

# THE NUCLEUS

January 1999

Vol. LXXVII, No. 5

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*Carl Selavka of the State Crime Lab Speaks about Forensic Science*

## Centennial Meeting News

*Reports on the Family Program, George Whitesides' address and pictures from the Reception*

## Software Review

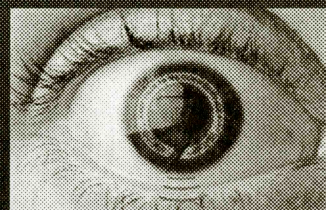
*Computer Molecules for High Schoolers?*

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## THE NUCLEUS

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## From the New Chair

Happy New Year — and welcome to the year of Nines! (We don't have to dress to the Nines!)

I have the honor of presiding over the Northeastern Section this year. It is an exciting time. We have just celebrated our Centennial — with the leadership of Mike Hearn and a large committee chaired by Dorothy Phillips and Pat Gordon. Boston hosted a well-attended national meeting of the ACS last August.

In 1999 we want to make the Best even Better.

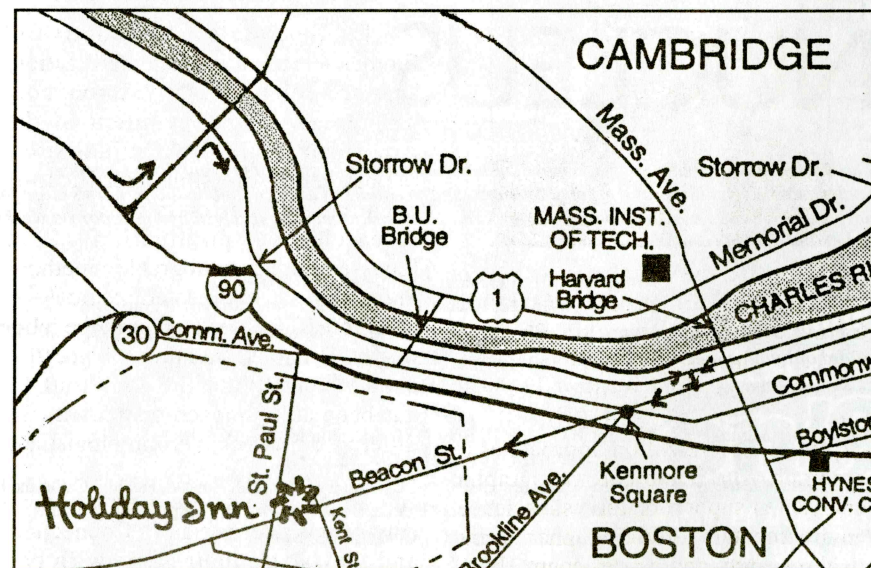
There will be a superb series of speakers at the monthly meetings, thanks to Professor Doris Lewis, our program chair and chair-elect. Many dedicated volunteers make the section a success. In the February issue of *The Nucleus* will be a list of the major committees and their chairs. Please look at them and consider doing an experiment: Choose an activity that looks interesting to you and contact the chair. Ask questions about what the committee does and what it could do if it had more members. Try your hand (or your ideas). This is a large section,

but we have more lurkers than workers. Would you like to help with Public Relations? Could you write an article about your school or organization for *The Nucleus*? Have you talked with your friends and colleagues about getting involved with the ACS? Perhaps you want to know more about the American Chemical Society and its local sections and its divisions. You already read *Chemical & Engineering News*. Try exploring our local web page. Its URL is listed on the page 3 of every issue of *The Nucleus*. Learning more about your section can help you develop as a chemical professional. It is still true that "It is your society!" You are part of "They" who run the organization and do things for "You".

This year a group of chemists is organizing a Younger Chemists Committee. If you are 35 or younger and are a chemistry major or chemist or chemistry teacher — please be alert for announcements of coming meetings. The YCC is planning a meeting on 14 January in Brookline to start.

Your suggestions will be welcomed. Call me or send questions and ideas by e-mail or snail mail. (See the title page for numbers and places to reach me.)

**Best wishes for a successful year!**  
Don Rickter ♦



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**From the South or North:** Take Rte. I-93 to Boston. Exit onto Storrow Drive at Exit 26. Continue on Storrow Drive to the Kenmore Exit. Follow \* below.

**\*From the Kenmore Exit off Storrow Drive:** At the first set of lights turn right onto Beacon Street. In Kenmore Square stay in the center lane and take the center road, which is Beacon St. The Holiday Inn is about 0.6 Mi. on the right at St. Paul St. Enter the driveway into the garage at the in-town end of the building. Parking at meters on Beacon Street may also be available, should the garage be full (no meter charge after 6:00 pm).

**By Public Transportation:** Take (or change at Park St. to) the Green Line, "C" train. Exit at the St. Paul St. stop (3<sup>rd</sup>. stop after Kenmore) across from the Holiday Inn. ♦

## Monthly Meeting

### The 803rd Meeting of the Northeastern Section of the American Chemical Society

Thursday, January 14, 1999 (Note: the pre-announcement date in the December *Nucleus* was incorrect, it IS the 14<sup>th</sup>!)

Holiday Inn, 1200 Beacon St., Brookline

**4:30-6:00 pm** Northeastern Section Younger Chemists Committee

**5:30 pm** Social Hour; a table of Career Services Literature and Aids will be available

**6:30 pm** Dinner

**8:00 pm** Evening meeting, Dr. Donald O. Rickter, Chair, presiding  
Dr. Carl Selavka, Massachusetts State Crime Laboratory *Forensic Science: Framing the Question (Why OJ Didn't Want My Opinion)*

Dinner reservations should be made no later than January 7, noon. Please call or fax Marilou Cashman at 800-872-2054. Reservations not canceled at least 24 hours in advance must be paid. Members, \$25.00; Non-members, \$28.00; Retirees, \$15.00; Students, \$8.00. **THE PUBLIC IS INVITED.**

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

**Parking:** Free; Obtain voucher when you sign in.

**Next Meeting:** February 11, 1999, Northeastern University, Student Center. Dr. Robert Langer, Mass. Institute of Technology, recipient-to-be of the 1999 ACS Award in Polymer Chemistry. 5:30 Social Hour and dinner, 8:00 Evening meeting.

## Biography

Carl Selavka is a criminalist specializing in explosives, arson, and toxicology. He serves as the Director of the Massachusetts State Police Crime Laboratory in Sudbury, Mass., having recently left Albany after spending two years as the Director of Forensic Services with the New York State Division of Criminal Justice Services. In New York, Dr. Selavka worked with the state's 25 public forensic science labs to achieve accreditation, initiate the State DNA Databank and develop centralized training programs. Prior to work with NYS, Dr. Selavka worked for five years in the private forensic laboratories of National Medical Services in Willow Grove, Penn., and 4 years with the Army Forensic Toxicology Drug Testing Lab in Hawaii.



Despite the best efforts of his research advisor, Prof. Ira S. Krull, Selavka graduated with a Ph.D. in Forensic Chemistry from Northeastern University in 1987. While at Northeastern, Selavka and Prof. Krull explored derivatization approaches to for improving liquid chromatographic analysis in support of forensic science, environmental monitoring, pharmaceutical research, and cancer chemotherapeutics.

## Younger Chemists

### Organizational Meeting on January 14, 1999

The Northeastern Section Younger Chemists Committee (NSYCC) was established to focus on specific issues facing younger chemists within the ACS, and to address the needs of younger chemists through support activities. The objectives are to provide services to younger chemists in career-related areas, leadership opportunities for individuals who want to develop skills, and a vehicle to voice concerns to the ACS. The goal of this meeting is to determine YCC programming and events for 1999.

Undergraduates, graduate students, post-doctorates, and [younger] chemists in government and industry are encouraged to attend.

A representative from the national ACS YCC will be present to suggest programming and to answer questions.

