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Atmospheric Chemistry Alums Return to Berkeley

Cohen to help unfold new era of ozone studies at Berkeley

New Assistant Professor Ron Cohen will officially join the College faculty on July 1, ensuring a tradition of vital atmospheric research led by Professor Emeritus Hal Johnston in the 1960s and carried on by such luminaries as alumnus Mario Molina, who recently received the Nobel Prize for his studies on ozone chemistry (see adjacent story).

Cohen received his Ph.D. from Berkeley five years ago, working in Professor Richard Saykally's group, and went on to complete his postdoctoral work at Harvard with Professor James G. Anderson.

With a joint appointment in the Department of Chemistry and the Department of Geology and Geophysics, Cohen said he intends to examine molecular mechanisms of ozone chemistry in the context of global events, both natural and man-made.

"Atmospheric chemistry bridges across disciplines," Cohen said. "I'd like to meld [knowledge of] chemical reactivity with how these reactions play out along an atmospheric time scale—that is, months to years."

Ron Cohen

In particular, Cohen will investigate the molecular mechanisms of ozone formation in the troposphere (from ground level to 15 km) and ozone destruction in the stratosphere (from 15-40 km).

Relating a better understanding of this chemistry to atmospheric dynamics, atmosphere-biosphere exchange, and chemical release by human activities is essential to understanding global scale phenomena, including widespread stratospheric ozone depletion and climate change.

"We want to find out what deviations from the natural state are tolerable before the chemistry is radically altered,"

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Nobel Prize winner Molina to speak at College Commencement

Recent Nobel laureate and Berkeley alumnus Mario Molina (Ph.D. '72 in Chemistry) will return to his alma mater Sunday, May 19, to address more than 250 graduating students, and their family and friends, at the College of Chemistry Commencement. The Commencement program will begin at 2:00 p.m. on the College plaza.

About 90 undergraduate and 50 graduate students from the Chemistry Department as well as 100 undergraduate and 25 graduate students from the Chemical Engineering Department are expected to receive degrees this year.

"It is a great pleasure for me to return to Berkeley on this joyous occasion. I have very fond memories of my student days in the late Professor Pimentel's research group," said Molina, whose wife Luisa also received her Ph.D. in chemistry at Berkeley. "I arrived there just after the Free Speech Movement and I had the opportunity to explore many areas and to engage in exciting scientific research in an intellectually stimulating environment."

Mario Molina

Molina, now a professor at the Massachusetts Institute of Technology, was among three scientists awarded the 1995 Nobel Prize in Chemistry for their groundbreaking research on stratospheric ozone chemistry. Their work paved the way for much of today's global environmental policy. Recent criticism of this policy in political circles makes this Nobel Prize particularly poignant, according to Molina.

"It is very satisfying to see that environmental research is taken very seriously now. I hope the awarding of the Nobel Prize to atmospheric chemists would encourage more students to get involved in environmental research, as

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Chemistry Professor Hearst Retires

Professor of Chemistry John Hearst capped off his prolific career at the College last December, electing to retire after more than three decades of teaching and research at Berkeley.

Although his work on the structure and dynamics of nucleic acids will be scaled back, Hearst's contributions to science show no signs of decline.

Hearst, 60, said he intends to devote the majority of his efforts to Steritech, a company he helped get off the ground in 1991 and which is committed to the development of new methods for decontaminating blood components for human transfusion.

"I've always been somebody who likes change," Hearst said. "Even in my science, I have tended to jump around to different areas. I feel University retirement is now the appropriate thing for me."

Hearst said he will keep an active postdoctoral program at the College and pledged to maintain his ties to the Berkeley campus.

John Hearst

"At the same time," he added, "I look forward to new challenges, new people and a new community of thought."

More than 50 graduate students received their doctorates under Hearst's tutelage—a fact that speaks to his love of teaching and collaboration.

"The noblest part of this job is really mentoring young people and helping them sort out the things they want to do with their lives," said Hearst, adding that he is proud of the success his students have gone on to achieve.

