When most Berkeley graduate students head across the San Rafael bridge, they have in mind a day of hiking on Mt. Tamalpais or soaking up the sun at Stinson Beach.

But for the last few years, Charles (“Chip”) Crawford, a member of the research group of Alex Pines, has taken the first exit in Marin County and headed straight to San Quentin prison.

Crawford is one of several dozen volunteer instructors who teach at San Quentin, now a medium-security prison run by the State of California. When asked why he has spent his scarce free time teaching prisoners, Crawford responds, “Because it’s fun! My students at San Quentin are some of the most appreciative and attentive students I’ve ever taught.”

Crawford volunteers through the College Program at San Quentin, an extension site of Patten University, an accredited independent university in Oakland, CA.

Since 1996, no state or federal funding has been available for higher education in California’s prisons. The College Program is supported entirely by donations from individuals and foundations. Most of the textbooks are donated by the publishers.

The executive director of the program is Berkeley rhetoric Ph.D. Jody Lewen, who won the campus’s 2006 Haas Public Service Award for her outstanding contributions in community service and education.

Crawford was born and raised in Winchester, VA, a small town of 25,000 people. He graduated from the College of William and Mary in 2004 with a B.S. in chemistry and a minor in math.

Crawford “wanted to get his hands dirty,” so he spent the summer of 2004 in Peoria, IL, doing computer modeling of the phase changes of steel for Caterpillar, Inc. He came to the College of Chemistry in fall 2004.

Crawford has taught math and chemistry at San Quentin since the summer of 2006. His chemistry course—featured as the cover story of the October 22, 2007, issue of Chemical & Engineering News—relies on videos of the work of Lonnie Martin, the college’s demonstration specialist.

At San Quentin, all of Crawford’s students have earned their GED high school equivalency and are working on their associate degrees. “I treat them as students first and prisoners second,” says Crawford. The motives for taking classes vary, Crawford adds. Some want to get the degree on their résumé to improve their chances in the job market after they are released. Some may never be released, and they pursue knowledge because it adds meaning to their lives.

“These are men who have made some serious mistakes,” says Crawford, “but I haven’t met anyone yet who I think is inherently bad. Most of us who accomplish something do it with the help of family and teachers and a lot of other people. We should remember where we would be without that support. I’m grateful to be here at Berkeley, and I’m grateful to have had the opportunity to teach at San Quentin.”
Tretters endow college’s first Hewlett Foundation challenge grant chair

The first chair in the College of Chemistry to be established under the terms of the William and Flora Hewlett Foundation Challenge Grant is being funded through a munificent gift of $1 million from James (Ph.D. ’60, Chem) and Neeltje (Nelly) Tretter.

Jim received his Ph.D. with Henry Rapoport and was a major contributor to the Rapoport Endowed Chair in Organic Chemistry. He has had a distinguished career in the pharmaceutical industry, directing research efforts at Pfizer, Rorer and Rhone-Poulenc Rorer, and serving as CEO and President of IXSYS Inc., a privately held biotech company in San Diego. His wife, Nelly, who was born and educated in the Netherlands, has participated actively in Jim’s professional activities.

Last summer, the Hewlett Foundation donated $40 million to Berkeley as a challenge grant that will match a prospective donor’s $1 million gift with $1 million from the Hewlett Foundation to create 80 $2 million chairs; and match prospective donor’s $1.5 million gift with $1.5 million from the Hewlett Foundation to create 20 $3 million, interdisciplinary chairs.

In making their pledge, Jim Tretter stated, “I hope this will act as a stimulus to bring forth other donors in support of at least three more chairs in [the College of] Chemistry.” (More complete coverage will be carried in a future issue of Catalyst).

Iglesia elected to NAE

Chancellor’s Professor of Chemical Engineering Enrique Iglesia has been elected to the National Academy of Engineering (NAE).

Election to the NAE is among the highest professional distinctions accorded to an engineer. Academy membership honors those who have made outstanding contributions to “engineering research, practice, or education, including, where appropriate, significant contributions to the engineering literature.”

