MCB AT BERKELEY

SPRING 1999

Newsletter for Members and Alumni of the Department of Molecular & Cell Biology at the University of California, Berkeley

The Berkeley Health Sciences Initiative

The Berkeley Health Sciences Initiative calls for a new approach to scientific study at Berkeley with enormous potential for basic and applied research. The proposal is for two seismically unsafe buildings on campus, Stanley and Warren Halls, to be replaced with multidisciplinary research and teaching centers. "These two buildings are deliberately planned to house people from different disciplines which represents a departure from the traditional 'silo' approach where chemists are all in one building, physicists in another," said Ed Penhoet, dean of the School of Public Health. "This is an overall trend occurring in science in this country. In today's world, there's a problem-solving orientation in which scientists work much more in groups and use whatever technology they need—chemistry, physics, biology."

The new centers, one for Molecular Engineering and one for Biomedical and Health Sciences, will be multidisciplinary but with an emphasis on biology and health. MCB Professor Robert Tjian, chair of the Chancellor's Advisory Council on Biology, said, "It is a natural thing that different disciplines are converging on certain problems. This effort is driven in large part by the interest of physical scientists and even psychologists and behavioral scientists in problems coming out of biology."

With the Health Sciences Initiative comes great promise for health research through the integration of Berkeley's biological and physical sciences, which are already top-ranked, world-class programs. In fact, the Health Sciences Initiative may be necessary for Berkeley's programs to remain competitive, since plans for similar multidisciplinary centers have recently been announced by other leading universities. "If Berkeley wants to remain as a preeminent public institution, we don't have any alternative," said Professor Tjian. "However, it is an exciting alternative because the research has the potential for direct benefit to human existence. We are not doing this research just because we enjoy it. The ultimate outcome could be to make a better therapeutic drug, a different treatment, a new diagnostic, an improved imaging process, things that can really benefit everyone."

The Molecular Engineering Complex

Applying technological advances from the physical sciences to biological problems will be a major theme of the Molecular Engineering Complex. There, the structural and physical biologists who currently occupy Stanley Hall will be joined in a larger building by members of the Physics Department and the College of Chemistry whose research has a biological component. Berkeley's new Bioengineering Department will also be located there. MCB Professor Dan Koshland, chair of the Molecular Engineering Planning Committee, said, "It makes sense to have them all in one building because they are already using similar facilities and are overlapping intellectually on problems. In one building, they will tend to cooperate and interact more."

Based on current research at Berkeley and future trends, the Molecular Engineering Planning Committee has projected the following cutting-edge research (examples of applications are shown in parentheses):

- Drug design and discovery
- Genomics and bioinformatics
- Engineering new organisms
- Nanometer-scale structures
- Imaging (MRI, PET, SQUIDS)
- Tissue engineering (human tissue replacement)
- Robotics (remote telesurgery)
- MEMS microdevices (wearable drug delivery)
- Embedded intelligence (prostheses)

To foster the research, state-of-the-art facilities and sophisticated instrumentation are planned for the Molecular Engineering Complex, which is expected to be completed in 2003.

The Biomedical and Health Sciences Center

Perhaps as early as 2004, the building to replace Warren Hall could be completed. Called the Biomedical and Health Sciences Center, it will house the following programs:

- School of Public Health
- Neuroscience Center
- Drosophila Genome Project
- Cancer Research Laboratory
- Infectious Disease and Tumor Immunology

The Biomedical and Health Sciences Center will be designed to integrate the buildings in the northwest quadrant of campus including Barker Hall (which will soon be retrofitted) and Koshland Hall. "The architecture should help facilitate interactions," said Dean Penhoet. He envisions "a community centered around the lawn next to Pat Brown's Grill, which will be a focal point for all of this activity."

MCB Profile

EDWARD PENHOET

Edward E. Penhoet is back at Berkeley nearly 20 years after leaving his position as a professor in Berkeley's Department of Biochemistry to co-found Chiron Corporation. Penhoet is now Berkeley's dean of the School of Public Health and a professor of health policy and administration and of molecular and cell biology. "I have a great loyalty to and interest in this university, and I was fortunate to be given this job," said Penhoet. "I am delighted to be back, and I plan to use what I learned in the business world to help manage this campus." He is off to a good start as one of the leaders of the Health Sciences Initiative (see page 1).

