New England Regional Primate Center, Harvard Medical School
will speak on

High Affinity Probes for Cocaine Receptors

6:00 p.m. Dinner
Ming Garden Restaurant
Chestnut Hill

For dinner reservations please call NESACS office, Mrs. Piper, by October 8, 1990, in (617) area: (800)872-2054; all other areas: (508)456-8227.

Members: \$10.00 Students: \$3.00

Next meeting: Nov. 13, 1990

Minisymposium on Conformationally Restricted Opioid Peptides. Speaker: Henry Mosberg, Univ. of Michigan; Peter Schiller, Clinical Research Institute of Montreal.

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Abstract

High Affinity Probes for Cocaine Receptors

The growing illicit use of cocaine has intensified efforts to identify the molecular targets mediating the stimulant effects and abuse liability of cocaine. These efforts have been facilitated by the use of [³H] cocaine to label specific recognition sites in brain tissues of non-human primates. The sites bind [³H] cocaine in a saturable and stereoselective manner, properties characteristic of receptors. Most importantly, the affinities of cocaine and related drugs at [³H] cocaine binding sites in striatal tissue parallel their potencies for inhibiting dopamine uptake and for producing cocaine-like behavioral effects including behavioral stimulation and self-administration. Together these findings strongly suggest that specific cocaine binding sites associated with dopamine transport play a fundamental role in mediating the behavioral effects of cocaine. However [³H] cocaine binds with relatively low affinity and dissociates rapidly, properties which limit its suitability for mapping the receptors in low density brain regions and for use in purification procedures. Further clarification of the mechanism of action of cocaine requires the development of probes which label the same pharmacologically relevant sites as cocaine, but with increased affinity and slower dissociation times. CFT (2β-carbomethoxy-3β-(4-fluorophenyl) tropane or WIN 35,428), a cocaine congener with 3 - 10 times the potency of cocaine in behavioral studies, has proven to be a valuable substitute for cocaine. It is appropriate for determining the number and properties of cocaine binding components, for mapping cocaine receptors in non-human primate brain and for monitoring the dopamine transporter in human control and diseased post-mortem tissue. Examples of the clear superiority of CFT to cocaine as a probe, as well as its limitations, will be given. ◇

October 18 Meeting

The 727th Meeting of the
Northeastern Section of the
American Chemical Society

Thursday, October 18, 1990

Henderson House, Weston, MA

(See directions on page 15; Notify Mrs. Piper if you need transportation.)

5:30 Social Hour

6:30 Dinner

7:30 Presentation of the Henry A. Hill Award to James U. Piper
The Henry A. Hill Awards – William O. Foye
Henry A. Hill Reminiscences – Janet Perkins
Introduction of the Award Recipient – Arno H.A. Heyn
Presentation of the Award – E. Joseph Billo

8:00 Lecture: *Challenges at Sigma-Aldrich* – Alfred Bader, Chairman, Sigma-Aldrich

Refreshments will be served after the program.

Dinner reservations must be made no later than October 12. Please call Mrs. Karen Piper at (508) 456-8227 or (800) 872-2054. Reservations not cancelled at least 24 hours in advance must be paid. Members, \$21.00; Non-members, \$23.00; Students and Retirees, \$8.00. THE PUBLIC IS INVITED.

Biography

Alfred Bader

Alfred Bader was born in Vienna in 1924 and left his homeland as a refugee student in 1938. He first went to England where he started his studies at Brighton Technical College, but in 1940 he was interned as a German and sent to Canada. After being paroled from the internment camp in November, 1941, he continued studies at Queen's University in Kingston, Ontario. He received the Ph.D. degree at Harvard under the direction of Professor Louis Fieser.

His working career started at Murphy Paint Company in Montreal and, when Pittsburgh Plate Glass bought Murphy, Dr. Bader was assigned to the paints division in Milwaukee, first as a Research Chemist and later as an Organic Group Leader. When PPG moved its research facilities, he decided to stay in Milwaukee

and gamble on the production of specialty chemicals, he had begun in a garage a few years earlier. His first product was 1-methyl-3-nitro-1-nitrosoguanidine, useful for preparing diazomethane.

Prior to the birth of Aldrich Chemical Company the American research chemist had only the Eastman Chemical catalogue as a source for organic intermediates. Bader started making and offering chemicals that Eastman did not list, but he quickly built up other sources for chemicals that he could list and sell. The expansion into new products and new areas to support the research chemist, led inevitably to making the Aldrich catalog the obvious first place to look for needed intermediates. The rest, as they say, is history.

Abstract

The How-to-do-it of Entrepreneurship

There aren't many success stories in the modern history of chemical entrepreneurs that rival the story of Alfred Bader and his Aldrich Chemical Company. From the traditional beginnings in a garage to the worldwide assembly of companies that the Sigma-Aldrich Corporation now embodies, the story is one of making the right decisions at the right time, pursuing the dream to the reality, understanding how to combine the talents and training of a research chemist with the hard-headed world of business. Dr. Bader will use the history of Aldrich and the way his company works to teach us what it takes to succeed as an entrepreneur in the chemical world. But beware, you may find yourself looking at a 17th century alchemist trying other methods for generating gold in the course of the talk. Bader has a well-deserved reputation for being entertaining as well as informative. ◇

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Preparing for the Job Search;

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If there is sufficient interest the Committee on Professional Relations will sponsor a work session on job hunting. The session would consist of talks by personnel directors of local companies, advice on resumé preparation and interview techniques, and a discussion of what being a professional in chemistry entails. If you are interested in such a session please write or call Mrs. Piper (800-872-2054 or 508-456-8227). To help us plan, please let Mrs. Piper know whether you would prefer a week-end day or weekday evenings.

The Professional Relations Column

M.S. Simon, Chairman, Professional Relations Committee

This juxtaposition of the Hill Award with Professional Relations at the October 18 meeting may need some explanation.

Dr. Henry A. Hill (1915-1979) came to Massachusetts to attend graduate school at M.I.T., receiving the Ph.D. degree in 1942. He stayed on to work as an industrial chemist, founding National Polychemicals and, later, Riverside Research Laboratory. He served this Section in a number of positions including chairman in 1963, and was an important contributor to the work of the national Society, serving as president in 1977. His interest in and work for the well-being of chemists, their rights and duties, came to fruition when the Society formal-

ized the relationship between employer and chemist in the PEG, "Professional Employment Guidelines". This was Hill's work and it established more clearly than ever before the professional nature of the chemist's work, responsibilities and rights, and defined proper and desirable behavior for the employer of chemists.