Iglesia was elected “for outstanding contributions to the understanding of catalyst structure-function relationships, the development of novel catalysts, and leadership in the field of catalysis.”

Iglesia has been involved in studies of heterogeneous catalysts for the direct and indirect conversion of methane to higher hydrocarbons, uses of light alkanes in desulfurization and de-NOx reactions, dehydrogenation of light alkanes to alkenes and aromatics, catalytic reforming and cracking processes, low-temperature isomerization, alkylation, and combustion reactions.

Iglesia, who was born in Cuba, earned his B.S. at Princeton and his M.S. (1979) and Ph.D. (1982) from Stanford University. He was a Research Associate and Section Head of Catalysis Science at the Corporate Research Laboratories of Exxon Research and Engineering Co. before joining the Berkeley faculty in 1993. He is also a Faculty Scientist at the Lawrence Berkeley National Laboratory, Vice President of the North American Catalysis Society, Editor-in-Chief of the Journal of Catalysis and the director of the Berkeley Catalysis Center.

Iglesia’s recent awards include the Humboldt Senior Scientist Research Award (2007) and the Donald Sterling Noyce Prize for Excellence in Undergraduate Teaching, University of California (2005).

Iglesia was among 65 new members and 9 foreign associates elected to the NAE. He is the seventh member in the College of Chemistry, including active emeriti.

Lee wins 2008 Othmer Medal

The Chemical Heritage Foundation has announced that Yuan Tseh Lee, Nobel laureate in chemistry and an alumnus and long-time faculty member, will receive the 2008 Othmer Gold Medal. The May 15 ceremony will mark the 11th annual presentation of the award. The 2007 award winner, Thomas Cech (Ph.D. ’75, Chem), studied with John Hearst and won the Nobel Prize in chemistry in 1989.

Lee received the Nobel Prize in 1986 with Dudley R. Herschbach and John C. Polanyi for their contributions to the study of the dynamics of chemical reactions. Their research contributed to the field of reaction dynamics by allowing the study of complex reaction mechanisms beyond the capability of previous methods.

Lee has also received the U.S. National Medal of Science, and he is a fellow of the American Academy of Arts and Sciences and a foreign member of the U.S. National Academy of Sciences.

In 1994 Lee retired from his position as university professor and principal investigator for the Lawrence Berkeley Laboratory to become the president of Academia Sinica in Taiwan. In 2006 he became president emeritus and distinguished research fellow there. He is currently university professor emeritus at Berkeley and special advisor to the Chancellor, the Dean of the College of Chemistry, and the Director of LBNL.

The Othmer Gold Medal commemorates Donald Othmer (1904–1995), noted researcher, consultant, editor, engineer, inventor, philanthropist, professor, and coeditor of the Kirk-Othmer Encyclopedia of Chemical Technology.
News & Notes

Chemical engineering loses two long-time instructors

Paul Plouffe and E. Morse (“Bud”) Blue, two long-time chemical engineering instructors, died recently, both from heart failure.

Plouffe died at age 68 on November 11, 2007. He had taught ChemE 185, “Technical Communications for Chemical Engineers,” since 1983.


Please see the upcoming issue of Catalyst magazine for more information.

Smit’s computational innovations help find new zeolite catalysts

Many of the substances that we take for granted every day, from gasoline to plastics, have passed through the microscopic pores of zeolite catalysts during their production. Now, thanks to their pioneering computational techniques, two chemical engineers are finding new uses for zeolites to improve efficiency and reduce waste in the refining and petrochemical industry.

UC Berkeley chemical engineering and chemistry professor Berend Smit and Theo L. M. Maesen, a research scientist with Chevron Corporation, have developed sophisticated computational techniques to model zeolite-based catalytic processes. Their results have been published in a review article in the February 7 issue of Nature magazine.

“Theo and I published our first paper in Nature on zeolites and computational techniques in 1995,” says Smit. “We committed ourselves then to improving computational techniques to the point that we could predict the catalytic behavior of zeolites via computer models.”