See the monthly meeting announcement on this page. For information, contact Danielle Simonelli, Dsimonel@emerald.tufts.edu  
617-627-3046 ♦

Dr. Selavka has been active in forensic certification, standardization, and accreditation efforts throughout his career. He is President of the American Board of Criminalistics, the national professional certification organization for criminalists. His research and publications have focussed on chromatographic methods in forensic science, esoteric toxicology, and professional leadership in the laboratory. He counts among his greatest accomplishments the fact that he has been able to teach his parents the difference between a criminologist and criminalist.

Dr. Selavka's wife, Carolyn, is an emergency veterinarian in Connecticut and they share their home with two dogs and cats. ♦

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## Nominations

### Aula Laudis

The Northeastern Section annually honors teachers of chemistry at the secondary level in our region by choosing several for selection to the honor society, *Aula Laudis*. Election to membership in *Aula Laudis* is a recognition of excellence in the Teaching of Chemistry at the secondary school level. This recognition is based on both qualitative and quantitative criteria that involve the totality of an individual's participation in and contribution to the teaching profession. Inasmuch as teaching is a skillful art with a wide range of marks of excellence, no one criterion for election to *Aula Laudis* is sufficient and no one criterion is necessary. The following criteria, in their broadest sense, shall be considered by the Selection Committee:

- Having taught chemistry to students who have won state-wide, regional, or national chemistry competitions, such as the Ashdown Examination Award;
- Having received awards for excellence in teaching from state-wide, regional or national organizations;
- Having advanced the scholarship of chemical education, including curriculum design, laboratory development, and the introduction of pedagogical methods and techniques through publication in recognized chemical education journals and/or through presentations at scientific meetings and continuing education symposia;
- Having served as the adviser of extra-curricular activities, such as clubs, science programs and science talent searches, in which the interest of chemistry students in the subject is advanced and developed;
- Having performed special service to the chemical education community, such as through the organization of continuing education symposia in chemistry;
- Having demonstrated excellence in classroom teaching as evidenced

### Philip L Levins Memorial Prize

Nominations for the Philip L. Levins Memorial Prize for outstanding performance by a graduate student on the way to a career in chemical science should be sent to the Executive Secretary, NESACS, 23 Cottage St., Natick, MA 01760 by **March 1, 1999**. The graduate student's research should be in the area of organic analytical chemistry and may include other areas of environmental analysis, biochemical analysis, or polymer analysis.

Nominations may be made by a faculty member, or the student may submit an application. A biographical sketch, transcripts of graduate and undergraduate grades, a description of present research activity and three references must be included. The nomination should be specific concerning the contribution the student has made to the research and publications (if any) with multiple authors.

The award will be presented at the May 1999 Section Meeting. ◇

from written in-class evaluations by supervisors;

- Having had a significant personal impact on students as evidenced by letters from alumni/ae on behalf of the nominee.

The Selection Committee will accept nominations on behalf of active and retired secondary school chemistry teachers; the length of teaching service is not a criterion. The criteria for each final recommendation shall be recorded in the minutes of the Selection Committee.

Nominations, including a one-page summary of the nominee's relevant accomplishments, are to be sent to: David Olney  
P.O. Box 559  
Mattapoisett, MA 02739

e-mail: [djolney@ma.ultranet.com](mailto:djolney@ma.ultranet.com)

Nominations are due **February 15, 1999**. ◇

## Excellence in Salem

### Craig Mielcarz gets perfect score in SAT II Chemistry test AND is a high-jump champion

From the November 12 issue of *The Salem Evening News*.

Craig Mielcarz is a junior in Salem High School. He recently was informed that he scored a perfect score of 800 on the SAT II test in chemistry. He is also the national indoor scholastic high-jump champion with a jump of 6ft 10 in. He also received high scores on the SAT Math test (780 out of 800) and in writing. His chemistry teacher is Rayellen Gillis.

Mielcarz is applying to Harvard, MIT, Stanford, Dartmouth and Princeton and is thinking of computer science as a major – maybe some chemistry faculty member can turn that around. Good Luck Craig! ◇

## From the Editor

### New features to start the second century

In this issue we start two new features:

- A puzzle column, hosted by E. Joseph Billo, and
- A software review column, which is looking for a host.

For both we ask readers to contribute suitable material. If you are a puzzle-whiz, please send puzzles with a chemical twist to Dr. E. Joseph Billo, Chemistry Department, Boston College, Chestnut Hill, MA 02467. 617-552-3619; fax: 617-552-2705. For a start, we are reprinting crossword puzzles from the New York/North Jersey Section's Newsletter, *The Indicator* with permission of its editor.

If you wish to coordinate the review of software of interest to chemists, or have suggestions for

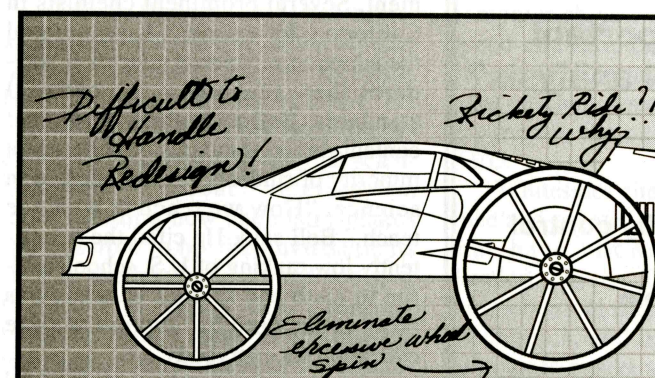
## Correction

Dr. Atkinson has pointed out two errors which occurred in processing his Book Review manuscript on pages 20 and 24 of the December 1998 *NUCLEUS*:

The second paragraph of the article on page 20 should start out with: "For each **site** (rather than "state") there are provided the following items."

In the continuation on page 24, 9 lines from the bottom, it should say: "...for mention of **one of** America's most outstanding scientific treasures—" ("referring to MIT's corridor museums) – we would not wish to slight other universities' science museum collections. Sorry Ed! [ed.]. ◇

programs to be reviewed, please contact the Associate Editor, Dr. Myron Simon, 20 Somerset Rd., West Newton, MA 02465; 617-332-5273. ◇



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# Centennial Meeting News

*At 100, ACS Northeastern Section keeps an eye on the future*

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Suburban Boston was the scene for last month's centennial celebration of the ACS Northeastern Section, officially founded on Feb. 4, 1898. The celebration kicked off on Thursday, Oct. 15, with the section's 800th meeting and was followed by a day of family activities and special symposia the following Saturday.

Schoolchildren of all ages, and their parents, were treated to a series of colorful chemical demonstrations by

the hands-on chemistry team of William I. (Toby) Dills Jr. and James A. Golen, both professors of chemistry at the University of Massachusetts, Dartmouth. Appropriately, the morning symposium focused on chemical education. It seemed an apt form of "fireworks" for a local section often defined by the brilliance of its chemists.

The Northeastern Section is one of the society's large sections, with a membership of approximately 5,600 people. It was formed by a group of about 150 chemists in 1898, all from the Boston area. These chemists had participated in hosting the first ACS national meeting outside New York—in Newport, R.I., in 1890—and they hosted the 1894 ACS national meeting in Boston. When ACS decided to return there for its national meeting in 1898, the Northeastern Section officially was born. In terms of founding, it is the 11th oldest among the society's 188 local sections.

By any measure, it was and remains a distinguished group of chemists. Along with chemists from Harvard University and Massachusetts

Institute of Technology, the Northeastern Section is home for chemists from numerous other colleges and universities in New England as well as many leading chemists from industry—which today includes emerging enterprises in biotechnology and other high-technology businesses.