Finding the opportunity and building a successful company based on chemistry is the dream of many a chemist. Dr. Alfred Bader had this dream forty years ago, and his success has become a legend in chemical circles. Dr. Bader will try to provide an understanding of what is required for success as an entrepreneur. ◇



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The Northeastern Section's Committee on Continuing Education Presents:

Symposium on Microscale Techniques in Chemical Research

at Northeastern University, 360 Huntington Ave., Boston, MA
Room 129 Hurtig Hall

on Saturday, November 17, 1990

Schedule:

- 8:00 - 8:30 a.m. Registration and Coffee
8:30 Opening Remarks – E. I. Becker, NESACS, Continuing Education Committee
8:35 Historical Development of Microscale Laboratory Experiments – Prof. Ronald M. Pike, Merrimac College
The historical development of microscale laboratory experiments will be discussed with emphasis on their inherent advantages.
9:30 Synthesis of Leucotrienes – Dr. Weigo Su, Central Research Laboratories, Pfizer, Inc.
The synthesis of leucotrienes will be discussed with emphasis on the application of sub-microscale laboratory techniques.
10:25 Coffee Break
10:40 Characterization of Polymer Colloids – Prof. Robert E. Rowell, University of Massachusetts at Amherst
The determination of the important properties of particle size distribution and surface chemistry of colloidal particles will be presented.
11:35 Microscale Experimentation in Inorganic Chemistry – Dr. Zvi Szafran, Merrimac College
Microscale laboratory techniques permit a larger variety of experiments with simultaneous reduction of cost and virtual elimination of waste.
12:30 Closing Remarks – Dr. Ernest I. Becker
12:35 Exhibits and discussion of microscale equipment.

Registration Fees: General admission..... \$40.00
Retirees, Students, High School Teachers..... \$10.00
High School students accompanied by their teacher... free

For further information contact: Prof. Alfred Viola - (617) 437 2809

Advanced Registration Required by Nov. 9, 1990 - use form below:

Registration form for Symposium on Microscale Techniques in Chemical Research

Name: _____

Address: _____

Telephone: _____

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

Call For Nominations

Gustavus John Esselen
Award for Chemistry in the
Public Interest

The Award was established by the Northeastern Section in 1985. The award annually recognizes a chemist whose scientific and technical work has contributed to the public well-being, and has thereby communicated positive values of the chemical profession. The significance of this work shall have become apparent to the public within the five years preceding nomination, and the Awardee shall be a living resident of the United States or Canada at the time of nomination. Awardees have generally been individuals who deserve greater public recognition for their accomplishments.

The prize will be a bronze medal and a check for \$5,000. Travel expenses will be reimbursed. At the award ceremony in April 1991 the Awardee will deliver an address on the subject of the work for which the honor is being conferred, or for work in progress which is also directed to chemistry in the public interest.

Nominating Procedure

It is requested to provide seven copies of 1) a biography of the candidate, 2) a description of their public contribution and its importance, 3) copies of pertinent news articles and technical papers, and 4) the names of three co-sponsors. Please send nominations and inquiries for further information to: Chair, Esselen Award Committee, c/o Northeastern Section, American Chemical Society, 19 Mill Road, Harvard, MA 01451, Telephone (508) 456-8227, 1-(800)-872-2054 (MA only), post-marked no later than December 1. Joint nominations are acceptable. The Committee reserves the right to declare that no candidate meets its standards, and that no award will be given. ◇

Northeastern Section Recognized

Award for Outstanding Performance in 1989

At the Washington National ACS Meeting, on August 28, the Northeastern Section was recognized for Outstanding Performance of a Large Section.

Each year the ACS Committee on Local Section Activities recognizes a Local Section in each of the five size categories based on the program of the Section activities as described in the Annual Report of the Section. The notification letter states:

"This award nomination recognizes the hard work of many officers and the support and enthusiasm of the section membership; together you have carried out an exemplary program of service to your communities.

The image of chemistry and of chemists is built upon and sustained by the personal activities of ACS members at the local level. Your dedication to the goals of the Society and willingness to provide service beyond that which is expected are recognized and set as an example for others to follow."

The officers, Board of Trustees, the Board of Directors and members of the several committees can take pride in this award. Last, but not least, Michael E. Strem, the 1989 Chairman, and Karen Piper who were responsible for compiling the Annual Report should be happy to see their hard work rewarded. ◇

Nominated for Phoenix Award for outstanding work for National Chemistry Week

Our local section was one of seven finalists for the Phoenix Award for outstanding work for National Chemistry Week in the category of Best Program for Chemical Demonstrations.

The awards were presented at the ACS national meeting in Washington, D.C. on Tuesday night, August 28, 1990. Valerie Wilcox, National Chemistry Week coordinator for the Section, was present at the awards ceremony.

In addition, the Northeastern Section was represented with a poster display of our NCW events in the registration area of the Washington Convention Center at the national meeting. ◇

N.E. Section Student Brings Home the Gold

Whitney places 6th in International Chemistry Olympiad

The U.S. Chemistry Olympiad Team of four high school students came in 4th in the international competition in Paris, France in July.

Wayne Whitney, a June graduate of Medfield High School, won a gold medal with a 6th place finish out of 111 students from 28 nations. Wayne was the 1989 winner of the first prize – The Simmons College Prize – in the annual Avery A. Ashdown High School Exam Contest.

The four students from the U.S. team were among 22 finalists who participated in a two-week-long chemistry training camp at the U.S. Air Force Academy in Colorado Springs. The finalists in turn were chosen from more than 750 outstanding high school students picked from an original group of some 10,000 contenders nationwide. All were recommended by their teachers to ACS Local Sections, which administered the exams.

Wayne was a 1989 finalist in the U.S. Chemistry Olympiad and attended the training camp but was not selected for the U.S. team for last year's world competition in Halle, East Germany.

The other three members of the 1990 team, Marc Dionne of LaJolla, CA, Roger Moore of Loveland, CO, and Steve Gubser of Englewood, CO, each won silver medals in the competition. Moore was on last year's team and Gubser was on the 1989 U.S. Physics Olympiad team, winning a gold medal and first place in Warsaw, Poland.

The U.S. first entered a team in the International Chemistry Olympiad in 1984 and ranked 8th of the 20 countries participating that year, with one silver and two bronze medals. In 1985, the team brought home two silvers and two bronzes. Wayne's older brother, Glen, was a member of the 1985 team and won a bronze medal in Bratislava, Czechoslovakia. The only other gold medal won by a U.S. team member was in 1986 by Keith Rickert in Leiden, the

Netherlands, at his third appearance in the Olympiad.

This year's 4th place finish is the best for a U.S. team in the seven years of competing internationally. China placed first with four gold medals, Poland was second and West Germany third. The Soviet Union, which often has a strong team, did not compete this year.

Wayne and Glen are sons of Dr. Thomas A. Whitney, ACS member and Principal Scientist at Duracell Worldwide Technology Center in Needham, MA, and Patricia J. Whitney. Wayne entered Harvard at 16 with sophomore standing in September majoring in mathematics. Glen graduated from Harvard last January at 20 with two B.S.'s and a M.S. and is presently pursuing a Ph.D. in mathematics at UCLA. ◇



Judith Noble of Medfield High School, Whitney's teacher, with Wayne Whitney.

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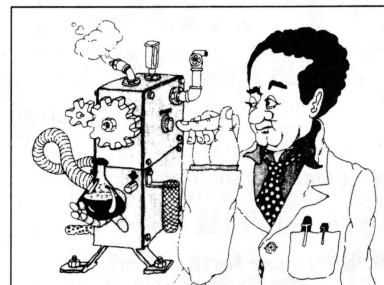
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Board of Directors

Condensed Minutes, Meeting of May 10, 1990

Michael J. Hearn, Secretary

Treasurer's Report: J. Piper reported on the status of the funds as of the end of April.