“Access to conventional crude oil stocks is declining,” Smit adds, “and with the arrival of alternative feed stocks from biological sources, there will be a growing demand to rapidly find new catalysts. We hope our computational techniques will play a role in identifying and screening the catalysts necessary for a more energy-efficient world.”

Faculty awards

Michael A. Marletta, the Aldo DeBenedictis Distinguished Professor of Chemistry and the chair of the Department of Chemistry, has won the 2008 Murray Goodman Memorial Prize for “contributions towards a molecular understanding of nitric oxide signaling and gas sensing using chemical and biophysical methods.” Goodman, a long-time professor of chemistry at UCSD, received his Ph.D. at Berkeley in 1953 with Melvin Calvin.

Jamie Doudna Cate, Professor of Chemistry, has won the 2008 Irving Sigal Young Investigator Award of the Protein Society. The award, sponsored by Merck Research Laboratories, recognizes a significant contribution to the study of proteins by a scientist who is in the early stages of an independent career.

Robert G. Bergman, Gerald E. K. Branch Distinguished Professor, has been selected to receive the 2008 Richards Medal by the Northeastern Section of the American Chemical Society (ACS). The Richards Medal is awarded every two years for conspicuous achievement in chemistry. It is the section’s oldest and most prestigious award, honoring the first U.S. Nobel laureate in chemistry.

Rachel A. Segalman, the Charles Wilke Assistant Professor of Chemical Engineering, has been awarded the newly launched MDV Innovators Award from Mohr Davidow Ventures, a leading Silicon Valley-based venture capital firm.

Jane Wang wins Hertz Foundation Fellowship

Jane Wang, a first-year graduate student in the research group of Dean Toste, has won a full five-year graduate fellowship from the prestigious Fannie and John Hertz Foundation. Wang is one of 15 graduate students selected from more than 580 across the country to receive the Hertz graduate fellowship. Hertz Fellows each receive funding over five years to pursue their own scientific interests at top universities in the United States.
ChemE student helps create new battery class

Chemical engineering graduate student Paul Albertus has a knack for making use of the available reactants to create an important new product.

Albertus has helped design ChemE 295F, Battery Technology and Markets. “To the best of my knowledge,” says Albertus, “this is the first and only full-semester course offered in a U.S. university that focuses on batteries from the underlying electrochemistry to market applications.”

Albertus’s background is as eclectic as the course he helped create. He earned his B.S. in chemical engineering from the University of Michigan in 2003. With help from a UM fellowship, he spent a year studying English literature and political philosophy at England’s University of York before arriving at Berkeley in fall 2004 and joining John Newman’s research group.

Albertus created the course along with Berkeley materials science and engineering Ph.D. Ilan Gur, who helped launch a local battery startup, and Venkat Srinivasan (Postdoc ’03, ChemE), a scientist at the Lawrence Berkeley National Laboratory. Srinivasan works with the Batteries for Advanced Transportation Technologies (BATT) program.

The idea for the course won 3rd place and $2000 in the curriculum innovation category from Bears Breaking Boundaries contest, part of the campus’s Big Ideas@Berkeley program. The course also was approved by the UC Berkeley Committee on Courses of Instruction.

According to Albertus, 41 students enrolled in the twice-weekly class, mostly from the engineering disciplines, but with a few from physics and the energy and resources group. There were three undergraduates in the course.

Throughout the semester guest lecturers from local industry spoke to the class, including Kurt Kelty from Tesla Motors, a San Carlos, CA, company that makes an electric roadster based on the Lotus Elise that can go 0-60 mph in less than four seconds.

Another guest lecturer was Dania Ghantous, who is in charge of battery technology for Lion Batteries of Menlo Park, CA, a company that develops high-power lithium-ion batteries.

Representatives also spoke from CalCars, a non-profit startup formed by entrepreneurs, engineers, environmentalists and consumers to promote plug-in hybrid vehicles.

“One of the best things I’ve learned is that there is no one right answer,” says Albertus. “For me,” says Albertus, “the best part of the class was the group projects.”

The class split into groups of three to six students to tackle real-world battery application problems.