The morning symposium on chemical education began with a review and discussion of the National Science Education Standards by Jerry A. Bell, a program director at the American Association for the Advancement of Science (AAAS). Those standards—developed as a guide for science education standards to be adopted by the states—would change the emphasis in high school science reaching from "content," or rote memorization of facts, to a more context-driven approach. Rather than emphasize exact memorization of the periodic table, for example, reaching and learning assessment would emphasize scientific understanding and reasoning.

Although they are endorsed by ACS, AAAS, and other leading scientific societies, Bell acknowledged that the standards have met with disagreement. Several prominent chemists in California, for example, have opposed the adoption of science education standards there that mirror the national standards. Bell and others argue that content-driven standards only benefit a minority of students already talented in science. "How we teach is what we teach," Bell said. He cited the consistently low ranking of U.S. schoolchildren in math and science education as proof of the need to "improve science education for everybody".

Another morning lecture, by ACS Region VI Director Glenn A. Crosby, a professor of chemistry at Washington State University, Pullman, highlighted the effects of high school science education on colleges and universities. Titled "Redefining Institutional Missions, Goals, and Boundaries: An Educational Imperative for the 20th Century," Crosby examined such issues as the rise of the research institution in U.S. higher education; the "double hump" distribution of undergraduate students in terms of their scientific

knowledge and ability; and the competition for students that many institutions will face from for-profit institutions that offer affordable access to marketable skills but not, according to Crosby and others, an education.

Afternoon sessions emphasized the future of chemical research with a series of lectures by some of the leading lights of the Northeastern Section. Sylvia T. Ceyer, a professor of chemistry at Massachusetts Institute of Technology, presented an overview of her work on bulk hydrogen. Richard H. Holm, a professor of chemistry at Harvard University, lectured on "Metal Clusters in Biology."

For those who might despair the future of chemical research, Richard J. Roberts of New England Biolabs, Beverly, Mass., gave a talk entitled "Biology: A Fertile Area for Chemical Research." Biology, he said, is really the chemistry of life. He talked about the revolutionary discoveries in biology that have occurred since mid-century, including the discovery that DNA contains genetic information—which was soon followed by the elucidation of the chemical structure of DNA.

Today, Roberts said, scientists seek to understand the chemical reactions that are essential to life, including further understanding of DNA. He pointed out that RNA has been discovered to act catalytically and that scientists have great interest in understanding how chemistry makes life possible in hostile environments such as geothermal vents and pools, of sulfur. Unlocking the chemical processes behind these phenomena drives much of the research in biotechnology that will lead to new medicines, materials, and so on. "We thought we knew a lot," he said, "but don't have a clue what's going on in many of these reactions."

The celebration of the Northeastern Section's centennial wrapped up with a dinner and an engaging and wide-ranging forecast for the next 100 years, given by George M. Whitesides, a professor of chemistry and chemical biology at Harvard. Chemistry, he said, is atoms and molecules. As a profession, he said, it generates knowledge

and solves problems. As a philosophy, chemistry is a way of looking at the world through the lens of atomic and molecular parts. "Chemistry is the most perceptible of the sciences," he said.

Chemistry enjoyed a period of great importance in the past, Whitesides continued. It can again, he insisted, if chemists pay attention to the context of chemistry and not just the chemicals. He outlined some areas where chemistry will produce necessary understanding. Medicinal chemistry, for instance, will one day allow transplantation in humans of animal tissue—perhaps routine replacement of bodily parts—without immune system reactions that lead to rejection and without fear of also transplanting dangerous viruses.

Animals and machines will be different, Whitesides said. Science will be able within the next 50 years to engineer animals to the shapes and sizes wanted and for a variety of purposes from agriculture to medicine. And with the aid of chemistry, some materials will be biologically based, driving new technology—such as organically based computer chips—with the unparalleled speed and efficiency of biochemical processes. Capitalism, he said, is the most efficient system that will provide the means for necessary efforts in R&D.

Whitesides cited the history of science and pointed out the progressions that have allowed disciplines to develop. Physics, for example, moved from classical mechanics to quantum mechanics, and biology has moved from a descriptive science to a molecular science. He noted that Harvard recently renamed its chemistry department, now known as the department of chemistry and chemical biology. For chemists to avoid becoming mere technicians for the future, he said, the discipline must seek out biology and other contexts as areas for the future of chemical research.

[The original article had pictures of Sylvia Ceyer, George Whitesides, Dills and Golen]

William Schulz ♦

# Family Activities Program

Reported by Dr. Frances Shawcross

About 30 people, mostly children, attended the program. The program began with chemistry demonstrations given by Drs. Jim Golen and Toby Dills of UMass Dartmouth. The demonstrations included oscillating reactions, explorations with liquid nitrogen, chemical luminescence, density columns, the ethanol cannon, and many more interesting and colorful reactions. The demonstration concluded with the formation of Elephant's Toothpaste!

After the demonstration the children moved next-door for hands-on activities. They made "Goofy Putty" from carpenters' glue and Boraxo soap; they inflated plastic bags with vinegar and baking soda, they did secret writing and they investigated the action of household chemicals on indicators.

Each participant was given a pair of safety glasses to take home (thanks to Fisher Scientific Co.). The children were also given colorful Periodic Tables, balloons and "Beaker Buddies". Meanwhile their parents received maps, printed directions for the experiments, and many other chemistry activities, brochures and other promotional material about activities and events in Boston and its suburbs.

The program was a great success thanks to the work of Wellesley College students Lauren Birenbaum, Susan Glover, Catherine Halt and Anita Tsai who helped with the Hands-on Chemistry.

Frances Shawcross (chair), Tom Hayden, Arlene and Ted Light, and Junrui Yang, Family Activities Committee. ♦

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# What Are the Next Questions

Report of an address by Professor George Whitesides at the Centennial Celebration of the Northeastern Section of the American Chemical Society. October 16, 1998

Reported by M. Simon.

"Predicting the future of chemistry for the next hundred years is fundamentally valueless, but may have some entertainment value."—GW

Chemistry has defined itself as the study of atoms and molecules. In the future it must look to its adjacent sciences, physics and biology, for growth, and to broaden its definition. Chemistry as a profession has the tasks of generating knowledge, solving problems, and educating and training the new generation of chemists.

GW suggested two philosophical descriptions of chemistry:

1. A way of looking at the world in terms of its atomic and molecular parts, and

2. As the most perceptible science.

What do I do as a chemist? What is interesting and important, and to whom and for what? What to teach to whom? (Include teaching as a requirement for industry as well as in the university.) Are we correctly organized? Should the divisions of organic, physical, analytical chemistry, etc., be abandoned? (GW thinks so.) How does society see us? Are we loved enough for what we do, i.e. do we receive the financial backing we feel we deserve? If not, why not?

GW asked a son to list our generation's legacy. The list: survival in the Cold War, development of biology and biotechnology, information technology, and reduction of inequality between genders (but not among races.) None of these topics would have been on GW's list at his son's age. This is sound evidence for the rashness of predicting the future.

What are our assumptions for the future, and are they correct? What are the problems we expect to see continue

for a while, that have to be solved? Where do discoveries come from and what role does chemistry have in the process? Chemistry has an important input in solving future problems.

Assumptions:

1. **We are mortal:** We are learning to use animals, e.g. pigs, to provide replacement parts for humans. We are learning to repair telomers in cells so that the clock which times and ends the replication of cells can be turned off. We are engaged in genetic engineering. We can foresee the lengthening of the human lifespan and a change in the notion of death. Chemistry in pharmacology holds the steering wheel on this journey.

2. **We are individuals and have a right to privacy:** But we are living more of a hive existence as our individuality and privacy are encroached by cell phones, beepers, location plotting, genetic engineering. Chemistry's part includes such widely diverse fields as genomics and proteomics and making batteries for electronic gadgets. As we learn which genes cause diseases we will develop genetic therapy, and might even find the genes for intelligence and a sense of humor!