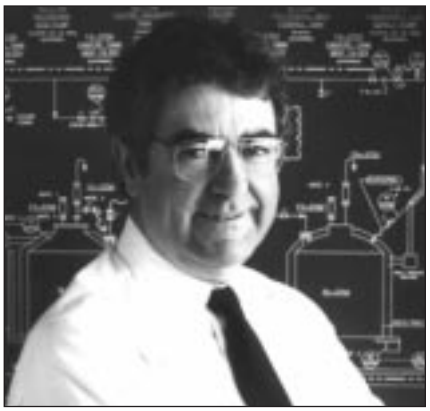
Penhoet was Chiron's president and chief executive officer from when it was founded in 1981 until 1998. Under his management, Chiron developed into one of the world's leading biotechnology companies. Penhoet said he was inspired to found Chiron because he "wanted to make more of a direct contribution to health." (For more information, see "Biotech History" on page 3.) Judging from Chiron's products during his tenure, his contribution has been significant. Chiron's very first product had a tremendous public health impact. It was a vaccine for hepatitis B, a virus which is a major cause of cirrhosis and liver cancer. Of course, the vaccine has been a financial success for Chiron and its partners, but based on the work of Chiron co-founders William Rutter and Pablo Valenzuela at UC San Francisco, it also has been a large source of royalties for UC, which seems to please Penhoet greatly. Chiron's most important accomplishment, in Penhoet's opinion, was the discovery of the hepatitis C virus. This discovery "solved one of the biggest health mysteries of the century," said Penhoet. Based on this discovery, Chiron created a test for diagnosing the hundreds of millions infected with the virus and another test to screen donated blood to ensure it does not transmit the hepatitis C virus.

Penhoet could point to the hepatitis B vaccine and Chiron's other products (see "Chiron's Products" on page 3) in lobbying the U.S. Congress for increased funding for biomedical research. "In turning around the government's views about funding," said Penhoet, "one of the most persuasive arguments to give was that the investment that the government makes in basic research in this field actually gets translated into useful products that the population as a whole will benefit from."

Penhoet's leadership was central to Chiron's success, according to William Rutter, chairman of Chiron and UCSF professor emeritus. "As the president and CEO from the beginning, Ed had a major role in defining Chiron's strategy, the leading role in developing the infrastructure and the programs for all the employees, the sole role in relationships with the financial community, and he was involved in all our acquisitions and de-acquisitions," explained Rutter. "He is beloved by all our employees. One cannot use adjectives that are too adulatory. You could simply call him Mr. Chiron."

Penhoet first worked with Rutter as an undergraduate at Stanford University. Rutter was on sabbatical from the University of Illinois in the laboratory of Clifford Grobstein, who was Stanford's chair of biology at that time. Penhoet studied pancreas differentiation in Grobstein's lab, a lab which had earlier demonstrated that diffusible factors were involved in differentiation, an important finding for developmental biology. Penhoet "had so much fun" that, after receiving his A.B. in 1963, he went to graduate school where—again—he worked with Rutter. Penhoet began his graduate studies in Rutter's lab at the University of Illinois and later moved with Rutter to the University of Washington in Seattle, where Penhoet received his Ph.D. in 1968. As a graduate student, Penhoet studied the glycolysis enzyme aldolase, which at the time was known to be present in different forms in liver and muscle. Penhoet and Rutter discovered a third form of aldolase in the brain and determined the subunit composition of the various forms.

The professional relationship that developed between Chiron co-founders Rutter and Penhoet beginning when Penhoet was a



student was long-lasting, productive, and according to Rutter, "never boring." Rutter described Penhoet as "a strongly ethical person, bright and inventive, with an engaging character." He continued, "The fact that we have interacted so positively over the years is partly due to my great respect for his contributions to organizations and to people. He is interested in the development of people—both in their careers and as human beings. He is a somewhat selfless person which is unusual in people taking leadership roles."

From 1968 to 1970, Penhoet was a postdoctoral fellow in virologist John Holland's lab at UC San Diego. Penhoet's research resulted in the discovery of influenza RNA polymerase, a discovery which Penhoet considers his most significant direct scientific contribution.