Awards Committee: W. Foye reported that the Levins Award is to be presented at the evening meeting to James Hill.

Board of Publications: C. Costello MOVED to approve the contracts for the Editor, A. Heyn and the Business Manager, R. McCann. The motion was seconded and PASSED. C. Costello informed the directors that the Board is planning to reappoint V. Gale as Advertising Manager and M. Simon as Associate Editor. Thanks were extended to A. Dey, M. Druy, C. McGowan, M. Solstad and W. Adams for their contribution to the NUCLEUS.

Constitution and Bylaws: A. Heyn indicated that approval of the Section bylaw amendments is expected soon by the national C&B Committee.

Professional Relations: M. Simon proposed a meeting for students in late October or early November devoted to employment preparation, such as preparation of resumes and techniques at interviews. Drs. Kolb and Light supported this suggestion.

Program Committee: C. Kolb recommended that write-ups of talks at section meetings be submitted for corrections to the speaker before publication.

Public Relations: P. Brauner reported for the committee that the subject of "Photodynamic Therapy", as presented as this year's Esselen Award Address by Dr. Thomas Dougherty was covered on TV Channel 56, also in *C&E News* and in *Chemecology*. The committee, with the help of Karen Piper, generated a mailing list of 2000 names for use by the national ACS Public Relations office for publicizing the Forum "The Science behind the Issues" and to locate two Spanish-speaking chemists for interviews at a Spanish language TV station. Also, arrangements were made for an interview of Bassam Shakhshiri by Channel 2 TV with a film sequence from his 1989 Holiday Lecture at the Boston Museum of Science. The committee, with the valuable help of K. Piper, arranged for photographs at Education Night by photographer A. Fingland who was also thanked for providing photos expeditiously.

Continuing Education: C. Kolb suggested a program on database searching and a general introduction to information science for a fall session.

Long Range Planning: A. Dey requested that the committee report be available to board members prior to the June Directors' meeting.

State House Chemistry Day: P. Brauner and P. Samuel reported on the successful exhibits and demonstrations. The fourth grade class which attended was enthusiastic and the event is worth trying again, perhaps with even more demonstrations.

Summerthing: Two panel discussions will be held: "Educating Chemical

Educators for the Twenty-First Century", sponsored by the ACS sections, and "Chemists and Environmental Issues" sponsored by the AIC.

NERM 23: T. Gilbert thanked the volunteers for the NERM 23 committees.

1990 Boston National Meeting: E. Billo expressed his satisfaction with the great success of the meeting operation and thanked all those who helped.

Council Meeting: T. Light reported that the three petitions which had been discussed previously on restructuring ACS dues were referred to committees and will probably be withdrawn because of lack of support. 1991 dues were set at \$ 86, an increase of \$4 as a result of increases in the cost of services index. At the Employment Clearing House 970 candidates were registered, also 202 employers which listed 416 positions. Over 4,000 interviews took place. NESACS was able to save the Clearing House operation thousands of dollars by providing volunteers to process applicants and employers. 6,000 copies of the NUCLEUS had been provided for distribution to registrants. C. Spodick communicated thanks to all student volunteers. E. Billo indicated that the section will probably be credited for five exposition booths. All Red Sox game tickets were sold. About 150 members attended the section reception, well above the estimate.

New Business: Graduate students from Boston College will be appointed as tellers for the NESACS election. D. Saez MOVED the formation of a professional consulting chemists group for the purpose for providing information for members, but not to provide marketing of services. Seed money of \$500 is to be provided by the Section. The motion was SECONDED and PASSED. E. Hopkins agreed to bring information and a formal proposal to the Board in October for establishing a fund to enable a disabled chemist to present a paper or otherwise participate in a National Meeting. It was MOVED, subject to approval by D. Bagley, to help provide requested funds for a Section high school teacher to attend an upcoming workshop. The motion was SECONDED and PASSED. ◇

Historical Notes (Part I)

by Edward R. Atkinson, Amherst, MA

As has been our custom these past years we devote the October issue of the Notes to short biographies of chemists and chemical engineers whose deaths have not been recorded previously here. We thank members of the Northeastern Section and the families of the deceased for their help in assembling the data needed.

A. Byron Adams, 74, died on April 3, 1990. He was a native of Boston who received his undergraduate degree from Mt. Allison University, Sackville, New Brunswick, and then the Ph.D. from McGill University in 1939. He became a research chemist with the Dewey & Almy Chemical Co. in Cambridge (now a division of W.R. Grace & Co.) and remained with the firm for 37 years, retiring in 1977. In his early years at D & A he was involved in the U.S. government synthetic rubber program. In later years he developed applications of polymers in the construction industry. Adams was a Fellow of the American Institute of Chemists and a vice-chairman of ASTM.

Elliott Torrey Adams, 89, died on January 3, 1989. Born in Boston, he served in the armed forces during World War I, then obtained the S.B. in chemistry at M.I.T. (1921) and the Ph.D. in biochemistry at Harvard (1926). He taught chemistry as an Austin Teaching Fellow at the Harvard Medical School. From 1926-1932 he taught biochemistry at the University of Georgia Medical School, then was employed by his father as a financial advisor until 1935 when he resumed his academic life at Tufts University. In 1955 he once again resumed care of the father's affairs and devoted the balance of his life to educational philanthropy. Established by him were the Herbert W. Adams Professorship of Medicine at N.Y.U. and the Elliott and Orié Adams Professorship of Biochemistry at the Harvard Medical School, the latter honoring his wife, the bioscientist Orié Hixon Powers, whom he married in 1963. Adams was

a 50-year member of ACS and a member of many other professional societies here and abroad.

Marion Delight Alcott, 93, died on June 15, 1990. Her early education was in the public schools of Chelsea and Everett. She received the B.S. in chemistry from Simmons College in 1919. During her college years she was a summer employee of the Merrimac Chemical Co. in Everett (now Montanto) where she was the first woman laboratory worker to be employed by the company. She was employed by the Massachusetts Food and Drug Administration. After one year she became a research assistant to Dr. Allan Winter Rowe at the Boston University Medical School. In 1926 she moved to the Lynn Hospital as a medical technician. From 1937 to 1976 she was a member of Dr. Lyman H. Hoyt's group at the Deaconess Hospital. During her professional career she was an officer of the Massachusetts Association of Medical Technologists. As a resident of Watertown she was active in church and community affairs.

Theodore Oscar Bogosian, 73, died on June 8, 1990. He was a native Bostonian who received the B.S. in chemical engineering from Tufts College in 1932. His early employment was at U.S. Rubber Co. and the Green Rubber Co. in Cambridge and at the American Esna Co. in New Jersey. During World War II he was employed by the U.S. Defense Department developing liners for submarines in Groton, Conn. Prior to retirement in 1974 he worked for 17 years at Johns Mansville Co. in New Jersey. After retiring to Watertown he engaged in consulting work and, as a member of the Executive Service Corps, advised Columbia on matters of his expertise. His many patents included one for an oil absorbent material used in oil spill containment booms. Bogosian was an emeritus member of the ACS and active in the Rubber Division.