3. **Animals and machines are different:** We will be able to make animals to order, of different shapes for different purposes. Again, genetic engineering.

4. **Capitalism is the most efficient system:** The most valuable thing is information. With the Internet and new technology any Third World country can be in the forefront of information access. Will the political-economic structure matter?

Do chemists want to restrict them-

selves to the level of technicians or do they want to run things?

Past divisions into scientific disciplines are outdated. While we go from a name "Department of Chemistry" to "Department of Chemistry and Chemical Biology" we are just taking a small step to where we should be going, to the "Department of Very Interesting Stuff." No field of chemistry need stand alone.

**In biology and medicine** we can predict the fundamental discoveries that can be expected over the next 20 to 30 years but we haven't a clue to the basic question of how to go from what we know about a molecule to the behavior of cells. The study of emergent behavior, the ability to know the properties of things from the properties of individual components, is the big science for the future.

**Material science:** Electronics has been solely based on silicon. Organic transistors would allow miniaturization from the 100 micron level to the 50 nanometer level. A wristwatch could contain the information of a thousand CD's, all the information for a lifetime. A person would have no need of memory. On the other hand, finding the information one needed might be a problem.

Within 50 years, the fusion of biological systems with information systems will produce systems which are neither living nor dead: part digital, part biological. An illustration of a cell attached to a bed of pins showed an early experiment in this area.

**Fundamentals:** We are entering the realm of engineering at the atomic level. We have spectroscopic tools so fast that we can follow a chemical reaction and examine the transition state directly. We are beginning to learn the chemistry of single molecules. These are going to change our view of the world. We cannot do engineering below the atomic level nor work on less than single molecules so this sets a lower boundary.

Societal needs are a (very) little more predictable: While the making of nuclear devices is limited to the U.S. and Russia, at least for the next twenty

years, still the world is less safe than it had been during the Cold War. This is due to potential national and individual acts of terrorism where anthrax or DX could be used to wipe out large populations. Here chemistry offers a large part of the answer.

**Energy:** In the next hundred years fossil fuels will probably be replaced by nuclear fuels in the generation of electricity. Chemistry will have to solve the associated problems of chemical and nuclear waste disposal.

**Environment:** With some wrong choices we may be on our way to converting Earth into Venus. Global warming is real, and this and other environmental concerns such as waste disposal are more problems to be addressed by chemistry. Transgenic goats are being used as chemical factories to produce proteins formerly made by chemical synthesis. This is being done largely for "green" reasons. There is a major shift in converting chemical companies to life sciences companies, but GW doubts that chemical management will know how to run life sciences businesses.

**Population:** The greater numbers of people in the future, and resultant increased consumption, is a chemical problem.

**Competitiveness:** This has been a mechanism for justifying jobs, goods and services. A stable society uses jobs for the distribution of wealth.

**Division of Labor:** In the past, basic discovery was done mostly in the university, and the application to products was done by industry, with some overlap. As the focus of industry shifted to a shorter period to bring research to the market, now about eighteen months, the gap between universities and industrial research has widened. Now there is a greater problem in bringing university research to prototypes of products. Small businesses that have sprung up may be filling this gap.

**Education:** The importance of education to provide the scientists for the future is obvious, but little recognition is given to the importance of starting in the right way at the K to 12 level.

How should this be handled? What role should chemical industry play?

**Consolidation:** Globalization has brought with it consolidation. Industries are reducing the number of their members by swallowing up the small fry. The chemical industry recognizes

the importance of globalization but faces a world which it doesn't know how to manage. This is a problem it shares with the universities. Chemistry has been a support science for other sciences, providing the chemicals and materials.

GW contrasted the period just passing with the future:

1950 – 2000

Cold War

Capitalism vs. Marxist-Socialism

The two types of conflicts represent problems which must be solved by the rich nations paying attention to the health, energy supply and standard of living of people in the Third World

National conflicts

Nations start having conflicts not with other nations, but with other groups, e.g. the terrorist bombings leading to U.S. attacks on a small group in Afghanistan

Information Technology and Biology overlap both periods.

GW emphasized the dichotomy between development and discovery:

**Development**

Environment: Cleanup waste site (Cost, methods knowable)

Organic microelectronics

Technology for national security. (Development of "electronic nose" to replace dogs in sniffing out explosives.)

Preventive and quality-of-life medicine

Energy: Fuel Cells

Development is predictable

If we develop processes which will execute specific developments and solve societal problems, society will support us and pay for the discovery phase.

**Questions:**

1. Are we doing the right kinds of research? It seems so.
2. Are we looking at the right problems? Yes.
3. Are we doing the right kinds of teaching? No.
4. Do we have the right kind of organization? Hard to say. ◇

the importance of globalization but faces a world which it doesn't know how to manage. This is a problem it shares with the universities. Chemistry has been a support science for other sciences, providing the chemicals and materials.

2000 +

Conflict between the rich and poor nations

Capitalism vs. religious fundamentalism

Blurring of national identities. Terrorism.

**Discovery**

Predict scope of CO<sub>2</sub> problem

Single molecule electronics

The brain. What is the nature of memory, perception?)

The cell

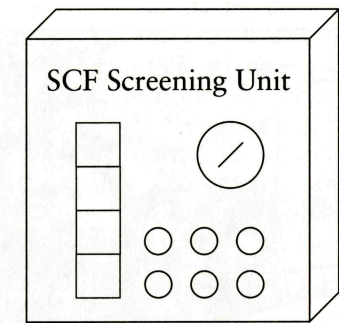
Oxidative phosphorylation (Energy supplied by concentration gradients of sodium and potassium ions. No one is working in this area.)

Discovery is not predictable

Build a general environment which will foster the discovery of unknown things of which we are totally unaware

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## Centennial Meeting Pictures

Photos by Robert Phillips, taken at the Friday night Reception



Vera Meyer performing on her Finkenbeiner Glass Harmonica



Left to right, Henry Brown and Arno Heyn at the Woodward Exhibit



Group at the Reception, Left to Right: Front: Patrick Gordon (co-chair), Dorothy Phillips (co-chair), Michaeline Chen, Phyllis Brauner, Mary Burgess, Cathy Costello; Back: Don Rickter, Paul Walters (ACS President), Michael Hearn (NESACS Chair), Myron Simon, Morton Hoffman

## Mr. Jacoby, you've been had!

Copy of a letter to the Editor, submitted to the *Boston Globe*

By Arno Heyn

In answer to your column of November 5, 1998, I too, have received the material in support of a petition opposing the Kyoto agreement on global warming, sent out by the Oregon Institute of Science and Medicine on Global Warming, and so have many of the 5,300 members of the Northeastern Section of the American Chemical Society (ACS). Several months back we addressed this issue extensively in the pages of *The NUCLEUS*, the publication of the Northeastern Section of the ACS.

Briefly, members in our Section who specialize in atmospheric science and chemistry tracked down the information and found that the supposed scientific reprint which was sent by the Oregon Institute had not been published in a technical publication nor had it been subject to peer-review, as is standard for scientific journals. The opinion expressed was that global warming, if it is, in fact, occurring, would be beneficial to agriculture, is strictly that of the authors, who do not appear to be specialists in atmospheric science. As a consequence, the Oregon Institute urged a petition campaign to reject international agreements on Global Warming ("Kyoto").

The consensus of most scientists who have expertise in this area is, that global warming is occurring, although the extent of the man-made contribution is still in doubt, with the preponderance of the evidence being that this contribution is significant. There may be differences of opinion on the extent of the effect of global warming, but if past experience provides a guide, it may be larger than at first thought.

Change is natural, but it matters very much to us how rapidly such changes occur – civilizations will adapt to changes which occur over thousands of years but changes occurring in a few decades are very disruptive.

I am enclosing the two 1998 issues\* of *The NUCLEUS* which contain editorials and papers by specialists in the field on the topic of Global Warming and on the campaign by the Oregon Institute of Science and Medicine.