Penhoet continued studying influenza virus and other viruses in his own lab at UC Berkeley as an assistant professor of biochemistry beginning in 1971 and later as an associate professor beginning in 1977. However, Penhoet's lab did not focus on virology exclusively. His lab was the first to show that nerve growth factor was made in cells of neural origin (it had previously been purified from salivary glands) and that it was a chemotactic agent, both significant neurobiological findings. He was involved in numerous collaborations with other professors in the department—studying tRNAs and their modification with Bruce

Ames, DNA repair with Stu Linn, RNA polymerase with Mike Chamberlin, and virus budding with Clint Ballou. About the extreme diversity of his projects, which is unusual, Penhoet said, "I wouldn't advise a young scientist to do what I did, but in my case it turned out to be a strength later on. My broad spectrum of knowledge and my ability to work in different fields probably contributed to the success of Chiron in some ways."

Over the many years Penhoet was at Chiron, he remained an adjunct professor at Berkeley. He participated in faculty meetings and taught classes. He did what MCB Professor and Department Co-Chair Randy Schekman called "a valuable yeoman's job" of teaching MCB 102 (Survey of Biochemistry and Molecular Biology), a class which is notoriously difficult to teach. He also co-taught a graduate course in virology. Penhoet continued to teach despite what must have been a very full schedule at Chiron because, he said, he enjoyed teaching and because he thought he could "bring an unusual perspective and make a valuable contribution." To this end, Penhoet taught a graduate course in career opportunities outside academia.

In 1991, the MCB Department awarded Penhoet its Distinguished Service Award. "Ed Penhoet is one of the department's most valuable and loyal colleagues," said Schekman, "who contributed to the intellectual development, teaching mission, and financial support of the program." In 1983, Penhoet gave the department a substantial donation of Chiron stock which has provided funding for various department activities including the Chiron Lectures.

Penhoet stayed involved in the department over the years because maintaining his personal friendships with department members is important to him. Penhoet even spends some of his scarce free time at a Berkeley outpost at Silver Lake near Mt. Lassen where he has a cabin, as do some of his colleagues from the former biochemistry department including Professors Linn, Ballou, and Barker. But Penhoet admitted he also had a professional interest in staying associated with the department because "companies like Chiron make a business out of interfacing university science with the commercial world." (For more information, see "Biotech History," this page.) Some of Chiron's most important academic collaborations were those with MCB

CONTINUED ON PAGE 8 . . .

TWENTY-FIVE YEARS OF BIOTECHNOLOGY

Biotech History

Ed Penhoet took part in the events on campus commemorating the twenty-fifth anniversary of biotechnology held on March 12 and 13, 1999. The events were organized to inaugurate the Bancroft Library's Program in the History of the Biological Sciences and Biotechnology. On March 12, the Bancroft Library held an opening for their new exhibit *Bioscience at Berkeley*. On March 13, Ed Penhoet and Dan Koshland were the moderators of a symposium entitled "Biotechnology at 25: Perspectives on History, Science, and Society." In honor of the symposium, Penhoet and Koshland were also guests on the March 12 National Public Radio program "Talk of the Nation: Science Friday." On that program, Penhoet spoke about how the advent of recombinant DNA technology, beginning with the first cloning experiments in the laboratories of Cohen and Boyer 25 years ago, inspired him to found Chiron. He also explained how the biotechnology industry has dramatically changed the culture of both academic and industrial research.

Penhoet on founding Chiron:

"The new tools that had come along as a result of the cloning inventions and also the invention of monoclonal antibodies allowed a whole new approach to understanding, curing and preventing disease. The possibility of making a direct contribution to that in a biotechnology company was simply too attractive for me to pass up, and so together with William Rutter and Pablo Valenzuela, we founded Chiron Corporation initially to use these techniques to have an impact on infectious disease."

Penhoet on the influence of the biotechnology industry:

"At the time we started biotechnology as an industry there was very little dialogue between the academic world and the business community, and those of us who jumped across the boundary so to speak brought a greater understanding to both sides. And perhaps when the history of the biotechnology industry is written, one of the most important contributions of biotech companies will be bridging this gap between university science and applied science...What has resulted is, first of all, the installation of many of the university's values into the business world with a strong emphasis on quality science and publication of results, and at the same time a much greater appreciation for the practical utility of science among colleagues in the academic world. So probably both have, in a sense, learned from one another and become much closer over the last 20 years."

