

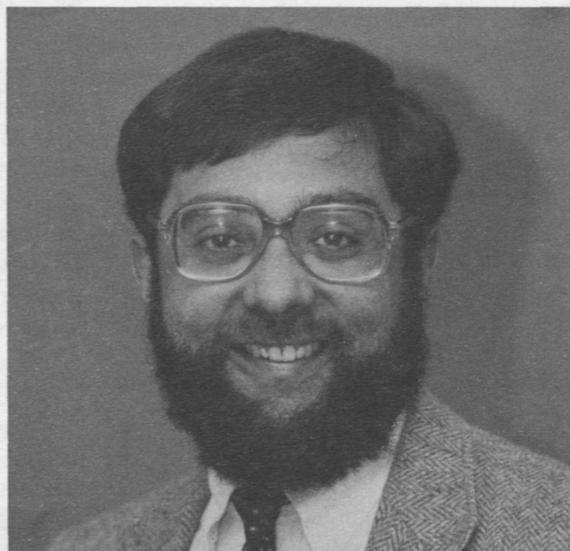
# Cornell Chemistry

The Newsletter of the Department of  
Chemistry at Cornell University and  
the Society of Cornell Chemists

December 1990  
Issue 49

## David Zax Joins the Department

David Zax received his PhD from the University of California at Berkeley, where he was a National Science Foundation Predoctoral Fellow with Alex Pines. He worked with Shimon Vega at the Weizmann Institute as a Bantrell Postdoctoral Fellow, and then with Charles P. Slichter at the University of Illinois as an IBM Post-doctoral Fellow. After a period as staff scientist at the Weizmann Institute, he joined the Cornell faculty in July, 1990.



My training and interests lie in applications of nuclear magnetic resonance (NMR) spectroscopy to problems in solid state chemistry and physics. While the Department of Chemistry already has four working superconducting magnet systems in its NMR facility, the sorts of experiments I plan on doing are rarely done in departmental facilities. Instruments which are capable of serving dozens of users a day tend not to be compatible with the applications or time demands I have in mind, so we are in the process of building our own machine. That should take until the end of winter. Then, we will start doing science.

Most analytical tools developed for solid state structure determination focus on the "big picture" and provide information about gross structure and bulk properties. Solid state NMR is unique in its ability to analyze phenomena at short range; optically, to about 5-10 Å. Our goal is to

develop an understanding of the interplay between short-range structure and bulk properties in solid state materials. These questions are important throughout the world of "advanced technologies" or "materials science," because more and more often problems are being solved by the exploitation of new materials—such as polymers, alloys, composites, and/or doped systems—where the sort of long-range order characteristic of ideal solids such as NaCl or pure metals is unknown.

To add a further complication, our understanding of these systems is often developed within a framework determined by theoretical calculations of equilibrium structure and properties. Unfortunately, many materials are prepared via elaborate recipes where the ultimate products are kinetically, and not thermodynamically, determined. Assumptions about properties based on equilibrium structures may therefore only poorly represent actual

materials. Thus, it is important to develop a method for understanding *chemistry* (i.e. the impact of local bonding and structure) on solid state properties. Because NMR is *atom-specific* as well as *chemically sensitive*, it can provide important experimental information about actual atomic and electronic distributions. Furthermore, it is possible to track dynamics, or follow changes in chemistry and morphology as a function of chemical/thermal treatments.

At Cornell I plan to apply our methods to a variety of systems, including highly doped silicon. In recent years it has become possible to grow solid state materials essentially atom-by-atom, and thereby to maintain a far more aggressive guiding hand in the resulting structures than was traditionally possible. Using low temperature, ultra high vacuum/chemical vapor deposition, boron can be introduced into Si films at concentrations far beyond equilibrium limits while maintaining high crystallographic perfection. These compounds are characterized by large numbers of charge carriers and unusually high electronic speeds. I plan to follow (1) structure (both chemical and electronic) in highly doped Si single crystals, and the correlation between the local properties and the observed electronic characteristics; and (2) the rates of atomic diffusion at the growth surface of these crystals, and in the bulk thereafter. This will detail the kinetic barriers which maintain non-equilibrium structures, because if surface diffusion is sufficiently slow then whatever structure is formed by the initial chemistry is locked in by the surrounding matrix of the growing solid state structure.

-David Zax

# Department News

## Faculty Honors

Professor **Roald Hoffmann** received an honorary D.Sc. from the University of Maryland in May. His second collection of poems, "Gaps and Verges", was published by the University of Central Florida Press.

The Council of the American Physical Society has awarded Professor **Frank DiSalvo** the 1991 American Physical Society International Prize for New Materials, sponsored by IBM. The prize is given to recognize and encourage outstanding achievement in the science and application of new materials.