"I tend to think of the highlights [of my career] in terms of my personal interactions with graduate and postdoctoral students in my lab. In the best of circumstances, lifetime friendships are developed."

Hearst began his career at Berkeley in 1962 as an Assistant Professor of Chemistry, publishing a series of papers on the "wormlike coil" model for DNA molecules with then-Assistant Professor Robert Harris. Hearst later examined the structure of DNA in chromosomes and in viruses using electron microscopy.

Hearst is considered one of the pioneer researchers of psoralen photochemistry—natural products that have the ability to cross-link DNA duplexes.

In a collaboration with Chemistry Professor Henry Rapoport, Hearst synthesized improved psoralens, 100 times more photoreactive than the natural products, allowing a more detailed understanding of the molecules' mechanism of reactions with DNA. This understanding culminated in the idea of using the compounds to kill viruses, which spawned the formation of Steritech.

"I think that Steritech has a very good chance of blossoming into a major US corporation," Hearst said, adding that many Steritech scientists were formerly students in his lab.

In the realm of DNA dynamics, Hearst focused his efforts on the torque effects produced by RNA polymerase, the enzyme responsible for synthesizing RNA molecules from the DNA blueprint.

The "Gamper-Hearst" model for the corkscrew progression of RNA polymerase on the DNA screw remains a significant educational tool in molecular biology today.

While Acting Director of Chemical Biodynamics from 1986 to 1989, Hearst was influential in bringing to Lawrence Berkeley National Laboratory the Human Genome Project and in initiating its program in Structural Biology.

He also initiated and directed a program in Calvin Laboratory which studied the molecular genetics of photosynthesis, leading to the first DNA sequence of the genes that code for photosynthetic reaction centers.

"I tend to be a restless person and I like new challenges," Hearst remarked, commenting on both his past work and his future endeavors. "I have learned from my years of research—beginning in graduate school in 1957 at the California Institute of Technology and continuing to my present activities—that I love science and am totally incapable of living life without it. I am enthusiastically anticipating the future."

Questions & Answers with New Chemistry Department Chair Paul Bartlett

Professor Paul Bartlett will become the new Chair of the Department of Chemistry on July 1, succeeding Kenneth Raymond, who has chaired the department since 1993.

Bartlett joined the department as an assistant professor in 1973 and was instrumental in establishing Berkeley as one of the world's leading bioorganic chemistry research centers. Bartlett's research focuses on the design of enzyme-inhibitors and use of "combinatorial" chemistry to discover new biologically-active molecules.

He is very active in College and University administration, having served as Chair of the Academic Senate's Committee on Budget and Interdepartmental Relations and as Vice-Chairman of the Department of Chemistry.

Q: What departmental issues are going to be priorities for you and how will you address these issues?

A: One of the issues clearly relates to the stature which the department has been able to attain over the years. We have been fortunate enough to enjoy the top ranking in a number of recent, fairly significant surveys.

While we can't really aspire to rise higher than that, one of the goals of any department chair is to maintain that.

Q: What's the winning combination in having a first-rate department?

A: Probably above everything else really is the synergy among the faculty. One thing that this department I think can be proud of over the years is the way the faculty have always pulled together. We don't have the factionalism that often occurs in other places. We all realize we're on the same boat. There are not any divisive issues in the department that make it difficult to pull together. That's one of the things that makes this a survivable job: one does have the support of one's colleagues.

The department is significantly reduced in numbers in comparison to what it was prior to the accelerated retirement programs. We need not only to build up the faculty again, within the limitations that our downsized campus requires, but also to make sure the people we do bring in will be of the caliber that we sought always in the past.

We're very fortunate in retaining our faculty and we're very fortunate in junior and senior hires that we've made recently.

Q: How does the state and national funding situation look for the department?

A: The department has been facing a lot of challenges and will continue to do so. We've had to do the same amount and in fact more with less money in recent years than we had before. So finding ways to be more efficient in how we teach and how we run our labs is something we have to face all the time.

Federal grant money is harder to come by. In some respects, the numbers on this campus don't give the real picture because this campus has remained extraordinarily successful in the national funding scene. But, it's the result of ever harder effort on the part of our colleagues to keep the quality up and keep the grant money coming in.

