

# Cornell Chemistry

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

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## Electrochemist Uses Many Tools



*Héctor D. Abruña came to Cornell in 1983 and was promoted to Associate Professor with tenure in 1988. Professor Abruña is the recipient of a Presidential Young Investigator Award, an Alfred P. Sloan Foundation Fellowship, and the Tajima Prize of the International Society of Electrochemistry. He is a member of the American Chemical Society, Electrochemical Society, Society of Electroanalytical Chemistry and the Phi Lambda Upsilon Honorary Chemical Society.*

*"Tito's" research group consists of eight graduate students, one postdoctoral associate, one visiting professor and two undergraduates. We asked him to describe what's keeping them busy.*

My research group takes a multidisciplinary approach to the study of electrochemical phenomena in an effort to gain an understanding of the factors that govern electrochemical reactivity. Such an approach has led to our using non-traditional techniques for the study of electrochemical systems.

For example, X-rays represent unique probes for the study of electrochemical interfaces because they can provide structural information in-situ. Our group has used x-ray based techniques such as surface EXAFS (extended x-ray absorption fine structure) and x-ray standing waves (XSW).

With these techniques we have been able to determine the structure of metal monolayers on electrode surfaces as well as concentration profiles as a function of applied potential.

We also employ chemically modified electrodes (CME's) in analytical and

electrocatalytic applications. In our analytical studies we employ CME's for the determination of transition metal ions and organic functionalities in solution. The method is based on the pre-concentration of the analyte at the electrode surface by its modification with functionalized polymers which carry reagents for the sensitive and selective determination of the species of interest. We have developed procedures for the determination of a variety of metal ions and organic functionalities. We are currently combining this approach with the use of microelectrodes for the analysis of small specimens including single cells.

In the general area of electrocatalysis at modified electrodes, our work has involved the synthesis and electrochemical characterization of reactivity trends of transition metal complexes and the incorporation of those onto electrode surfaces. A system in which we are particularly interested is the electrocatalytic reduction of carbon dioxide.

Closely related to the two areas mentioned is the study of electron and energy transfer and transport processes in redox polymers and their molecular weight dependence. We prepare redox polymers based on transition metal complexes of vinyl-bipyride and related ligands by both solution polymerization and electroreductive polymerization. In the former case we also fractionate the products according to molecular weight by gel permeation chromatography. We have been able to determine the dependence of redox conduction on the nature of the metal center as well as temperature. In addition we have performed spectroscopic and electrochemical characterization of these polymeric materials as a function of molecular weight.

Finally a word of thanks to the members of my research group: Dr. J. White, Prof. S. Cha, M. Albarelli, H. Hurrell, S. Lopez, D. Acevedo, M. Bommarito, C. Arana, B. Pendley, K. Liu, S. Lowery and R. Bretz.

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# FACULTY NEWS

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## New Grants

**Héctor Abruña**, DOD/Navy-ONR - \$108,549, *Surface EXAFS and X-ray Standing Wave Studies at Well Defined Electrode Surfaces*

**Simon Bauer**, NASA - \$50,000, *Kinetics of Nucleation and Condensation from Vapors of Metals and Metal Oxides*

**Jon Clardy**, ED - \$150,000, *Chemistry Graduate Assistance for the National Need*

**Paul Houston**, DOE - \$95,000, *State-Resolved Studies of the Methyl Radical*

**Roger Loring**, ACS-PRF - \$18,000, *Microscopic Theory of the Excitation of Molecular Motions in Liquids with Short Optical Pulses*

**Laura Philips**, ACS-PRF - \$18,000, *Infrared Studies of the Chemistry and Structure of Molecules and Clusters in a Supersonic Expansion*

**Jerrold Meinwald**, CNS Res. - \$33,440, *Testing of Arthropod Venom Fractions; Anaquest, \$64,016, Synthesis of Optically Pure Inhalation Anesthetics*

**George Morrison**, EG&G Idaho - \$30,000, *Subcellular Boron Distribution in BNCT Using Microscopy*

**John Wiesenfeld**, NSF - \$121,600, *Atmospheric Ozone Chemistry*

## Awards and Nominations

**Jerrold Meinwald** is being recognized for his broad-ranging contributions to organic chemistry by the ACS Division of Organic Chemistry. The Arthur C. Cope Scholar Award will be presented along with a \$15,000 unrestricted research grant at the symposium of the same name during the ACS national meeting September 10-15 in Miami Beach.

**Fred McLafferty** received the Frank H. Field and Joe L. Franklin Award for Outstanding Achievement in Mass Spectrometry. His achievements include the discovery that MS ion decomposition mechanisms can be described in terms of familiar chemical reaction pathways. One of the mechanisms he found, now called the McLafferty rearrangement, remains the sole "name" reaction in the MS field.