Chiron's Products

- Hepatitis B vaccine
- Tests for hepatitis C infection, both for diagnosis and for screening donated blood.
- A technique for measuring viral load, which is especially useful for managing the treatment of those infected with viruses like HIV and hepatitis C since their response to various drug therapies can be determined.
- Platelet-derived growth factor in a topical ointment for wound healing, especially for use by diabetics.
- Human insulin produced in yeast, represents half the world's supply of insulin.

The following Chiron products resulted from the merger with Cetus in 1991.

- PCR, the revolutionary DNA amplification technology.
- Interleukin-2, which is used to treat kidney cancer, melanoma, and increasingly HIV.
- Beta-interferon, which is the first drug treatment for multiple sclerosis and which dramatically slows the progress of the disease.

NEW FACULTY

Sharon Amacher

Assistant Professor of Genetics and Development

Arrives July, 1999

Education:
- B.A. in Physiology, 1988, University of California, Berkeley.
- Ph.D. in Biochemistry, 1993, University of Washington, Thesis advisor: Stephen D. Hauschka. *Dissertation title:* "Myocardiocyte Regulatory Elements and Trans-acting Factors of the Mouse Muscle Creatine Kinase Gene"

Postdoctoral Research:
- 1994-1999, University of Oregon, American Cancer Society Postdoctoral Fellowship (1994-1997), Advisor: Charles B. Kimmel.
- *Project:* The genetic and cellular control of mesodermal cell fate specification in the zebrafish embryo.

Current Research: We are interested in how cells become sequentially specified to more precisely defined fates during vertebrate embryonic development. Currently, we are using genetics, molecular biology, and embryology to investigate mesodermal patterning and segmentation in the zebrafish embryo. We are studying how a gene called spadetail functions in both processes. Also, we are performing screens to identify other genes that function in mesodermal patterning, segmentation, or both.

Practical Applications of Research: Our genetic screens identify genes that function during normal embryonic development. We anticipate that our work will eventually provide animal models, diagnostic tools, and therapeutic approaches for human genetic diseases.

What special contribution do you hope to make to the department? I plan to contribute to the department's strong developmental genetics program by adding a new vertebrate genetic model system, the zebrafish.

Personal Information: My husband, Jay Hollick, is an adjunct assistant professor in the Department of Plant and Microbial Biology. We enjoy backpacking, gardening, and reading.

Karsten Weis

Assistant Professor of Cell and Developmental Biology

Started January, 1999

Education:
- Diploma in Molecular Biology, 1992, University of Marburg, Germany.
- Ph.D. in Human Biology, 1996, EMBL, Heidelberg, and Phillips University, Marburg, Germany, Thesis advisor: Angus I. Lamond. *Dissertation title:* "Identification and Characterization of Factors that Mediate Import of Proteins into the Nucleus"

Postdoctoral Research:
- 1996-1998, Research Fellow, University of California, San Francisco.
- *Project:* As a UCSF Research Fellow, I had the opportunity to run my own small research lab in which we studied the export of proteins from the nucleus. In a collaboration with the lab of Christine Guthrie, we identified a soluble receptor that mediates that transport process called exportin 1 or Xpo1/Crm1 in yeast.

Current Research: We try to understand how macromolecules are transported into and out of the nucleus. We want to learn more about the mechanism and the molecules which are involved in these transport pathways.

Practical Applications of Research: The regulated localization of proteins in either the nuclear or cytoplasmic compartment is frequently used to control important cellular decisions such as cell division or cell fate. In addition, several viruses, including HIV-1, abuse these intracellular transport pathways in order to multiply efficiently inside cells. Understanding these transport pathways could therefore support the developments of therapies for cancer, viral infections, and certain human genetic diseases.

What special contribution do you hope to make to the department? My area of expertise is not yet represented in the department. I hope that this will open the doors for collaborations in various areas.