Arno Heyn, Editor, *The NUCLEUS* ♦

\*May 1998, pp. 23-24; Summer 1998, 28-35.

## Software Review

Computer Molecules For High Schoolers?

by George Martins, retired, Newton North High School

ChemSite is an interactive 3-D modeling software which generates a great variety of organic and biochemical molecules in line form, ball-and-stick, and space-filling modes.

It allows rotation about two axes, enlargements, dynamic simulations at various temperatures and at constant energy, and the saving and printing of user-generated models or those available on the CDROM and from internet databases. While the software certainly would find usefulness in college organic or biochem courses, the question of whether this software would be useful in high school chemistry courses is a more difficult one to answer.

Firstly, how does the software work? Model generation can follow some four paths. 1) The easiest way to create one's own structures is to use the *Sketch Tool*, available on the tool bar or from the *Build Menu* bar. Molecules are built directly with the mouse, much like sketching on a black board or piece of paper. A *Sketch Menu* appears showing buttons of 10 elements common in organics, and some options. In the large part of the screen called the *Viewport*, moving and clicking the mouse places selected atoms in position bonded to adjacent atoms. The right mouse button allows varying the type of bond.

When sketching is finished, the *Optimize Structure* button performs energy minimization and converts the sketch to a 3D molecule without hydrogen, which can be quickly added by a tool bar button.

2) The most precise way to build the molecule is by using the *Add Atom* selection from the *Build Menu*. An *Add Atom* window appears with the 10

atoms and others possible. There are more drawing options, such as valence geometry, atom style, torsion angle, close ring, etc. Thus selecting atoms and adding them generates the structure. These can be saved in a variety of formats including .lib and .mod.

3) The CDROM contains an extensive list of structures that can be quickly opened. Over 600 structures are stored in the following nine folders: Biochems, Chemsite, DNA, Drugs, Hormones, Organic, Proteins, RNA, and Vitamins. The Organic folder contains additional folders with over 300 molecules, and there are 80 proteins in the Protein folder.

4) The Brookhaven Protein Data Bank is a database of thousands of protein, DNA, and RNA molecular structures contributed by scientists from all over the world, accessible via the internet at <http://www.pdb.pdb.bnl.gov> and <ftp:pd.bnl.gov>, the latter for transferring files of interest using "anonymous" as user name.

Using the *Atom Builder* one can create molecules with rings, add functional groups from alkanes to sulfones, add monosaccharides of D-aldoses, D-ketoses, and others, add amino acids in making protein biopolymers, and also add nucleic acid segments so that very complex structures can fill the Viewport, (one reason to keep the *add hydrogen* as optional selection so as not to "smudge" the structure). Rendering of molecules can be line, ball and stick, space-filling, and molecular orbitals. The latter would be very useful in discussing in the classroom orbital bonding in the varieties of hybridizations.

Molecular dynamics is a technique that integrates the equations of motion for all atoms in a system. The equations of motion are integrated over time to produce a trajectory about a central atom. Simulations are available at Constant Energy and Constant Temperature. These selections includes bath temperature, timestep, and show the path of a particular atom.

The 70 page user manual is written clearly and is easy to follow, showing many menu windows but not any graphics of molecular structures. Also,

the tutorial, though helpful, comes near the end of the manual and would be more useful at the beginning, helping the teacher or student construct a simpler molecule like acetone and performing the many software operations on it.

Now the big question: Is this kind of software useful for chemistry instruction in high school? The answer is a qualified yes. High school chemistry in New England, and for most of the country, usually consists of four levels in a comprehensive high school: The highest level is Advanced Chemistry, often the official Advanced Placement, usually requiring a previous year of one of the two following: Honors First Year Chemistry or Standard College Prep Chemistry (best suited for non-science-math college majors). The least academic and usually descriptive and student relevant one goes by many names such as Descriptive Chemistry. ChemSite would be applicable to students in Advanced or Honors Chemistry. The major problem is that, contrary to the European science system of a specified course in organic chemistry, the latter is taught piecemeal in American chemistry courses and the Advanced and Honors courses stress concepts more related to physical chemistry.

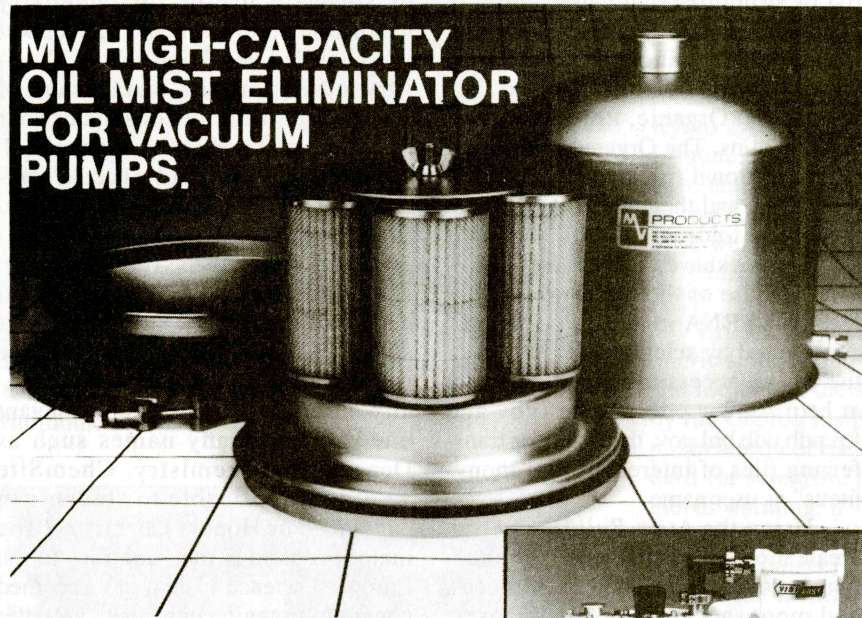
Another problem for use of ChemSite is its format for Windows operating systems only, and not the MAC OS, since many high schools are equipped only with Apple computers.

Here are ways in which ChemSite might be used. 1) Classroom demonstrations on large monitors by the teacher. Teachers in a class or two might display and discuss some of the organic, biochemical, drug, or DNA molecules in their impressive rotation, vibration, space filling modes. This assumes that high school classrooms are equipped with computer systems and large displays. 2) The school computer lab could own a few copies of ChemSite for students of the Advanced and Honors courses to use for project studies. 3) Also, the teacher's copy might be lent to students for home study of the software. The student

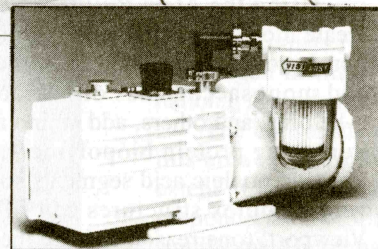
continued on page 16

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## Software Review

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could construct his molecule of interest, study it in structure and dynamics and include printouts of it in his class report, even demonstrating his treatment on the class room monitor to his classmates. ChemSite sells for about \$50 per copy, discounted to about half that on purchase of 100 copies. It is described as a "quickly learned, premier interactive 3-D molecular modeling tool for organic/biochem students, used by students, educators, and professionals worldwide." Students can easily "grasp concepts and theories of the simplest and most complex molecules in an interactive way extending knowledge beyond the stick and 2-D textbook presentations". One can "import, operate on, save, and print molecules from vast databases worldwide." It is available from Pyramid Learning, 11854 Garfield Rd., Hiram, OH, 44234-1868, tel 330-569-7755, (reachme@dvoice.com). The original ChemSite "site" is <http://www.chem-site1.com>.

System requirements are IBM PC; 486 or higher; MS Windows 95, 98, NT; 8 MB RAM, 10 MB free disk space; SVGA display and modem for accessing world databases. It installs in less than 5 minutes. The software worked efficiently on the reviewer's system: AMD 200 Mhz, Win95, 64MB RAM, 8 GB HD, with 256 colors at 800 by 600 SVGA display.