**Pete Wolczanski** has been honored for significant innovative academic achievement in catalysis research by Union Carbide's Chemicals and Plastics Group and its South Charleston Technical Center. He and six other scientists received the 1988 Innovation Recognition Award for research with catalysts, substances that modify the rate of chemical reactions without being consumed in the process.

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# ALUMNI NEWS

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We received many letters and donations in memory of Lauby; here are a few of the comments we thought we'd share.

*Lauby had a great influence on me as an undergraduate, as a graduate, and later in my career.*

- Arthur Newkirk, PhD '40

*He was a good mentor and a good friend.*

- James E. Magoffin, PhD '36

*To that great Professor and wonderful human being, Lauby - in memoriam.*

- Betty Armstrong, wife of the late Dr. Ben Allen, PhD '50

*....he was a founder/builder/originator - aside from his chemistry professoring - he founded (with others) the Statler Club, the Yacht Club, the American Wine Association... As you know, he was the Department Historian.*

- Robert Hughes

*Lauby meant a great deal to me. I'm sure this fund will be used to perpetuate his goals.*

- William Watt, PhD '56

*It was with sadness that my wife and I heard of the death of Lauby. I remember with the greatest gratitude the welcome he extended me as a postdoc at Cornell in 1958-9 and the excellent start he gave to my professional career.*

- J. David Smith, Pdoc '58

Thanks to all of you who donated or wrote.

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# STUDENT NEWS

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## ACS Physical Chemistry Prizes and Organic Fellowships

Two of the three national 1988 ACS/Procter & Gamble Awards in Physical Chemistry were made to graduate students in the department: **Laurence Fried**, who completed his PhD in August, was a member of Greg Ezra's research group. He is currently a postdoctoral research associate at the University of Rochester. **Rachel Loo**, who is completing her PhD, worked in Paul Houston's group. They each received a check for \$2,500.

**Thomas Lectka**, a member of John McMurry's group, was chosen as one of nine awardees of the ACS Division of Organic Chemistry Graduate Fellowship sponsored by Monsanto for the academic year 1988-89. The Fellowship consisted of a check for \$9,000. Lectka, who is in his 4th year of graduate study is working on a study of three-center, two-electron bonds in organic compounds.

## Faculty/Student Lunches

**John McMurry** hosted four informal luncheons for prospective chem majors in November. Over 40 sophomores enjoyed the opportunity to talk with chemistry faculty members during the lunches, which are part of Cornell Chemistry's effort to inform undergraduates about the chemistry major.

## Chemistry Club

**Emily Ehrenfeld '89**, has organized a Cornell Chemistry Club for undergraduates. Plans for future meetings include visits to industries in the area, a rap session with chemistry graduate students, and a career planning workshop.

## Dept of Education Grant

**Pete Wolczanski**, Graduate Field Representative, announced in October that Cornell's Department of Chemistry has received a \$150,000 grant from the Department of Education to increase the number of graduate students entering graduate study in chemistry.

The money will be used to attract graduate students to Cornell Chemistry, and to increase interest at the undergraduate level in chemistry as a career.

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# COMING EVENTS

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## ACS Meeting

The 197th National ACS Meeting will be held in Dallas, Texas from April 9 - 14, 1989. We hope to see you at the continental breakfast for alumni and friends of Cornell Chemistry. Tickets will be available. Please see the February 13, 1989 edition of *Chemical and Engineering News* for further details and advance registration forms.

## Debye Lecture Series

**Jack Edward Baldwin**, Professor and Head of the Department of Organic Chemistry at Oxford University will deliver the 1989 Debye Lecture series. The lectures will be given on April 18th at 11:15 am, 19th at 4:40 pm and 20th at 11:15 am in room 119 Baker. Titles will be announced at a later date.

## 1989 Bayer/Mobay Lecture Series

**Dotsevi Sogah**, DuPont Central Research, will give the Bayer/Mobay Lectures in April. Tentative titles for the lectures are *Synthesis of Polymers* on Monday the 24th, *Advances in Biopolymers* on Tuesday the 25th and *New Applications of Novel Polymer Structures* on Wednesday the 26th. All lectures will take place at 4:40 pm in 119 Baker Laboratory.

## National Organic Symposium (NOS) - Coming in June

The 31st National Organic Symposium will be held June 18 - 22, 1989 on the campuses of Cornell University and Ithaca College. **Bruce Ganem** and **Jon Clardy** are co-chairmen of the event. The program will be highlighted by the Roger Adams Award Address on Tuesday evening, June 20, given by Professor George Olah. In addition to ten plenary lectures, the Local Organizing Committee has planned two evening poster sessions. As an added treat, the Borodin Ensemble will give a concert on Wednesday evening, June 21, at the Ford Auditorium of Ithaca College.

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Best wishes for 1989  
from the Department of Chemistry  
at Cornell University

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