Personal information: My girlfriend Sibylle has come from Germany to join me in Berkeley. I like sports; I play squash and go running. In addition, I like to cook for myself and other people.

Remembering

ALAN BEARDEN

1931–1999

By W. Geoffrey Owen,
MCB Professor of Neurobiology

MCB Professor Emeritus Alan Joyce Bearden died following a heart attack on February 17, 1999. He was 67 years of age. Born in Baltimore, he grew up in an academic family, his father being a distinguished physicist at Johns Hopkins University. He remembered, as a young child, trying to persuade Enrico Fermi that his toy train was an accurate replica of the real thing. When he was 11 or 12, using a shortwave radio he had built, he would listen to the night-time radio transmissions of German U-boats surfaced in the Chesapeake Bay. It is not surprising, therefore, that Alan should decide to study physics. After earning a bachelor's degree from Johns Hopkins University at the tender age of 19, Alan took a commission in the U.S. Navy. He spent four years on active duty that included service in the Korean War and five subsequent years in the U.S. Naval Reserve. While in the navy, he was assigned to the Los Alamos National Laboratory as a radiation expert and witnessed and analyzed nuclear weapons tests in the Pacific. He remained an associate member of the U.S. Naval Institute.

On completing his active service, he returned to Johns Hopkins and, in 1958, earned a doctorate in physics with a dissertation on the X-ray absorption properties of various elements. He went on to hold faculty positions in physics (University of Wisconsin and Cornell University) and chemistry (UC San Diego) before coming to Berkeley in 1969. He was elected a fellow of the American Physical Society and served as chair of its Division of Biological Physics from 1977 to 1979. Alan was a forward thinker and during his tenure as chair of the former Department of Biophysics and Medical Physics at Berkeley from 1979 to 1984, he worked tirelessly to maintain the department's strength in the physical sciences while striving to broaden its focus to encompass the newest developments in biology. With the reorganization of the biological sciences on the Berkeley campus in 1989, Alan joined the Department of Molecular and Cell Biology as a professor of neurobiology.

Alan's research interests were unusually varied. His early work on the physics of X-ray absorption culminated in his measurement of the mass of the Mu meson, which helped to establish its identity as a heavy electron. An early champion of Mössbauer spectroscopy, he pioneered its use in the study of proteins. This led to an interest in bioenergetics, and his research took on a more biological focus. His work on photosynthesis, comprising more than 40 papers over a period of twelve years, was perhaps his most significant contribution. In collaboration with UCB Plant and Microbial Biology Professor Richard Malkin, Alan identified the iron-sulfur proteins as the electron receptors in the photosynthetic reaction center and then employed a combination of sophisticated spectroscopic techniques to elucidate general features of their structure and function. Later, with his student Robert Goldstein, he was the first to detect an extremely weak charge-transfer band. This type of energy transfer within the photosynthetic reaction center had been predicted on theoretical grounds by John Hopfield, and to detect it at the limits of resolution was a considerable technical achievement. Most recently, he became interested in sensory transduction, and it was while thinking about how to visualize the tiny movements of sensory cells in the inner ear that he and his student Michael O'Neill invented LAMDA (Laser Amplified Motion Detection and Analysis), a method of laser feedback interferometry which permits the imaging of nanometer-scale structures. LAMDA has since found application in several scientific and commercial devices including an ultra-high resolution optical microscope and a high-density data storage system.

When Bearden took emeritus status in 1993, he had more time for his personal interests, which were no less varied than his research interests. He was a talented pianist and an opera lover. As a student, he could never afford to buy tickets for the opera, but would wait outside the opera house and pick up the stubs discarded by patrons who left during the first intermission. He often said that he knew how the operas ended but that it was years before he found out how they

began. His love of opera and his early fascination with radio came together in his interest in sound recording. He amassed a remarkable collection of audiotapes of live and broadcast music and of particular sounds that interested him such as foghorns, steam trains, bagpipes, etc. Having worked for a while as a photojournalist for Life magazine, he remained an avid photographer. A lifelong sports car enthusiast, he spent much of one year as the carburetion specialist on a motor racing team, and the restoration of his beloved Austin Healey sports car was soon to be finished. He was a prolific writer of short stories and, more recently, of novels; he was working on his third at the time of his death.