Hemalata M. (Berde) Dali, 45, professor of organic chemistry at the

University of Massachusetts-Boston, died on May 6, 1990. She received the Ph.D. from the National Chemical Institute of India and came to the U.S. in 1973. After teaching appointments at Ohio State University and Boston College she joined the faculty at Northeastern University in 1978 and conducted research on cancer and Alzheimer's disease until joining the U-Mass faculty in 1986.

John L. Engelke, 50, chairman of the chemistry and physics department at Salem State College, died on August 16, 1989. He was a native of Panama who received the B.S. (1952) and M.S. (1953) at Michigan Technological University then went on to receive the Ph.D. in physical chemistry at Berkeley in 1959. After two years in the U.S. Army and employment at the Stanford Research Institute and Arthur D. Little, Inc., he took the chairman's position at Salem in 1969. His teaching areas included physical chemistry and astronomy.

to be continued

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Long Range Planning Committee

Interim Report of the 1990 Committee

Members; Adrienne Day, Chair; Joe Billo, Phyllis Brauner, Tom Gilbert, Charles Kolb, Peter Meltzer, Arthur Obermayer.

Education

Elementary education: A major new program to send speakers into all Section elementary schools to present materials developed for this purpose is proposed (C. Kolb). The committee recommends that the chairman of the Section immediately appoint a task force to study this proposal and to develop a pilot program. Funding may be available through NSF. Adequate staff support will have to be considered.

Continuing education: The Section needs to do more in this area to better serve its members. Modern synthetic methods, materials science and starting one's own business or consulting practice were among the topics suggested for short courses. A video tape library should also be developed, to include tapes of our meetings and of ACS short courses.

Career education: The annual career days for high school and college students should be revived to point out the many exciting opportunities in chemistry in the 1990s.

Community education: An expansion of the Speakers' Bureau is urged. Speakers should be sent to community groups both to increase the public's scientific literacy and to improve the image of chemistry. Retired chemists

may wish to be involved here, as well as in the elementary school program.

Services for our Members

Monthly programs: Monthly meetings patterned after the successful annual medicinal chemistry symposium are recommended: an afternoon symposium (possibly a tutorial) organized by a topical group, subsection, or non-ACS group of chemical professionals (to further interaction with other scientific societies) followed by the usual dinner and evening lecture.

Inventors' Night: A new annual program patterned after the Midland Section's annual Author's Night is suggested, to involve many industrial chemists who can not publish in scholarly journals (A. Dey).

Topical groups: Greater support for topical groups is urged. Advisory boards composed of prominent members of the Section should be established to help existing and newly formed topical groups in developing their programs. New topical groups in synthetic chemistry, materials science, and information science were suggested.

Subsections: We are not effectively involving members who live and work far from Boston. Both a New Hampshire subsection and soon a Cape Cod/ South Shore subsection may be viable: Woods Hole, SMU and many retired members.

Professional services: The section should continue and expand its programs on entrepreneurship, funding, grant applications, retraining for new and emerging fields of chemistry, etc.

Public Outreach

Speakers' Bureau: see above under education

TV and radio: Greater efforts should be made in getting coverage of our meetings and of chemical research in the Section. P. Meltzer suggested getting Mr. Rogers (PBS) to do a program on visiting a laboratory. The local access cable channel could be used to develop programs which could then move on to commercial channels. National ACS

may be helpful with these activities. Video tapes of our award meetings and of the holiday lectures and other symposia could be furnished to the stations and any subsections.

Press coverage: The Board of Publications and the Public Relations Committee are urged to explore further cooperation with the fledgling New England News Service at Boston University and to involve members to do interviews and write articles.

Organizational Matters

Staffing: The Officers and the Board of Directors should consider a full time paid staff person as a worthwhile long range goal. Committees must use discretion assigning secretarial tasks to paid staff.

Committees: All major committees should be required to appoint a specific number of members by a specific date and to develop agenda to be discussed at regular meetings of the full committee. Minutes should be kept and reports placed on the agenda of Board meetings, when needed. Long range plans should be developed by each committee to fit into the long range plan of the Section and to assure some continuity in the mission of each committee.

Volunteers: More effort should be put into greeting new members. The Nucleus should resume publishing lists of new members. Profiles of randomly selected new members might be done. The special New Members' meeting should be continued; a list of very specific tasks with job descriptions should be available for new members. The list of contacts at each employer needs to be updated. This has been a good source of volunteers.

Long range planning: The long range planning committee should continue to meet on a regular basis reviewing and integrating long range plans of committees, new ideas, and the progress of the section in accomplishing its goals.

Interim report submitted May 10, 1990
Adrienne S. Dey, Chair ◊

Directions to Henderson House

Henderson House is located in Weston, Massachusetts, just north of the Weston-Wellesley line. It is west of Route 128 and south of the Massachusetts Turnpike, between Routes 9 and 30.

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Going West on Route 9. West of Route 128, immediately after Route 9 passes under Route 16, there is a

GULF station on the right. Just past the GULF station, take a sharp right to Cliff Road, bearing right at the bottom of the exit ramp. Proceed about 1.2 miles and just past the Weston-Wellesley town line turn left next to the small pond onto Scotch Pine Road. Bear right on the curves and follow the signs to Henderson House which is on Westcliff Road on the left at the top of the hill. ◊

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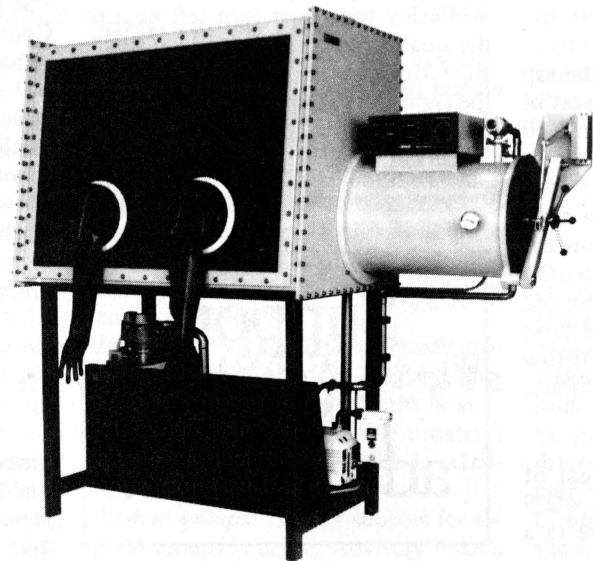
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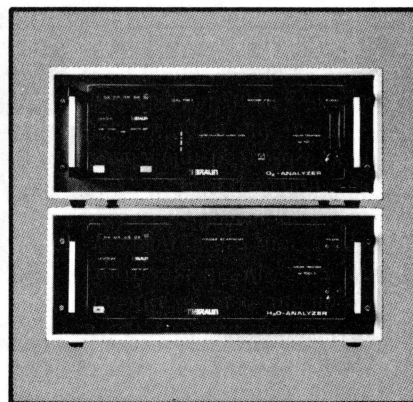
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**Observations on U.S.
Industrial Productivity**

Report of an address by John M. Deutch, MIT at the May 10, 1990 Meeting

by Ikuo Koyasu*

Prof. John M. Deutch served on the MIT Commission on Industrial Productivity from 1986 to 1989. The Commission investigated eight major manufacturing industries.