One group helped AC Transit to develop computer modeling of their new fuel cell/hybrid drive buses to allow them to tailor the battery system to the needs of specific routes. Other presentations looked at optimal charging schemes for lead-acid batteries used in rural areas and developing countries, the best batteries to use in plug-in hybrids, and the potential of ultracapacitors to replace batteries in electric vehicles.

Srinivasan led the students on a tour of the battery research facilities at LBNL. Says Srinivasan about his teaching experience, “I’m grateful to John Newman, the director of the BATT program, who gave me the flexibility to lecture for this course. I’d gladly do it again.”

“We’re hoping our course materials can be used by others interested in starting battery courses,” says Albertus, “so we have left all our materials as a reference on our website, battery.berkeley.edu.”

Albertus also dreams of finding the time and funding to write a textbook based on the team’s experience teaching the course. “There are electrochemistry textbooks out there, but there are no textbooks with the breadth and depth to make them useful for a battery technology class,” he says.

“The Bay Area is becoming a leader in alternative energy and transportation,” adds Gur. “The battery technology class is beneficial to growing local companies who would like to hire students with just this sort of training.”

“The best indicator of the value of the class is that almost everyone involved would like to see it happen again,” says Albertus. “Maybe in two years. In the meantime, I’ve got a dissertation to finish.”
Amino acids can exist either in left-handed or right-handed versions. The acid group (COOH), the amine group (NH₂) and the functional group (R, which varies between the amino acids) can be arranged as mirror images. Clayton Heathcock, emeritus chemistry professor, former college dean, and the UC Berkeley chief scientist for QB3, has returned to serve as interim dean during the search for a permanent replacement. Heathcock began his duties on January 1, 2008, and expects to hand them off to the new dean no later than July 1.

In an effort to make the dean’s position more manageable, Heathcock has reorganized the college administration. Professor Douglas Clark has been appointed Executive Associate Dean of the College. Clark will have primary responsibility for Analytical Facilities, Network Services, Business and Finance, and Engineering Services. Heathcock will have final authority in all of these areas and also primary authority in Academic Affairs and College Relations.

Two new assistant deans are working with the dean, Assistant Dean for Engineering Services, Alexander Shtromberg, and Assistant Dean for Business and Finance, Suzanne Pierce.

New biochip could replace animal testing

Chemical engineering professor Doug Clark and colleagues from Rensselaer Polytechnic Institute and Solidus Biosciences, Inc., have developed cultures of skin cells in a so-called DataChip that could be used to rapidly screen new chemicals for skin toxicity or irritability.

With the cosmetics industry facing a European ban on animal testing in 2009, a newly developed biochip could provide the rapid analysis needed to insure that the chemicals in cosmetics are nontoxic to humans.

The biochip, announced in the December 26 online edition of the Proceedings of the National Academy of Sciences, is a suspension of more than a thousand human cell cultures in a three-dimensional gel on a standard microscope slide. Each cell culture is capable of assessing the toxicity of a different chemical.

By adding other types of cells, such as lung or heart cells, and combining the DataChip with technology Clark has already developed, cosmetics or chemical companies could also test whether chemicals are toxic to other organs, not just skin.

“The DataChip expands the capabilities of our earlier Metachip and enables it to test for toxic effects of chemicals and their metabolites throughout the body,” said Clark, a co-founder of Solidus Biosciences, the company that is working to commercialize the chips. “It is one step closer to a replacement for animals in evaluating product safety, as well as to a personalized system that can predict the toxicity of drugs in individual patients.”

Solidus is looking for an efficient, more accurate way to test drug compounds for toxicity earlier in the discovery process, before a lot of money has been invested in a drug candidate. However, according to Clark, pharmaceutical companies are only one potential user, and not necessarily the first.

“Obviously cosmetics need to be safe, and ensuring the safety of new compounds without testing them on animals presents a new challenge to the industry, especially as the number of compounds increases,” said Clark. “These chips can meet this challenge by providing comprehensive toxicity data very quickly and cheaply.”

The DataChip currently contains 1,080 human cell cultures arranged within a gel made of collagen or algae extract, approximating how cells are arranged in organs of the human body.