## Spring 1991 Lectures

Robert Grubbs, a professor at the California Institute of Technology, will deliver the **1990-91 Bayer/Mobay Lectures** in Baker Laboratory on January 28, 29, and 30, 1991. The general topic of the lectures is "Polymer Synthesis with Organometallic Reagents". Lecture titles are "ROMP Polymerization - Synthesis of Polymers of Controlled Structures"; "Synthesis and Characterizations of Substituted Polyacetylenes"; and "Catalyst Synthesis - Alkylidene Complexes from Reduced Tungsten Alkoxides and Aqueous Ru(II) Complexes".

The **1990-91 Debye Lectures** will be delivered by Professor Jean Rouxel of the University of Nantes. The first lecture, entitled "Solid State Chemistry: Challenges and Opportunities", will be given on April 22, 1991. The remaining two lectures, entitled "Design of Novel Solids: Low Dimensional Structures", and "Chemical Reactivity of Solids: Inter-collision Reactions", will be given on April 23 and April 25, respectively.

## A Lasting Memorial

The Department of Chemistry is the recipient of a \$100,000 bequest from the estate of Helen S. Holzberger, the widow of **Walter Holzberger, BChem '21**. The gift, known as The Walter and Helen S. Holzberger Contribution from the Class of 1921, will be used to benefit both undergraduate and graduate students for many years to come.

## New Students Arrive; Enrollment Holds Steady

This year's entering class of graduate students numbered 37, a slight increase over last year's class. While the total number of graduate students remains relatively steady, the proportion of women in the classes has increased over the past ten years, as has the number of students arriving from outside the United States.

	<u>1980</u>	<u>1989</u>	<u>1990</u>
Male	29	18	21
Female	10	16	16
Non-U.S. citizen	4	10	7

The number of first- and second-year undergraduates taking introductory chemistry courses has held steady for the past three years, but still reflects a loss of about 14% when compared with enrollments a decade ago. On the national level, introductory chemistry enrollments have decreased about one-third in the past ten years.

First- and second-year undergraduates enrolled

	<u>1980</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>
Chem 103	442	274	286	278
Chem 207	1181	683	699	746
Chem 211*	n/a	430	381	368 **
Chem 215	<u>71</u>	<u>88</u>	<u>109</u>	<u>86</u>
Total	1694	1475	1475	1478 **

\* Chem 211 was introduced in the Fall semester, 1988. The course is offered in both semesters of each year.

\*\* estimated



# Alumni News

**Patrick G. Barber**, PhD '69, on a sabbatical leave from Longwood College, is participating in a faculty exchange with the Humboldt University in Berlin.

**Irving Berstein**, PhD '51, worked for Tracerlab, Inc. for seven years after leaving Cornell, then formed a company called Controls for Radiation Inc., working in the fields of radiation protection, environmental measurements, and radiation dosimetry instrumentation. After selling that company, Berstein worked for the Harvard-MIT Division of Health Sciences and Technology, where he was in charge of collaborative research program development. In 1980 he formed a company which manufactured home diagnostic kits, *First Response*, for pregnancy and ovulation prediction. He says he would like to see Cornell's graduates thinking of entrepreneurial careers. What a good example!

**Linn B. Bowman**, BChem '25, retired as president of Rochester Gas & Electric Corp. in 1969. Mr. Bowman enjoyed a close personal relationship with Professor Laubengayer for many years, and likes the feeling that after 65 years he still has a connection with the Cornell Chemistry Department.

**David Clark**, BS '71; PhD (Chem. Eng.) '78, is a senior scientist with the American Red Cross in Rockville, MD.

**Lincoln I. Diuguid**, PhD '45, is president of Du-Good Chem. Lab & Mfrs. in St. Louis, Missouri.

**Angela Galiano-Roth**, PhD '89, is working at Mobil Chemical in Paulsboro, NJ. She says, "Dave Blain is right across the hall from me at work as he was right down the hall from me while we were both at Cornell."

**Nathan Goldberg**, AB '34, is retired and living in South Orange, NJ.

**Jeanne Sawicki Hamers**, PhD '87 and **Robert Hamers**, PhD '85, have moved to Madison, WI. Bob has a tenured associate professor position in the chemistry department and Jeanne is an assistant scientist in the engineering school, both at the University of Wisconsin.

**Carla Holder**, AB '76, is working at Lever Brothers doing strategic and financial planning for the detergent division. Her chemistry background comes in very handy, especially when talking with R&D staff.

**Daniel Lang**, AB '88, is a student at Cornell Medical School.

**David Leitner**, AB '85, has been named a 1990 postdoctoral fellow in chemistry by the National Science Foundation. Leitner, who earned his PhD from the University of Chicago, will continue his work at the University of Heidelberg, calculating and analyzing the vibronically coupled spectra of excited intermediates.