A decline in U.S. industrial performance has been caused by three parts of the society, that is, government, the private sector and universities according to Professor Deutch. U.S. industrial productivity "has declined substantially" compared to past history. In the past productivity was growing 5% per year, but now it is growing only 3% per year, half the growth of that of Japan.

The first part causing the decline in U.S. productivity is the government. "The single most important thing the government can do is to get the economic climate correct," Prof. Deutch said. Compared with countries with higher industrial productivity, such as Japan, West Germany and France, the U.S. government is not encouraging savings, and consumers are spending much more. To improve trade deficits and encourage investment, he said, the U.S. needs lower interest rates, higher savings rates, and less government spending.

Though people argue for trade barriers to stop foreign competition this is not sensible. Trade barriers are "a way of avoiding learning, and it really is an expensive way to live for citizens in this country," he argued.

The second part is the private sector. He pointed out a lack of cooperation between management and labor, individual firms and government. There is also very little cooperation

* Ikuo Koyasu is a student in the Program for Reporting in Science and Medicine at Boston University, a master degree program in the School of Communications.

among research and engineering departments, manufacturing departments, and market and sales departments. He called for integrating research, development and manufacturing.

ACS News: Waste Management Manual

The ACS Department of Government Relations and Science Policy has released the *Waste Management Manual for Laboratory Personnel* developed by the ACS Task Force on RCRA. The manual provides a rich resource for laboratory bench chemists concerned about the proper disposal of wastes produced in the laboratory and can provide a good supplement to in-house industrial training. *The Waste Management Manual* emphasizes practical approaches to the management of hazardous waste in a laboratory setting, stressing the federal regulatory requirements and noting the need to consult state regulations and company policies before attempting to develop a waste management program.

Laboratory professionals, the "front line" generators of hazardous waste, are in a key position to determine whether a waste management program succeeds or fails. Laboratory personnel are uniquely qualified to contribute to the tasks of segregating and labeling wastes and properly accumulating the wastes. As a part of an overall waste management program, they need to understand both the relationship between the regulatory and organizational requirements and the commitment they must make for the program to succeed. This commitment includes considering all waste management

The last part is universities. "Our education system is very much oriented towards motivating kids to research," he said, "It does not spend so much time motivating kids to thinking about issues of research, manufacturing and production."

Some engineering schools deal with manufacturing and production, as well as research careers. For example, he mentioned his program at MIT, which works with five major corporations. It gives students a master's degree in engineering and manufacturing, and management, and gives students practical experience. ◇

options and minimization techniques when planning laboratory activities.

Industrial bench chemists receive an introduction to the concept of a waste management system and are led through an overview of the federal regulations governing waste disposal. Detailed information on hazardous wastes regulated by the federal government is provided in a separate section to make referral easy. Complete lists of compounds that are hazardous wastes listed by EPA are provided.

The document describes how to develop a waste management system. Waste minimization, identification and labeling of wastes, proper use of normal trash and sanitary sewer, in-lab treatment of hazardous waste, and storage prior to shipment are described in clear terms. *The Waste Management Manual* also provides information on the role and authority of the waste manager, how to work with contractors, and recordkeeping requirements.

Single copies of the manual are available free of charge (up to 10 for nonprofit groups) from the ACS Department of Government Relations and Science Policy, 1155 Sixteenth Street, NW, Washington, DC 20036. Please include a self-addressed mailing label. For multiple copies, contact Ms. Robin Y. Lindsey, (202) 872-4386. ◇

Information Services in Chemistry*

The Future of Electronic Information Services in Chemistry

Because of the interest in information services in chemistry stimulated by the recent law-suit of Dialog against Chemical Abstract Services we are reprinting in part a paper presented at the *Infobase '90* meeting in the hope of giving our readers some background in this field.

The Editor

INTRODUCTION

Reviewing the changes in the past 20 years:

- Twenty years ago—in 1970—most chemists, engineers, and other scientists conducted chemistry literature searches themselves by using library collections of printed Chemical Abstracts, Beilstein, Gmelin, etc.
- Ten years ago—in 1980—more and more literature searching was being done in the library with computer assistance and with the aid of a professional librarian or information specialist.
- Today, more and more scientists are conducting a wide range of information-handling functions from their own desks. They may be keeping an electronic lab notebook, communicating with colleagues via electronic mail, performing some research by computer simulation, accessing internal databases, and even accessing external online vendors.

Is print dying? Are information specialists disappearing from the picture? Will chemists, engineers, and other practitioners of the chemical sciences become the primary online searchers? We do not really know the answers to these questions, but we do know what has happened, and what is happening today. All the present proves is: Some scientists still rely on printed sources, most scientists still rely on information specialists for online retrieval, and

* Condensed from a paper by James V. Seals, Jr., Director of Marketing & Corporate Development, Chemical Abstracts Service.

some scientists do some of their online searching themselves. One way of accessing information has not extinguished the others, and no species of searcher is becoming extinct. All three user environments exist simultaneously, and our current challenge is to deal with the needs of all three environments at the same time. As for the future:

The future of electronic information services in chemistry is related to the future of printed services.

It is related to the future of information specialists and end-users.

It is related to the database producers, online vendors, users and the interconnected web of relationships that bind the three together.

It is related to how users budget for information, how providers price information, and how the value of information is perceived.

PRINTED SERVICES: MANAGING THE FINAL TRANSITION

We are still in a time of transition. Print and electronic media continue to co-exist. From the database producers' point of view, it is difficult to talk about one medium without addressing the other, for we must consider both printed and electronic distribution channels and manage this transition very carefully. Our continued existence depends on it.

The Shift from Print to Online 1979-1989. Even though CAS does not exist to make a profit for shareholders,

it must manage its operations in a responsible way, and that requires it to think carefully about its financial health. In this regard, one trend that we have been monitoring at CAS is the shift from the use of chemical information in printed form toward the use of information in electronic form. We have been watching this transition for the last 20 years, and it is a situation that becomes readily apparent by looking at our revenue sources.

Until very recently, the vast majority of our revenues came from sales of printed subscriptions. Even as recently as 1979, 80% of our revenues were still from printed subscription sales and only 10% from electronic delivery — at that time via commercial and government batch and online vendors. However, by 1989, this situation had changed dramatically. Last year, 46% of our revenues came from printed services and 45% from electronic services, to a large extent from STN International (the online information service operated jointly by ACS and organizations in Germany and Japan).

We have lost subscriptions — nearly 1,000 CA printed sales in the last decade alone, and more than 2,000 since 1969. These 2,000 lost sales would today represent about \$25 million a year to CAS. But as it is, fewer and fewer organizations buy printed CA every year. We have had to increase our prices accordingly in order to maintain our printed revenues.