This reviewer had a fun time constructing, rendering, rotating, simulating dynamics, saving, and printing a possible structure for methyl ethyl ketone peroxide suggested by a chemist at the Beilstein booth at the recent fall ACS meeting in Boston. ♦

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## Summer Scholar Report

### Synthesis and Unexpected Reactivity Of 2-Benzylidene-4,5-Dicyano-1,3-Dithiole

Monica A. Rixman\* and D. I. Sandman (Faculty supervisor)  
Center for Advanced Materials  
Department of Chemistry  
University of Massachusetts - Lowell

#### Introduction

1,2-Dicyanoarenes and -alkenes are known to react with alkali metal alkoxides in alcohols to yield molecular cyclotetramers, perhaps the best known examples of which are the phthalocyanines (or tetraazaporphines).<sup>1</sup> In contrast to previous literature<sup>1</sup>, we now report that 2-benzylidene-4,5-dicyano-1,3-dithiole reacts with lithium n-butoxide in n-butanol at reflux to give a new polymer with a conjugated C=N backbone structure.

Phthalocyanine is structurally related to chlorophyll and hemoglobin precursors (both of which are porphyrins), and just as these species are capable of coordinating iron (heme) and magnesium (chlorophyll), so is phthalocyanine capable of coordinating metals among the nitrogen atoms within the ring. Phthalocyanine and its metal derivatives are well known for low ionization energy and excellent thermal stability, as well as for a myriad of industrial applications including painting, printing, paper, textiles, chemical fibers, plastics, and use in semiconductors, lasers, and other quantum electronics research. Although the term phthalocyanine generally refers to a ring that consists of four phthalonitrile units, rings of three and five units, known as subphthalocyanines<sup>2</sup> and superphthalocyanines<sup>3</sup> respectively, have been synthesized as well. Each of the three, four, and five membered forms have characteristic absorptions in the visible spectrum:  $\lambda_{max}$  occurs at approximately 570 nm for the cyclotrimer, ~650-700 nm for the cyclotetramer, and ~900 nm for the cyclopentamer. Phthalonitrile, the monomer of phthalocyanine and its derivatives, has been cyclized by a number of routes to yield both metal-coordinated and metal-free species.<sup>1,2</sup> The synthesis of interest is the reaction of phthalonitrile with a metal alkoxide in alcohol, which is known to yield the metal-free tetraazaporphine.<sup>1,4</sup> When reacted under the same conditions, the title compound (Figure 1, 1a) yields a linear conjugated polymer with weight average molecular weight in the range 17,000-60,000 as determined by gel permeation chromatography (GPC) versus polystyrene standards.

Conjugated polymers, occasionally termed "semiconducting polymers", are a unique group of macromolecules known to have low ionization energies and excitations at wavelengths in the visible spectrum.<sup>5,6</sup> Polymers with backbone structures of the type shown in Figure 1 have been

\* 1998 Norris/Richards Summer Scholar

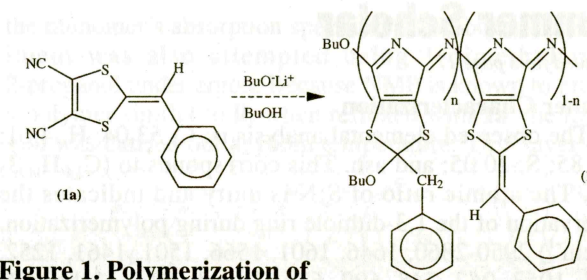


Figure 1. Polymerization of 2-benzylidene-4,5-dicyano-1,3-dithiole

suggested for materials obtained from diphenylmaleonitrile and succinonitrile.<sup>7</sup> A similar structure was also suggested for polymers obtained from the reaction of bis-(3',4'-dicyano-phenoxy)-4,4'-biphenyl with diamines.<sup>8</sup> Phthalonitrile was reported in a 1986 Japanese patent<sup>9</sup> to react with sodium methoxide in methanol to yield such a polymer, but only phthalocyanine was obtained by our group in such experiments. To the best of my knowledge, the work discussed in this paper is unprecedented in supporting such a structure with <sup>13</sup>C NMR evidence. The focus of this paper is the preparation, characterization and photoluminescent properties of this unusual polymer as well as some of our current mechanistic speculation about its formation.

#### 2-Benzylidene-4,5-Dicyano-1,3-Dithiole

The monomer (1a), previously available as a minor reaction byproduct,<sup>10</sup> was synthesized in the present work by a three step route.<sup>11</sup> 1a absorbs light in the visible region at 460 nm, and emits a fluorescence at 530 nm. The monomer is a bright red needle-like crystalline solid exhibiting a melting range of 148-150°C, and is readily soluble. Mass spectrometry reveals the expected molecular ion at m/e 242. Elemental analysis: Calculated for C<sub>12</sub>H<sub>6</sub>N<sub>2</sub>S<sub>2</sub>: C, 59.48; H, 2.50; N, 11.56; S, 26.46. Found: C, 59.65; H, 2.28; N, 11.29; S, 26.62 IR (cm<sup>-1</sup>): 2900, 2214, 1580, 1561, 1529, 1182, 1069, 943, 844, 828, 752, 729, 690. <sup>1</sup>H NMR (ppm): 6.7, 7.35-7.5(m). <sup>13</sup>C NMR (ppm): 109.3(2), 117(2), 126.3(2), 127.5, 128.7 129.5, 130.2, 134.8.

#### Polymerization of 2-Benzylidene-4,5-Dicyano-1,3-Dithiole

In light of reports from extensive phthalocyanine research,<sup>1,2</sup> the reaction illustrated in Figure 1 was expected to produce a molecular tetraazaporphine. Analogous reactions have also been attempted with other reagents known to give a cyclotetramer from phthalonitrile, including dimethylamino-2-propanol and sodium pentoxide in pentanol; all reagents yield a similar linear polymer. The product is a dull blue-black amorphous powder completely soluble in dimethylformamide, dimethylsulfoxide, and n-methylpyrrolidinone (NMP); solutions are dark purple. From thermogravimetric analysis (TGA) data, the sample begins to decompose at 150°C, loses weight most dramatically at 175°C, and is reduced to 80% of its weight by 250°C Based on IR, <sup>1</sup>H, and <sup>13</sup>C NMR spectra, as well as elemental analysis, a current hypothesis for the structure of the I polymer is given in Figure 1 (1b).

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## Summer Scholar

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### Polymer Characterization

The observed elemental analysis is: C, 53.04; H, 4.61; N, 8.85; S, 20.05; and ash. This corresponds to  $(C_{14}H_{14}S_2N_2)_n$ . The atomic ratio of S:N is unity and indicates the preservation of the 1,3-dithiole ring during polymerization. IR ( $cm^{-1}$ ) 2950-2860, 1646, 1601, 1566, 1501, 1461, 1252, 1137, 1053, 963, 748, 699, 624. The absence of the -CN stretch in the IR spectrum suggests a conjugated backbone structure formed by cyclopolymerization across the dicyanoalkene moiety.  $^1H$  NMR (ppm): 0.84-0.93(m), 1.27-1.37(m), 1.6(m), 3.39(t), 3.57, 3.65, 4.01-4.04(t), 6.2, 7.23-7.27(m), 7.30-7.33(t), 7.43, 7.48, 7.48-7.52(t), 7.62, 7.95(d).  $^{13}C$  NMR (ppm): 14.35(2), 19.30-19.52(3), 21.23, 35.55, 62.61, 64.77, 65.22, 66.76, 127.45(2), 127.63-130.54(m), 131.64, 133.70, 135.33, 135.89, 164.71, 168.15, 172.02, 173.50. The assignment of the peaks at 165-174 ppm in the  $^{13}C$  NMR spectrum to the carbon atoms in the conjugated backbone of the polymer follows from results from NMR simulation software, as well as reported resonances of similar carbons in phthalocyanines and diiminoindolines (165-175 ppm),<sup>12</sup> polyazines (155-161),<sup>13</sup> and polyaniline (160-170 PPM).<sup>14</sup> These peaks were particularly difficult to observe due to the high rigidity of the C=N bond; the sample was studied with 20-50,000 scans and a relaxation time of 2-3 seconds (varied by sample) in a