For now, the DataChip establishes a drug’s toxicity by whether it kills cells or inhibits their growth. Through fundamental research, however, Clark and Solidus co-founder Jonathan Dordick hope to adapt this methodology to test for other biological responses, not just cell death.

“We have the fundamental platform and concept, and there is the potential to expand considerably beyond that to test for many different biological responses, such as allergic responses or binding of a chemical to a receptor to trigger a reaction,” Clark said. “For personalized medicine, that is exactly what you’d want to do.”
Professors create legacy for future students

by Jane Scheiber and Mindy Rex

Fellowships

“I first came to Berkeley in 1962 to pursue my graduate studies because Berkeley had the best professors in the world; I returned in 1974 as a professor because we have the best students.”

Yuan T. Lee, 1986 Nobel laureate

Yuan T. Lee has said it all. The excellence of the faculty and the excellence of the graduate students at Berkeley are inextricably intertwined. And both are key to the excellence of the college and of UC Berkeley. Graduate students partner with the faculty not only in research but also in teaching, thus enhancing the educational experience of our undergraduates and contributing to the vibrancy of the university community.

The quality of the graduate students at Berkeley has been, in many of our recent faculty retention cases, the decisive factor in our professors’ choosing to remain here. First-rate graduate students also help in recruiting new faculty.

But what about recruiting the graduate students? While the outstanding opportunities for working with a distinguished faculty are the main drawing card, financial incentives cannot be ignored. A recent survey showed that when Berkeley’s offer was at least $1,000 greater than that of a competitor, 81 percent of the graduate students chose Berkeley. When

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Hoffman makes a difference

Most senior faculty members at Berkeley have taught hundreds of undergraduates and mentored dozens of graduate students. Their lists of awards are exceeded only by their lists of publications. They leave a wonderful legacy of educating generations of new leaders in chemistry and chemical engineering and creating a body of new knowledge that has advanced the chemical sciences.

But now many of them are creating a further enduring legacy for future generations of students by endowing funds for fellowship support so that Berkeley can continue to attract the best and the brightest.

In the competition for top graduate students, dollars do count. Our academic peers, most of which are private, can often offer richer financial packages than Berkeley’s to attract outstanding students. And once the students are here, the faculty must secure grants to be sure those students are fully supported.

Recognizing the need for reliable sources of student support, Chancellor Birgeneau has established the “Chancellor’s Challenge,” which matches dollar for dollar, gifts from current or retired faculty and staff, their surviving partners or spouses, and current students up to a maximum per individual of $250,000 for endowed funds for fellowships and scholarships.

The Chancellor’s Challenge “was an opportunity too good to pass up,” said Darleane Hoffman, Professor in the Graduate School. Taking advantage of a special IRA rollover provision, she donated $100,000 last December to endow a graduate support fund in nuclear chemistry.

Graduate students had not always been a part of Professor Hoffman’s career — she came to academe after 30 years at Los Alamos National Laboratory, where she had been a senior scientist and the first female leader of a technical division. Having spent 1978-79 as a Guggenheim Fellow at Berkeley working with Nobel laureate Glenn Seaborg, she accepted an offer to join the chemistry faculty in 1984.

Glenn Seaborg was “wonderfully encouraging and kind,” a supportive guiding force, and his death in 1999 prompted her first real philanthropy to the College of Chemistry — a gift to the Glenn T. Seaborg Memorial Fund, which is used to support student travel to professional meetings.

At Berkeley, Professor Hoffman found, to her surprise, that she enjoyed teaching, particularly the lab course in nuclear chemistry, where she could really get to know her students. She also directed the work of 20 Ph.D. students and many postdocs from all over the world. Her work in nuclear chemistry was recognized with the National Medal of Science and the Priestley Medal, among other honors.

“I would never have been able to accomplish what I did without the environment, faculty, and students here—especially my own students,” commented Professor Hoffman in explaining why she chose to make such a generous gift to the department. “Berkeley had done so much for me. It was a very collegial and intellectually stimulating atmosphere, and I found my colleagues, both in chemistry and in other departments across campus, very helpful.