Through careful management of the transition, our revenues from printed CA have held steady in constant (1981) dollars. In 1990, the price is \$12,800. But it is clear from the number of organizations which still subscribe that many believe CA is worth this price. (In the U.S., it is only the equivalent of the salary for a library clerk.)

Online Activity Required to Recover a Printed CA Subscription. This is the age of electronic information, but print endures, particularly at colleges and universities, which now represent about half of our printed CA subscribers. Printed CA is also purchased in parts of the world where online

technology is not yet available, which is virtually everywhere outside of the U.S., western Europe and Japan. But as the new industrial and developing nations emerge, we may see further losses in printed sales.

For every CA subscription we lose in 1990, users must spend significantly more than \$12,800 in online searching to return to CAS what we would have received for the subscription. In other words, the user who drops a subscription will need to spend the amount of the subscription price plus perhaps 40% more in order for CAS to recover \$12,800 in use charges because there is additional expense involved in delivering an online service.

Growth in Printed Current Awareness Services. While printed CA subscriptions have tended to migrate over the past 20 years to online usage, we have witnessed an unwaning interest in printed current-awareness bulletins which are derived from the CAS database using standard interest search profiles, with the results delivered in hardcopy. We began to produce such services in 1976 (Chemical Titles).

The ever increasing number of titles we publish every two weeks gives an indication of the popular interest in printed bulletins, as a low-cost alternative to online SDI searches. Since 1979, the number of bulletins we produce has increased from 80 titles to 257. Most (66%) of these subscriptions are purchased by industry for the use of individual chemists, engineers and other scientists.

CA Printed — Transition Strategies. While current-awareness services are becoming — along with online use — the staple of industry, the colleges and universities, as noted earlier, are becoming the principal subscribers to printed CA.

As other subscribers drop printed CA, and as academic use of CAS's files on STN increases (at an 85% to 90% discount), a larger and larger percentage of CAS's subscription sales and online usage is affected. Nearly 50% of all CA printed sales are now subject to an academic discount, as is one-third of the usage we receive from the CA File on STN.

Such academic discounts have been one way in which we have attempted to manage our printed subscription base in the online age. We have also maintained printed subscriptions by providing a CA subscriber discount on STN. Via this approach, our users have saved \$21.8 million dollars on their STN online bills since 1983 as a result of keeping their CA printed subscriptions active and current.

The discount on online usage helps us maintain printed subscriptions in parts of the world where online technology has been adopted. But many parts of the world do not have the option of going online. They need and want to continue buying print. Therefore, it is no surprise that an increasing percentage of our printed CA revenues come today from subscribers outside the United States: 68%. We have CA subscribers in over 100 countries, many of whom live in emerging or developing nations that do not yet have the infrastructure to support reliable access to online services. If for no other reason, we need to maintain our printed services to provide a service to such newly industrialized nations.

Print Endures. Print endures, but for how long? It survives in the present, but how much of this is due to our supporting and nurturing it? Our pricing and discount strategies help keep CA and CAS going. But so does tradition, habit, the prestige of a printed CA subscription, and in addition the lag in online technology being adopted in the vast majority of the world's nations.

The only growth in printed services we have seen in the last 10 years is from current-awareness publications.

As for the future, we will continue to produce printed services as long as the demand supports it, or as long as there is no alternative for our clientele.

INTERMEDIARIES: KEY TO THE PAST & THE FUTURE

As mentioned earlier, there are researchers who still use printed sources; there are researchers who

search online aided by an intermediary, and there are researchers who conduct some of their own online searches.

One question often asked — especially by intermediaries — is whether end-users are going to replace information specialists. That seems highly unlikely in the near term, but the need to satisfy both groups of users simultaneously is a real issue, and they are two different universes. But intermediaries, or "search specialists," though far fewer in number than end-users, would seem to hold the key to the future, just as they have represented a powerful force in the past.

The Emergence of End-Users. This is not to say that end-users do not exist in vast numbers and are not searching. In 1979, the term "end-user" was hardly ever used. We estimate that no more than 5% to 10% of the total online searchers at that time fit the definition. But by 1989, those who described themselves as end-users represented 48% of the users on STN. But, despite their numbers, end-users' online searching activity by its very nature does not result in sizable online usage. Information specialists still account for most of the usage of STN, even though as a percentage of the total user base they no longer constitute the majority of users.

Studies reported in the literature — as well as our own experimental programs — have demonstrated that the development of end-user searchers within companies does not diminish the workload of the intermediary but is more likely to increase the demand for complex, detailed searches. End-user searching also improves communication between the end-user and the search specialist. Rather than losing their position, information specialists are gaining stature in the eyes of end-users and management.

End-Users on STN. Right now we continue to watch end-users come online, and not just in the U.S. Late last year on STN, we found large concentrations of end-users in both the U.S. (52%) and Japan (44%). Not surprisingly, we also found large concentrations of searchers with limited

experience. About a third of the users on STN are "new searchers" as defined by our study, having searched online for less than three years. We also noted that very small concentrations of users are responsible for the search volume: Only 28% in the U.S. and only 18% in Japan search more frequently than once every two weeks, they are information specialists. End-users search seldom and infrequently. The question is: Why don't they search more?

Barriers to End-User Searching.

Most online vendors have been focusing on the command language and building front-ends to simplify access for the end-user, believing that this is the key to the problem. But the negative side of these approaches often is that they sacrifice precision and recall in making it easier for end-users to search. The real problem of end-user searching is not only in mastering a protocol; it is in the way databases are organized and indexed, and in the nature of human knowledge itself.

What is the problem that end-users confront when they attempt to duplicate the results they are used to receiving from a professional online searcher? Let me review the search process as it was recently described by an information specialist from a large pharmaceutical company.

Professional searchers know that databases are not easy to search, no matter what command language is being used. Once a request is received, they begin the search process by arranging an interview with the requester for the purpose of defining the question, determining which database might contain the answer, and developing in a general sense the search strategy, based on database content and system features. Before even logging on, a search profile is written. But it is impossible to pre-define a search. The searcher cannot possibly know in advance what the original search strategy will reveal online or to anticipate ideas that will be generated by looking at the early results. For this reason, some professional searchers like to have the person requesting the information sit with them at the ter-

minal to help conduct the search, review the results, and refine the search as it progresses.

End users have to realize that: 1) Database selection is important. 2) Search strategy is critical. 3) Online searching is interactive. Users need to adjust their strategy as they go along. Searching that is simplified to the point where it is no longer interactive is nothing more than batch searching, which is a retreat to the past and does not really take advantage of online technology.

The real answer to online searching seems to lie not in simplifying the protocol but in making database content more manageable and understandable to the end-user.

Intermediaries — The key. In today's world, intermediaries are still the predominant users of online services. Searching is their profession. They are deeply conscious of database content and design. They know the online services inside and out, strengths and weaknesses. They know, and care, what it costs to run a search. Unfortunately, as a result of their in-depth knowledge, they drive systems to be even more precise, which, unfortunately, makes them even more complex and difficult for end-users to master.