500 MHz spectrometer before the resonances were observed.

### Optical Spectra

As noted earlier, the light absorption by conjugated polymers at visible wavelengths is a defining characteristic of this family of macromolecules. Light emission by these molecules has also been known to occur in a large number of species.<sup>5,6</sup> Dilute solutions of **1b** in DMF are observed to absorb light throughout the visible spectrum, with significant absorption tailing past 1000 nm. As Figure 2a illustrates, various samples of **1b** exhibit solution maxima between 530 and 578 nm, and obvious shoulders are present at 640 and 850 nm. Viscous solutions of **1b** in DMF were spin coated onto a glass slide, and the absorption spectra of the solid films found to exhibit maxima in the range 565-578 nm. Although significant absorption tailed out past 1000 nm as in the solution spectrum, no shoulders or other peak indications were observed in the solid state spectrum

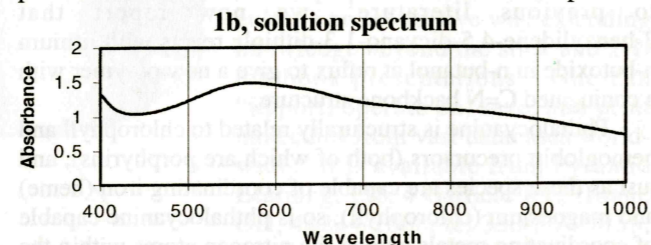


Figure 2a. Polymer absorption spectrum, solution in DMF.

## Summer Scholar

continued from page 18

(Figure 2b). A dilute solution of **1b** in THF was found to exhibit a strong fluorescence at 588 nm, shown in Figure 3.

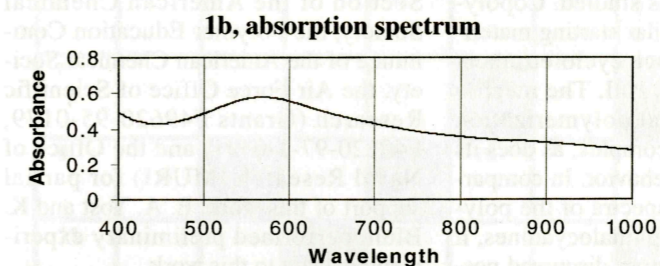


Figure 2b. Polymer absorption spectrum, solid film.

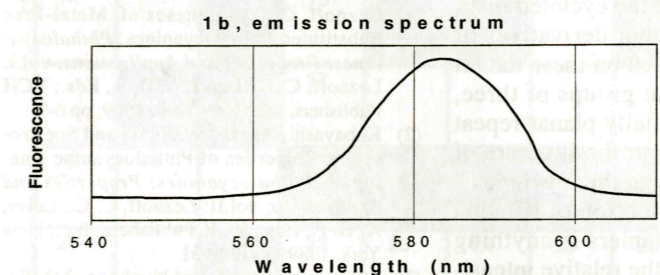


Figure 3. Polymer emission spectrum, solution in THF

### Mechanistic Discussion and Related Experiments

Any mechanistic discussion of the observed polymerization of **1a** should offer plausible reasons why **1a** should form a polymer and not a cyclotetramer. Since **1a** undergoes no reaction when refluxed in *n*-butanol, clearly an alkoxide is required for polymerization. In light of work reporting the alkoxide-induced formation of cation radicals from dicationic,<sup>15</sup> as well as recent studies involving anion radical formation from additions of methoxide to  $C_{60}$ ,<sup>16</sup> a plausible mechanism for the polymerization of **1a** is shown in Figure 4. It is arguable that the butoxide ion may react with **1a** to form a sufficiently electron-rich alkoxy adduct anion consisting of one to four monomer units that is capable of forming a pi donor/acceptor complex with a neighboring monomer unit. This would be a pi-complex between a closed-shell monoanion and a neutral closed shell acceptor.<sup>17</sup> Electron transfer may then occur within the complex such that the acceptor becomes an anion radical, which may readily dimerize with another monomer unit, thus forming a dianion. The dianion dimer would then be capable of propagating to yield a linear conjugated polymer.

The reduction of paraquat to its cation radical has been achieved by exposing the species, in aqueous solutions of primary or secondary alcohols, to UV light at wavelengths near its absorption maximum.<sup>15</sup> It was therefore of interest to attempt to initiate the electron transfer mechanism proposed in Figure 4 by irradiating **1a**, in *n*-butanol at reflux under argon, with a polychromatic UV lamp with maximum output at 370 nm. The broad spectrum of the lamp overlaps

the monomer's absorption spectrum cited above. The experiment was also attempted using 1-dimethylamino-2-propanol under argon. Because NMP is known to produce a polymer similar to **1b** when refluxed with **1a**, the irradiation was carried out at room temperature. Thin layer chro-

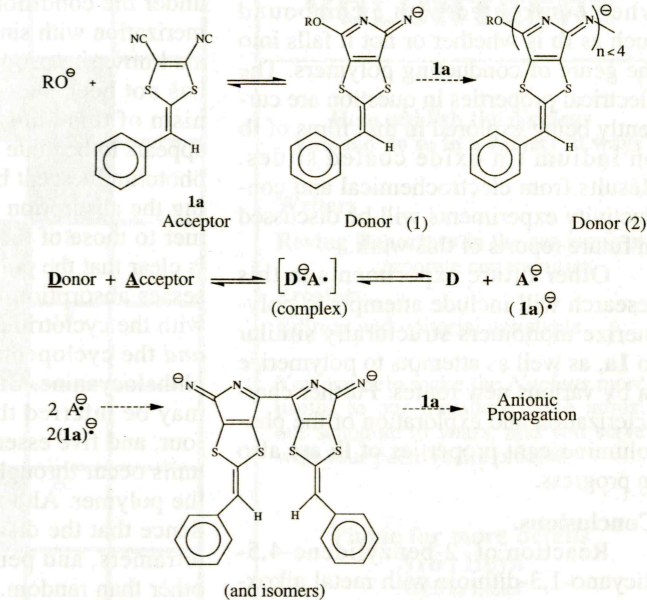


Figure 4. Proposed mechanism for polymerization of **1a**.

matography (TLC) analysis of the reaction mixtures after 96 hours indicated the presence of at least five compounds in each (including unreacted **1a**), with no precise correlations between the two solutions. UV/Visible absorption spectroscopy of both solutions revealed only the absorption spectrum of **1a**. In the absence of the broad absorption maximum of the known polymer **1b**, I conclude that polymerization is not a major pathway under these conditions.

### Attempted Copolymerization

It was suspected that if phthalonitrile were incorporated into the structure of **1b**, it would likely lend some of the physical properties of phthalocyanine to the polymer. Hence, copolymerization of phthalonitrile / **1a** in a 25%:75% molar ratio was attempted, holding all other previous reaction conditions constant. Only the known polymer **1b** and phthalocyanine were detected in our analysis of the reaction mixture.

### Further Work

Phthalonitrile is known to possess a reversible reduction at -1.5 V vs. SCE. As **1a** is structurally similar to phthalonitrile, it is of interest to study the electrochemical reduction of **1a**. Using phthalonitrile as a standard, the reduction of **1a** with tetrabutylammonium hexafluorophosphate is currently being studied by cyclic voltammetry.