Alan will be remembered as a man with great zest for life. He was generous and fiercely loyal, both to his friends and to his ideals. He will be missed by his sons, Roger Bearden of Chicago and Colin Bearden of Austin, Texas, and by his many friends.
A memorial was held in the Faculty Club on Sunday, March 21, 1999. The first annual Bearden Memorial Award for biophysics research will be presented to PhD graduate Thomas Schlumpberger at the 1999 MCB Commencement. Contributions in Alan's name may be sent to UC Berkeley Botanical Garden, Berkeley, CA 94720-5045; to Cal Performances, Berkeley, CA 94720-4800; or to the Philharmonia Baroque Orchestra, 333 Market Street, San Francisco, CA 94105.

AWARD WINNERS

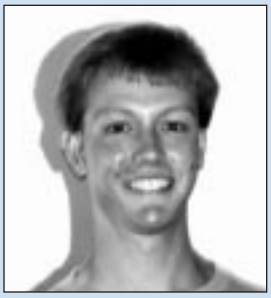
OUTSTANDING GSI AWARDS

The following MCB graduate students were named Outstanding Graduate Student Instructors for 1998. They received certificates of distinction and were honored at a reception hosted by the GSI Teaching and Resource Center on May 3, 1999.

Brian Peter, Cozzarelli Lab

Russell Vance, Raulet Lab

John Cowden, Levine Lab



Thomas Harbaugh, Garriga Lab

Ching Shang, Drubin Lab

Jeffrey Wallin, Sha Lab

Adalberto Erives, Levine Lab

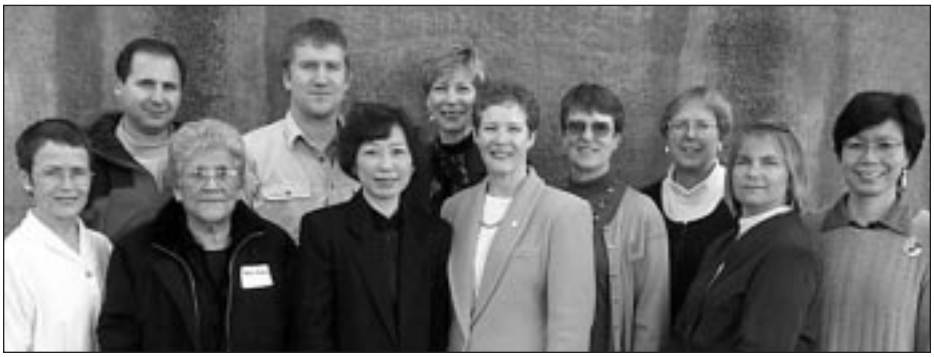
Victor Holmes, Cozzarelli Lab

Sarah Tegen, Martin Lab

Sarah Wignall, Heald Lab

DISTINGUISHED SERVICE AWARDS

The following MCB staff received Distinguished Service Awards for 1997-98. They were nominated by their supervisors for these campus awards which "recognize and reward exceptional individual performance which contributes to unit or department goals and supports UC Berkeley's administrative vision, principles and values." They received awards varying from $2550 to $5000. A photograph of the recipients was taken at a reception in their honor in Barrows Hall on March 10, 1999.



AWARD RECIPIENTS FROM LEFT TO RIGHT IN PHOTO:

Rachel Bates, *Administrative Analyst, MCB Academic Support Services;* ***Antonio Castellanos,*** *Senior Storekeeper, LSA Receiving;* ***Maria Avalos,*** *Lab Assistant I, Thorner Lab;* ***Brian Joseph,*** *Superintendent of MCB Mechanical Shops, Barker/Koshland ASU;* ***Su-Jane Lai,*** *Administrative Analyst, Barker/Koshland ASU Business Office;* ***Jeanene Greer,*** *Administrative Analyst, Barker/Koshland ASU Business Office;* ***Eileen Bell,*** *Student Affairs Officer II, MCB Graduate Affairs Office;* ***Anne Greenwood,*** *Administrative Analyst, LSA Stockroom;* ***Judie Nelson,*** *Administrative Specialist, LSA Manager's Office;* ***Leslie Ross,*** *Account Administrator III, LSA Accounting Unit;* ***Helen Wang,*** *Administrative Assistant II, LSA Financial Services;* ***Brian Kim*** *(not shown), Administrative Assistant I, LSA Financial Services.*

UNDERGRADUATE AWARDS

University Medal

- Vikram Rao, an MCB major in the Neurobiology emphasis, is the recipient of the University Medal, which is awarded each year to the "most distinguished graduating senior on the Berkeley campus."