On the other hand, end-users are practicing scientists and engineers, not information experts. They log on to online services infrequently, so they never get a chance to master them or to maintain their search skills in between periodic sessions. Within the scope of their research budgets, information is an insignificant expense. They tend to ask simple questions — the types of questions they would have thumbed through printed books to find, even accidentally, in the past. They want systems that are easy to use, and yet they want results that do not sacrifice precision. They want to find THE answer to their question.

These two entirely different and seemingly conflicting universes are united by the single aim of finding the answers to questions. But information specialists were the key to the past,

and they are the key to the foreseeable future. They are the past supporters of online technology. They brought online technology into their organizations, determined how to use it, and used it on a per capita basis more than any end-user ever will. They are the current buyers of online information. And they are leading the development of end-user searching in their organizations.

Given all of this, it is alarming to note how few information specialists currently are employed in industry. An informal poll of a few of our large customers revealed that one company had just one information specialist to support 300 researchers! And at the other extreme, one company had an information specialist for every 15. Even overall, it would appear that there is only one professional searcher for every 70 researchers!

As end-users search more and more, the demand for information specialists is only going to continue to increase. The greatest threat to our future may be that the demand cannot be satisfied from the labor force. The vast number of potential searchers that end-users represent has been a beguiling incentive to most online vendors to invest in new features. But having a relative few fulltime searchers logged on and searching is much more financially beneficial than having thousands of marginal and inactive accounts. It is also better — from the users' point of view — in terms of the quality of the answers that are retrieved.

THE ELECTRONIC ARENA: FROM PLAYERS to PARTNERS

Users, ironically, are not the only influential group in determining the future of electronic information services in chemistry. Those who design, compile and build databases from primary sources and those who are the online vendors of the data. But these artificial lines are blurring.

CAS is not only a database producer, but in cooperation with our STN associates, we also provide online access, which gives us a unique perspective and has given the online

arena a new dimension. One of the reasons CAS became an online vendor in 1980 was because we anticipated a development that actually occurred. We believed that we were going to become increasingly dependent on electronic revenues.

In 1979, just 10% of our revenues came from the delivery of electronic services. By 1989, this number had increased to 45%.

Not only have our electronic revenues grown, but the source of these revenues has changed. In 1979, the electronic information market was much less homogeneous than it is today. Public online services accounted for only 50% of the revenues that CAS received from our computer-readable tape services. The rest came about equally from batch processing centers and private batch and online services. By 1989, almost all (92%) of our electronic revenues were coming from online services, including STN. In sharp contrast to the situation in 1979, only 5% of our electronic revenues now come from batch centers, and only 3% from private installations.

Will this situation continue? With all the activities by private industry and also some large colleges in the U.S. to develop local area networks with locally mounted databases, perhaps we will see this trend reverse again in the next 10 years.

CD-ROM — Advance or Regression. Some speculate that CD-ROM will enter the picture here as a means of providing wide-spread electronic access to information. But in many respects CD-ROM goes against the current tide of research activity.

Many have observed that chemistry research today has a multi-disciplinary aspect. A chemistry question may lead the researcher into biomedicine, which in turn may lead the researcher to biochemistry and perhaps on to chemical physics. Today, more than one disciplinary database needs to be searched, often in combination. In this respect, the development of multi-file searching, led by ESA and later DIALOG, addresses the multi-disciplinary aspects of research and can be very useful technology if

used cautiously by an expert. But CD-ROM, at least as it exists today, is retrogressive in that it permits only one search at a time in only one database, and does not permit crossover and coordination of searches across multiple files.

Common Interests. As noted earlier, the future of information depends on the relations among database producers, online vendors and users. But the real key to the future lies with users. They will drive the developments that lead to tomorrow's electronic services. And as with most developments, the changes will be led by a few key users — those who share a common interest in information.

Currently, users in just six countries account for 90% of CAS ONLINE revenues — the United States, Japan, Germany, the U.K., France and Switzerland — and they will have the most influence on future developments.

Users at just a few hundred key companies — which currently conduct 80% of the online searching activity on CAS ONLINE — are influencing things today and will continue to do so tomorrow. CAS is working in partnership with these large customers to define future services.

A few individuals, less than 1,000 at 500 locations, who are expert searchers and opinion leaders within their organizations ... These are the people who are influencing the services that will be available tomorrow.

INFORMATION ECONOMICS: BUDGETS, PRICES AND VALUE

The future of electronic information services — as has been true to a large extent in the past — will be driven largely by economic considerations. For most vendors, the issue is how to recover the cost of offering information at a competitive price, while meeting their profit objectives. From the database producers' view, the issue tends to reduce to how they can recover a fair return for the information that is being delivered electronically at faster and faster rates and via shortcuts that undermine the old pricing structures. From the users' point of

view, it tends to involve budgets — how to plan and how to pay for online services. But, more and more, users are starting to focus on the real issue, which is the value of information, a topic that CAS as a database producer has been attempting to address for many years.

Revenues from License Fees & Use Charges. In the early days of computer searching, our prices were very low compared to the value of the service we were delivering in electronic form. In fact, in the first five years (1966-1970), our gross revenue was less than \$1 million from all those who licensed our computer-readable files — and that was just 1% of our revenues for that five-year period. As online services grew in the 1970s, we began to see more return, but this electronic income still represented a small fraction of our revenues. It was only in the 1980s, when we began to adjust our license and hit fees, and later by adding new pricing metrics, that our license revenues from computer-readable files broke the 10% mark, finally reaching today's 45% figure, a level that more accurately reflects the value of the electronic service.

Evolution of Online Pricing Metrics. An important part of this transition was the introduction of new pricing metrics in 1988 for CAS's files. It is important to remember that pricing in the online arena has been evolutionary, and we view our most recent changes as the next logical step for CAS.

When we first started providing computer-readable files to online and batch vendors in the mid-1960s, the only fees we levied were annual license fees. We did not add connect-hour charges until 1976. Charges for offline prints followed in 1977. And then as online display of answers became more common, online print charges were levied, starting in 1982.

All of this worked acceptably for CAS until transmission rates increased and front-end software packages encouraged users to hold down connect time by moving rapidly in and out of files, significantly lowering connect hour revenues in the process. Software

features introduced by online vendors to provide simultaneous multi-file searching had the effect of substantially reducing royalties to CAS.

In order to encourage the use of new technologies and search features in ways that would not be detrimental to us, in 1987 we announced a shift from connect-hour pricing to search-term based prices.

The Effects of Pricing. Search terms and other charges now levied by CAS account for 23% of the revenues we now receive from electronic service providers, including STN. Along with online displays, which did not exist in 1979, the new CAS metrics account for almost 60% of CAS's electronic revenues. Connect hour charges, which in 1979 accounted for more than half of our electronic revenues, now represent only about one fourth.

Factors that Drive Pricing. Such pricing changes as those we recently effected come in response to new technology that circumvents or overrides the older pricing formulas, which at-

tempted to generate a fair return for the value. Pricing changes also come in response to users' searching behavior, preferences, and demands. And, at least in the past, they have been largely predicated on what were not always totally harmonious relationships between database producers and online service providers.