The federal funding situation could become really unstable if some of these suggestions of 30 percent federal funding cutbacks are actually implemented. I trust that

Paul Bartlett

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some of these suggestions are made by congressmen who haven't thought through what the end result will be.

The other disquieting trend is the decrease in unrestricted industrial support, which seems to be dropping precipitously. Whether that's a momentary blip on the screen or whether it's something that's going to continue is hard to say. I hope it doesn't because the private support the department receives is worth far more than the dollar figure; the flexibility it gives us and the programs it supports can't be maintained any other way.

Q: How will the Tan Hall move affect the department?

A: The new building coming on-line this fall is one of the very positive things we can look forward to. We're starting to fill out the new labs, and, as space is freed up, renovate existing labs.

Still, we have an enormous amount to do. The bulk of our faculty have labs which are clearly in need of renovation to bring them up to standards that are appropriate for a modern chemistry department.

Q: How does this position compare to other administrative positions you've held, such as Vice-Chair of the Department back in 1980?

A: I don't think any of those positions compare with being the chair of a department like chemistry. The vice-chairs play a very important role in the operation of the department and, with all the staff, help keep things grounded. But it's the chair who's the lightning rod.... It's going to be a challenge.

Q: Will this new responsibility affect the pace of your research?

A: I certainly worry about that, but previous chairs have shown that the impact can be minimized. Like everybody else, I have to work more efficiently.

Molina

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there are still many challenges ahead of us," he said. "I also hope it will help put to rest any claims by special interest groups outside the scientific mainstream that human-caused ozone depletion is not a problem."

Making a Point

Chemical engineering graduate student Michael Tupy, a member of Professor Clayton Radke's group, gives a talk on "Enzyme Adsorption of Liquid-Liquid Interfaces" at the 18th Annual Industrial Liason Program Conference in March.

Schultz Named California Scientist of the Year

Research in Chemistry Professor Peter Schultz's group is going better than ever these days—a fact recently recognized by the California Museum of Science and Industry in awarding its annual California Scientist of the Year Award to Schultz and his colleague, Richard Lerner of the Scripps Research Institute.

Schultz was also profiled recently in *U.S. News and World Report* as a result of a survey of scientists in graduate institutions having a large impact on their fields.

"Being at Berkeley allows you to do the kind of science that leads to these awards. Berkeley provides resources, coworkers and facilities that cannot be matched anyplace else," Schultz said, summarizing the words of Professor Daniel Koshland, who introduced him at the awards banquet in March. "Dan was right on the money there."

Schultz is a pioneer of the library approach to chemistry, a strategy used to create and sift through endless configurations of novel molecules to find those with useful properties. The idea has proven to be extremely versatile, allowing Schultz to create a variety of new substances from catalytic antibodies and RNAs to enzyme inhibitors to solid state materials.

In addition to his synthetic work, Schultz is addressing basic scientific issues concerning key biological molecules.

"The antibody work is starting to answer fundamental questions about how the immune system works and what's special about the antibody molecule," Schultz said. "It also is giving us new insights into catalysis."

Schultz is also finding success with work in which he is using an expanded genetic code to create new proteins.

"In addition to using this methodology to address fundamental problems in protein chemistry, we're actually going to try to construct a bacterium that now grows on 21 rather than 20 amino acids," Schultz said, referring to the 20 natural building blocks used in the cell. "A new life form—I think this is a holy grail in chemical synthesis; rather than naming a molecule, we'll have the opportunity to name a new species."

Schultz says he feels his lab is now in a position to do its best work ever.

"What we're doing right now is probably more exciting and challenging than anything we've done to date," he said.

Cohen

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Cohen said. "As a starting point, we're trying to understand the distribution of the different chemicals in the atmosphere and what reactions are important to maintenance of those distributions."