As noted earlier, conjugated polymers are sometimes referred to as "semiconducting polymers". Many conjugated polymers are rendered conductive by an electron transfer


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## Summer Scholar

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process termed "doping". Clearly one of the first questions one might raise when confronted with a compound such as **1b** is whether or not it falls into the genre of conducting polymers. The electrical properties in question are currently being explored in thin films of **1b** on indium tin oxide coated slides. Results from electrochemical and conductivity experiments will be discussed in future reports of this work.

Other future experiments in this research will include attempts to polymerize monomers structurally similar to **1a**, as well as attempts to polymerize **1a** by various new routes. Further characterization and exploration of the photoluminescent properties of **1b** are also in progress.

### Conclusions.

Reaction of 2-benzylidene-4,5-dicyano-1,3-dithiole with metal alkoxides in alcohols yields a novel conjugated, linear polymer of high molecular weight and solution processability. The polymerization is fast, clean, and is

readily achieved with a variety of reagents. In contrast to the reported chemistry of similar materials,<sup>1,2</sup> our monomer shows no evidence to date of forming a molecular tetraazaporphine under the conditions studied. Copolymerization with similar starting materials known to produce cyclotetramers has not been successful. The mechanism of this unusual polymerization appears to be quite complex, as does its photoluminescent behavior. In comparing the absorption spectra of the polymer to those of the phthalocyanines, it is clear that the polymer discussed possesses absorption features in common with the cyclotrimer the cyclotetramer, and the cyclopentamer derivatives of phthalocyanine. Based on these data it may be inferred that groups of three, four, and five essentially planar repeat units occur throughout the structure of the polymer. Although there is no evidence that the distribution of trimers, tetramers, and pentamers is anything other than random, the relative intensities of the maxima and shoulders in the polymer solution absorption spectrum suggests that the trimer is most prevalent.

### Acknowledgements.

The author would like to thank Dr. Daniel J. Sandman and Dr. V. Shivshankar for their contributions to this research, as well as the Northeastern Section of the American Chemical Society, the Polymer Education Committee of the American Chemical Society, the Air Force Office of Scientific Research (Grants F49620-95-0179, F49620-97-1-0391) and the Office of Naval Research (MURI) for partial support of this work. E. A. Yost and K. Blum performed preliminary experiments related to this work.

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## Puzzle Column

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by Paris Svoronos

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			17					
18	19							20
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27								

### ACROSS

1. Any element between lanthanum and hafnium, or cerium through lutecium
8. \_\_\_ gas: another term for a noble gas
9. Its capital is Lansing
10. \_\_\_ ice: frozen carbon dioxide
11. Time period
12. Charged species
13. Letters surrounding P, Q and R
14. It indicates tin
16. Popular alien of the early 1980s
17. Calcium ore
18. Source of metals
20. Element atomic number 14
21. Element atomic number 11
22. Law that relates pressure and absolute temperature in ideal gases
27. The passage of a gas through a small hole into an evacuated space

### DOWN

1. Common name for calcium carbonate
2. Negatively charged species
3. The second lightest noble gas
4. Prefix indicating three
5. Hat's consonants
6. \_\_\_ equation: equation used in oxidation-reduction reactions
7. Known for his relativity theory
10. Opposite of don't
13. Prefix indicating bone-related (reversed)
15. Element atomic number 20
19. World War II British Air Force (initials)
22. Expensive metal
23. Element atomic number 62 (reversed)
24. Point's vowels
25. Dr. \_\_\_: James Bond's enemy
26. Ton's consonants

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## Summer Scholar

continued from page <None>

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## Historical Notes

We present here short biographies of chemists and chemical, engineers whose deaths have been reported to us during the past six months. Please send us obituary notices that appear in community newspapers that we do not see.

by Edward R. Atkinson,  
Amherst, Mass.

**Anna Jane Harrison**, 85, died on August 8, 1998 following a stroke. She was born and raised on a farm near Benton City, Missouri, and taught in her own one-room school for two years following her receiving the B.S. from the University of Missouri in 1933. She then returned to the University for M.A. and Ph.D. degrees in physical chemistry. During the 1940-1945 period she was a member of the faculty at Sophie Newcomb College of Tulane University. She came to Mount Holyoke College in 1945, was head of the chemistry department (1960-1966) and Keenan Professor from 1976 until retirement in 1979.

Anna Jane was active in ACS affairs for 62 years and served as ACS president in 1978. Among some 20 honorary degrees and awards was the James Flack

Norris Award for Outstanding Achievement in the Teaching of Chemistry given by our Section in 1977. She was a long-time board member of the AAAS and served as president in 1984.

At the recent national ACS meeting in Boston Anna Jane was to present a paper before the Division of the History of chemistry. In her place a number of chemists who had known her over the years spoke briefly. A memorial service was held at Mount Holyoke on October 23, 1998. The service also honored Lucy Weston Pickett, a longtime member of the chemistry faculty who had died on November 23, 1997 at age 93. Obituaries for Anna Jane Harrison, with photos, were published in the *New York Times*, August 16, 1998, and in the *Boston Globe*, August 12, 1998.

**Hoyt Clarke Hottel**, 95, died of pancreatic cancer on August 18, 1998. He was an Indiana native who received a B.S. in chemistry from the University of Indiana in 1922 and the S.M. in chemical engineering from MIT in 1924. He was an Institute Fellow and director of the MIT School of Chemical Engineering Practice before becoming a member of the MIT faculty in 1928. During the next 40 years he became director of the MIT Fuels Research Laboratory and the first Carbon Petroleum Dubbs Professor. A chair in the chemical engineering department was named after him in 1995.

Hottel was co-author of three books, 150 technical papers, and 8 patents. Among his more famous students was Charles Stark Draper. He built three solar houses while chairman of a project at MIT. During World War II he was chief of the NDRC committee on incendiaries. In 1948 he received the Medal for Merit, a civilian award, for services to the war effort and was similarly honored by the British government. He was active in the affairs of the National Academy, the American Academy of Arts and Sciences, and the AIChE. In addition to many professional awards, he received in 1994 the John Fritz Medal, awarded by the combined engineering societies, and the highest honor in the engineering profession. He was a member of Phi Beta Kappa, Sigma Xi, Tau Beta Pi, Phi Gamma Delta, and Epsilon of Alpha Chi Sigma. A memorial service was held at the MIT chapel on September 11, 1998. Longer obituaries, with photos, were in the *Boston Globe*, August 25, 1998 and in the *Technology Review*, November/December 1998, p. 46.

*To be continued.*

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Prof. Catherine Costello (Boston Univ. Sch. Med.)  
"Mass Spectrometry in Molecular Medicine"  
Northeastern Univ.  
Hurtig 129, at 4 PM

### Jan. 13

Prof. Jon Zubieta (Syracuse Univ.)  
"Solid State Coordination Chemistry: Complex Cation Influences on Vanadium and Molybdenum Oxide Structures"  
Mass. Inst. of Technology  
Room 6-120, at 4 PM

### Jan. 20

Prof. Marcetta Darensbourg (Texas A & M Univ.)  
"Chemical Model Studies for {NiFe}Hydrogenase, an Organometallic in Biology"  
Harvard Univ.  
Room MB23 (Pfizer), at 5 PM

### Jan. 21

Prof. Mike Maroney (Univ. MA, Amherst)  
Title TBA  
Mass. Inst. of Technology  
Room 6-120, at 4 PM

Prof. Vernon Reinhold (Univ. NH)  
"Is Functional Genomics Really Glycomics?"  
Boston Glycobiology Discussion Group  
MIT Faculty Club, at 6:30 PM  
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### Jan. 26-28

Prof. Maurice Brookhart (Univ. NC, Chapel Hill)  
Karl Pfister Visiting Lecturer  
Mass. Inst. of Technology  
Room 6-120, at 4 PM

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