Whatever the pricing structure is, it needs to work simultaneously for the benefit of database producers, vendors, and users alike. Some of the technology changes introduced unilaterally in recent years by various vendors have resulted in losses of revenue to CAS.

From Price to Value. In recent months, it has been refreshing to see some users refocusing their attention on the value of information.

Financial conditions at the point of use are placing pressure on industrial information centers to curb or at least justify spending levels and to measure and improve productivity, while at the same time bringing elec-

tronic information to the end-users on site. At colleges and universities, the How the individuals at these organizations resolve such issues will have a major impact on the future of chemical information services.

When users discuss these problem, with us, we ask them to consider the full costs of information retrieval in their analysis. The search process involves substantial personnel expenses that far exceed — in fact, by as much as eight to nine times — the cost of searching and retrieving information online. As an online vender, we maintain that our job is to help the information staff save their own valuable time. It is not our job to help them control their budgets by reducing revenues to the database producers who provide the very information they are seeking.

CAS has been successful in changing the pricing structure for its own files in order to support faster searchers and short-cuts. From the users' point of view, the emphasis is shifting from prices and discounts to the cost of a search. And, more and more, the value of information is becoming the primary issue. ◇

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Hampton L. Carson in a Book Review of "Speciation and its Consequences" by Daniel Ott and John E. Endler, eds. in *Science* (1989) 245, 872.

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Morrison Professor of Chemistry
Northwestern University

Design and Construction of Molecular Assemblies with Very Large Optical Nonlinearities
Tuesday, October 16, 4:00 pm

What Can Metal-Ligand Bond Energies Teach Us About Organometallic Chemistry and Catalysis?
Wednesday, October 17, 8:00 pm

Organometallic Surface Chemistry and Heterogeneous Olefin Polymerization Catalysis
Thursday, October 18, 4:00 pm

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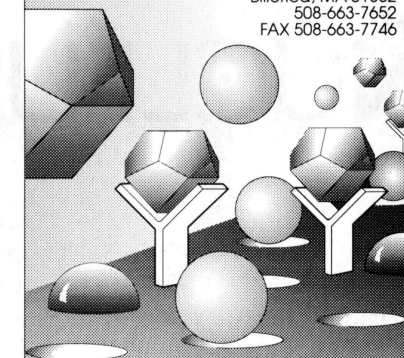
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Calendar

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Dartmouth College (603) 646-2501

Harvard/MIT Inorganic Seminar Series (617) 253-1794

Harvard University (Chemistry) (617) 495-4076

Southeastern Massachusetts University (508) 999-8232

Tufts University (617) 381-3441

Thursday, Oct. 4

Professor Patricia Samuel (Boston Univ.)
Intuition & Problem Solving in Science
BC, Gasson Hall Room 305 at 4 pm

Harvard/MIT Inorganic Seminar Series
William H. Armstrong (UC-Berkeley)
Bioinorganic Chemistry of Polynuclear Manganese Complexes Related to the Oxygen-Evolving Enzyme in Photosynthesis
Harvard, Mallinckrodt MB-23 at 5 pm

Monday, Oct. 8

Professor Viatcheslav I. Sokolov (Academy of Science, Moscow)
Optically Active Ferrocenes in the Enantioselective Synthesis of Organic Molecules
Brandeis, Gerstenzang 122 at 4 pm

Wednesday, Oct. 10

Dr. Craige Martin (UMASS)
Molecular Basis of Protein-DNA Interaction
Southeastern, Science & Engineering Bldg (Group II) Rm 305 at 4 pm

Thursday, Oct. 11

Professor Richard D. Petraso (MIT)
Cold Fusion: Facts & Fallacies
BC, Gasson Hall Rm 305 at 4 pm

Dr. Steve Goldstein (Pfizer)
Title to be Announced
Dartmouth, Steel Rm 107 at 10:30 am

Monday, Oct. 15

Professor Jack Halpern (U. of Chicago)
Title to be Announced
Brandeis, Gerstenzang 122 at 4 pm

Tuesday, Oct. 16, 17

Professor Tobin Marks (Northwestern U)
Design and Construction of Molecular Assemblies with Very Large Optical Nonlinearities (Oct. 16, 4 pm)

What Can Metal-Ligand Bond Energies Teach Us About Organometallic Chemistry and Catalysis? (Oct. 17, 8 pm)
BC, Higgins Hall Rm 307 at 8 pm

Dr. Laura Tubbs (Rochester Inst. of Tech)
Science and Art History: A Multi-disciplinary Study of Pontigny Abbey
Southeastern, Science & Engineering Bldg (Group II) Rm 305 at 4 pm (Oct. 17)

Thursday, Oct. 18

Professor Tobin Marks (Northwestern U)
Organometallic Surface Chemistry and Heterogeneous Olefin Polymerization Catalysis
BC, Higgin Hall Rm 307 at 4 pm

Dr. Chris Landry (Kodak)
Title to be Announced
Dartmouth, Steel Rm 107 at 10:30 am

Monday, Oct. 22

Professor Larry G. Sneddon (U Penn)
Molecular and Polymeric Precursors to Boran-Based Ceramics
Brandeis, Gerstenzang 122 at 4 pm

Thursday, Oct. 25

Professor Andrew Barron (Harvard U)
Title to be Announced
BC, Gasson Hall Rm 305 at 4 pm

Dr. Jim Larrabee (Middlebury)
Title to be Announced
Dartmouth, Steel Rm 107 at 10:30 am

Harvard/MIT Inorganic Seminar Series
Ian Rothwell (Purdue)
Organometallic Chemistry Supported by Aryloxide Ligation: From New Metallocycles to Catalytic Arene Hydrogenation
MIT Rm 6-120 at 5 pm

Saturday, Oct. 27

Photochemistry and Spectroscopy in Organized Media

Featured Speakers: David F. Eaton (DuPont); William J. Leigh (McMaster University); Linda J. Johnston (National Research Council of Canada); David G. Whitten (Univ. of Rochester)

A One-Day Symposium
Dept. of Chemistry, Worcester Poly. Inst.
Registration information: (508) 831-5371

Monday, Oct. 29

Dr. Richard L. Hahn (Brookhaven National Laboratories)
Searching for Solar Neutrinos (Where Chemistry and Physics Meet)
Brandeis, Gerstenzang 122 at 4 pm

Tuesday, Oct. 30

Professor Dieter Seebach (Eidgenossische Technische Hochschule, Zurich)
Self-Regeneration of Stereogenic Centers - Application, Limitation, and Abandonment of a Synthetic Principle
Harvard, Science Center C @ 4 pm

Wednesday, Oct. 31

Dr. James H. Davis (Brandeis University)
Recent Advances in Reaction Chemistry of Metallocarboranes
Southeastern, Science & Engineering Bldg (Group II) Rm 305 at 4 pm

Thursday, Nov. 1

Prof. Thomas McCarthy (UMass Amherst)
Organic Chemistry at Polymer Surfaces
BC, Gasson Hall Rm 305 at 4 pm

Dr. Gerard Parkin (Columbia)
Title to be Announced
Dartmouth, Steel Rm 107 at 10:30 am

Notices for the Nucleus Calendar should be sent to:

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