**Sylvia Lopez**, PhD '90, is a 1990 NSF postdoctoral fellow in chemistry. Lopez, a member of H.D. Abrufña's research group here at Cornell, will move on to the University of Minnesota to continue her fundamental work in the materials sector with a study of the electrocrystallization dynamics of low-dimensional solids.

**Patrick McGovern**, AB '66, is a research specialist in archeological chemistry at the University of Pennsylvania's Museum Applied Science Center for Archeology (MASCA) in Philadelphia, PA.

**Kate L. McPherran**, AB '83, is a self-employed technical writer and lives in Pittsburgh, PA.

**K. Ole Osrunn**, who was a grad student with W.T. Miller in the late 50's, resides in Fort Worth, TX, where he is employed by Sid Richardson Carbon and Gasoline Co.

**Joseph M. Ragosta**, PhD '86, is the founder and president of Ionex Consulting Services in Las Cruces, NM. Ionex assists clients with the evaluation and implementation of ion exchange processes for chemical purification, waste treatment and catalysis. Joe was formerly VP for marketing for Bio-Recovery Systems in Las Cruces. He began his career as a market manager for special waste treatment applications at Rohm and Haas.

**Malcolm Stevens**, PhD '61, is a professor of chemistry at the University of Hartford in Connecticut.

**Joshua A. Telser**, AB '80, is an assistant professor of chemistry at Roosevelt University in Chicago, IL.

**William J.L. Wallace**, PhD '37, resides in Institute, WV. He retired in 1973 as president of West Virginia State College.

**Marilyn Ward**, AB '72, lives in Syracuse, NY and is a psychiatrist at the Central NY Psychiatric Center.

**Lihten Wu**, AB '87, is a PEW fellow at Rockefeller University.

## Alumni Deaths

**James Richard Adams**, BChem '21, July 25, 1988.

**Warren M. Sperry**, BChem '21, July 11, 1990.

**Richard K. Parsell**, BChem '21, October 14, 1989.

**Harold A. Jewett**, BChem '22, February 23, 1990.

**Paul R. Judy**, PhD '28, January 10, 1989.

**Albert K. Shadduck**, BChem '28, MChem '32, March 11, 1990.

**J. Frank Thompson**, BChem '28, February 14, 1990.

**Marshall J. Walker**, BChem '33, October 29, 1989.

**Robert L. Voorhees**, BChem '35, December, 1989.

**Frank W. Bowen**, BChem '38, ChemE '39, February 19, 1990

**Samuel H. Reiser**, BChem '38, October 18, 1989.

**Donald W. Andrus**, PhD '40, October, 1988.

**Leonard W. Stieger, Jr.**, BChemE '48, February 1, 1990.

This newsletter is printed on recycled paper.

# A Letter from the Chair JAN 21 1991

Student enrollment and new faculty serve as the twin themes for this issue of Cornell Chemistry. These stories intersect, and the implications for our department and departments throughout the country are not good.

We are just at the beginning of a demographic curve that will dramatically increase the number of faculty members needed in chemistry departments. Today there are approximately 200 new academic jobs a year at PhD granting institutions — roughly one per department per year. Departments are roughly a year late in filling these jobs, so each August some 400 academic jobs are vacant. The 200 new jobs a year will increase to 300 in 1995, 500 in 2000, and 600 in 2002! Finding out how many graduate students are interested in pursuing academic careers is a harder job. The best estimate by the American Chemical Society is that roughly 150 students a year are interested in an academic career, and that the number of interested students is not increasing.

How will this affect our department? Well, things will be very interesting. Even if we hire a new person every year until the year 2000, we will most likely have a smaller faculty in 2000 than we do today. If we hire three people every two years, we could reach our authorized level of thirty-four by the end of the century. Finding new academics and providing them with the resources needed to establish vigorous programs will be the top priority of the next several department chairs.

-Jon Clardy

*Cornell Chemistry is published by the Department of Chemistry at Cornell University.  
Jon Clardy, Chair; Earl Peters, Executive Director  
Donna Middleton, Editor; Kelly Strickland, Editorial Assistant*

**The Society of Cornell Chemists asks you to support the cost of printing and mailing this Newsletter with your voluntary, annual dues of \$10. Please make your 1990 check payable to "Cornell Chemistry" and mail it to The Society of Cornell Chemists, G-03 Baker Laboratory, Department of Chemistry, Cornell University, Ithaca NY 14853-1301**

Cornell University  
Department of Chemistry  
Baker Laboratory  
Ithaca, New York 14853-1301

Nonprofit Org.  
U.S. Postage  
PAID  
Cornell  
University