Specifically, Cohen will measure atmospheric concentrations of nitrogen dioxide (NO_2), which, in excess amounts, plays a doubly harmful role in the chemistry of the atmosphere, from the perspective of human beings. In the troposphere, where copious quantities of ozone pose a health hazard, ozone is created directly from NO_2 precursors. But, at the higher altitudes of the stratosphere, where ozone acts as a barrier against the sun's harmful radiation, NO_2 breaks down the protective gas.

Cohen intends to measure a worldwide "vertical profile" of NO_2, sampling concentrations of the gas at many levels of the troposphere. To accomplish this, Cohen is developing new laser-based technology that will allow his group to study amounts of the gas with 100 times more sensitivity than conventional methods. The new silicon diode detectors of the laser system will also allow scientists to hone in on specific molecules rather than settle for a comparatively crude cross section of atmospheric gases available through current practices.

Eventually, Cohen hopes to produce a compact, lightweight computerized laser diagnostic system that can be sent up in aircraft to carry out measurements robotically.

According to Cohen, this database of information, once completed, will be pivotal in laying to rest questions about many well-founded, but yet unproven, claims relating to the degradation of the ozone layer as a result of increased NO_2 levels and about the possible effects of aircraft exhaust on atmospheric chemistry and climate.

"I think there's a general commitment in this country to understanding and preserving the environment," Cohen said. "Toward this end, there's still no substitute for good, unbiased information to inform the public and policy makers about the effects of various options available to them. This is the responsibility of the scientist."

Noteworthy News

Robin Curtis, a graduate student in chemical engineering, was awarded the ACS Division of Biochemical Technology's W. H. Peterson Award for best student poster presentation at the '96 Spring National Meeting.

Chemical engineering graduate student **Kristala L. Jones** has been named a United Negro College Fund Merck Graduate Science Research Fellow. The award aims to increase the number of African American researchers in biomedicine and related disciplines.

Chemical Engineering Assistant Professor **Roya Maboudian** received a prestigious Beckman Young Investigator Award for her work on silicon surface science and micromachining.

Chemical engineering undergraduate **Claudia Miranda** helped lead a Berkeley team to victory in the National Academic Olympiads of the Society of Hispanic Professional Engineers, held in February.

Professor of Chemistry **C. Bradley Moore** was recently elected a fellow of the American Academy of Arts and Sciences—considered one of the highest academic honors.

Professor **Daniel M. Neumark**, of the Department of Chemistry, received a Humbolt Research Award for Senior U.S. Scientists in January.

Readers of *Science* magazine got a healthy dose of College research from Chemistry Professor **Richard Saykally** and colleague **Paul Alivisatos**, who were both featured prominently in the February 16 issue on clusters. Professor **Alex Pines** contributed an article to the March 29 issue on improved NMR and MRI methods.

Chemistry professor **Ignacio Tinoco, Jr.** was awarded the 1996 Biophysical Society E. R. Cole Award in February for his "seminal contributions to the field of nucleic acid biophysics."

A Cal Day Greeting

Professor Emeritus Glenn Seaborg greets attendees of the College's 1996 Cal Day luncheon on the College of Chemistry Plaza. The luncheon also featured bluegrass music from the Riverboat Gamblers, a band composed of several College alumni. Presentations by College faculty members and the undergraduate office followed the luncheon.

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In Memoriam: Charles W. Tobias

Chemical Engineering Professor Charles Tobias, a seminal figure in the College for nearly half a century, passed away on March 6 at the age of 76.

Charles W. Tobias

Tobias was a leader in the field of electrochemical engineering during his 44 years of service at Berkeley. He retired from the university in 1991, but remained at Lawrence Berkeley National Laboratory's Materials Science Division until 1995.

Tobias was born in Hungary in 1920 and lived there until 1946, when he obtained his doctorate from the University of Technical Sciences. He was one of the founding members of Berkeley's Chemical Engineering Department when it formed in 1947.

Tobias was particularly active in the Berkeley community, becoming deeply involved with the University Art Museum and helping refugees of the Hungarian Revolution of 1956 get resettled at Berkeley. His love of art, music and his Hungarian heritage came to define Tobias outside of his scientific accomplishments.

The Fall *News Journal* will feature a more complete retrospective of Professor Tobias' life.