“I also feel strongly about the profession,” she continued. “I wanted to help the next generation of young students and young faculty to pursue careers in
nuclear and radio chemistry. We will need people trained in these fields to facilitate the utilization of nuclear energy as a safe and sustainable energy source, to monitor potential environmental concerns, and to conduct frontier research on elements heavier than uranium.”

Professor Hoffman has now added the role of philanthropist to her roles as government and university scientist, founding director of the Seaborg Institute for Transactinium Science at Livermore, and scientific advisor on many national committees. In the end, she said, “I wanted to make a difference.”

Steady commitment enhanced by matching

The college has been blessed by its long-standing relationship with Harold Johnston, Professor Emeritus in the College of Chemistry, and his wife, Mary Ella. Last June, the Johnstons donated $80,000 to establish the Mary Ella and Harold Johnston Graduate Student Support Fund.

The gift was motivated by pure philanthropy. “The College of Chemistry has been very, very good to us; we were in a position to give, so we did. We were aware of the need for graduate student support, but frankly, we would have given an unrestricted gift if that was what the Dean needed,” said Professor Johnston, who won the National Medal of Science in 1997, the same year as Professor Hoffman.

The Johnstons have shown an ongoing, steady commitment to the college over the years, giving many generous gifts to support everything from the annual fund to the building campaign to funds in memory of college friends and colleagues. When the opportunity arose in the 2007 tax year to make a gift directly to the college by rolling over funds from IRA accounts, they decided the time was right to increase their support of the college.

By participating in the campus matching fund program, the Johnstons were able to leverage their gift to direct even more support to the college. “We knew we wanted to give—the timing of the matching program helped to accelerate our gift,” Professor Johnston said.

Considering the fact that Professor and Mrs. Johnston have 4 children and 10 grandchildren ranging in age from 14 months to 24 years old, the college is enormously grateful for this generous show of support.

Cupola Era alumni meet goal for chair

“Our future lies with our young faculty members,” said Michael Marletta shortly after becoming chemistry chair. Now that future is looking a bit brighter for the College of Chemistry, thanks to the generosity of more than 125 donors from the Cupola Era alumni (1946-1963).

Led by a group of outstanding volunteers—T. Z. Chu, Bill Daniels, Bill Gerhardt, Virginia Lew, Bob Lindquist, Bob Lundin, Daisy Quan, Milt Ritchie, and David Templeton—the Cupola Era alumni have raised more than $500,000 for the Cupola Era Endowed Chair, which will support young faculty members as they launch their careers. (Look for more complete coverage in the next Catalyst.)

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Upcoming Events

April 12 — Cal Day
Berkeley Campus

Join us for this annual campus open house where there is something offered for all ages.

1:00 – 2:00 p.m., 1 Pimentel Hall.
Lecturer Michelle Douskey and Lab Supervisor Lonnie Martin will give a presentation on “Chemistry: Molecules, Materials, and Us.” Everything around and inside us is made of molecules. See dramatic, illuminating demonstrations and take chemistry quizzes that will help you explore the principles that underlie the formation, reaction, and functions of molecules.

2:00 – 4:00 p.m., 1 Pimentel Hall.
Associate Dean Herbert L. Strauss will discuss the college’s undergraduate programs in chemistry, chemical biology and chemical engineering. An informal Q & A will follow the presentation. Staff advisors will be present. Prospective students and their families are encouraged to attend.

For the complete campuswide Cal Day program, please visit calday.berkeley.edu.

Check chemistry.berkeley.edu/alumni for the latest information

May — Springfest

Join us as we celebrate our graduating undergraduate and graduate students. All alumni and friends are invited to this complimentary event! Visit our homepage at chemistry.berkeley.edu in early April for details.

May 24 — Commencement
7:00 p.m., Zellerbach Hall

Chemical Engineering Professor John Prausnitz, winner of the 2003 National Medal of Science, the nation’s highest honor for scientific achievement, will be this year’s commencement speaker.