In recognition of outstanding achievements by MCB undergraduates, the following awards will be presented by the MCB Department at the 1999 Commencement. The recipients are graduating seniors except as noted. The name of the professor in whose lab the student performed research is shown in parentheses.

Department Awards

- Buyung Santoso (Winoto) receives the MCB Departmental Citation for exceptional achievement in both course work and research.
- Gloria Choi (Harland) receives the MCB Outstanding Scholar Award for highest academic achievement.
- Alice Chiao and Cindy Yen receive Outstanding Service Awards for their service as president and vice-president, respectively, of the undergraduate association MCBcDNA.

Division Awards

- Natalia Glebova (Leighton) receives the BMB Divisional Citation for highest overall achievement in the Biochemistry and Molecular Biology emphasis.
- Andres Lebensohn (Koshland) receives the Grace Fimognari Memorial Award as an outstanding student in the BMB emphasis.
- Joanna Fong (Luan, PMB) receives the Kazuo Gerald Yanaba & Ting Jung Memorial Fund Prize based on her oral presentation of her research at the BMB Undergraduate Honors Research Symposium and on her honors thesis.
- Mary Lee (B. Ames) receives the F.H. Carpenter Memorial Prize in Biochemistry based on her academic achievement in MCB courses and faculty recommendation. This award provides a stipend to support the summer research of a junior MCB major in the BMB emphasis.

The following students are recipients of I.L. Chaikoff Awards for outstanding achievement and excellence in the Cell and Developmental Biology and Neurobiology emphases.

- Edward Chan (Timiras)
- Emy Chen (Sensabaugh, Pub Hlth)
- Lukasz Gorski (Westheimer)
- Brian Haig (Calendar)
- Andrew Hsieh (Firestone)
- Brian Kim (Wilt)
- Catherine Lacayo (Burnside)
- Vikram Rao (Bertozzi, Chem)
- Anshuman Singh (Forte)
- Miles Zajaczkowski (Shatz)

- Rahul Davé (Koshland) receives the Henke Award for outstanding achievement in the Neurobiology emphasis.
- Jennifer Ramond (Rine) is named the Outstanding Undergraduate Geneticist based on her oral presentation of her research at the Genetics Undergraduate Research Symposium and on her honors thesis.
- Tiffany Horng (Shastri) receives the Outstanding Immunologist Award for high academic achievement and quality of research by an undergraduate.

COMMENCEMENT

The MCB Commencement is on Sunday, May 23, 1999, at 2:00 PM at the Hearst Greek Theatre. Nobel Laureate J. Michael Bishop, chancellor of UC San Francisco, will give the commencement address.

CONTINUED FROM PAGE 3 . . .

Professors Randy Schekman and Jeremy Thorner involving yeast technologies. They were important because many of Chiron's products are made in yeast including the hepatitis B vaccine, hepatitis C antigens for the diagnostic test, and human insulin.

Over the years, Penhoet's job at Chiron changed a great deal. At the beginning when Chiron had only 20 employees, Penhoet said it was like running a university research lab, but Chiron has become a large corporation with over 7000 employees. "It was not my primary interest or skill to run a company that large," said Penhoet. "I still consider myself at the core a scientist, and as the company grew, I became more and more disconnected from the science." Penhoet stepped down as president and CEO of Chiron on April 30, 1998. He is now the vice chair of Chiron's Board of Directors.

Like the biotechnology industry he helped pioneer, Penhoet was born and flourished in the San Francisco Bay area. His hometown is Oakland, where his father owned a hardware store. His mother taught piano and violin lessons and was a founding member of the Oakland Symphony. Penhoet went to college at Stanford and spent his career at UC Berkeley and at Chiron in Emeryville. Currently, Penhoet lives in Oakland with his wife, although they also spend time at their farm in Napa where his wife trains horses for dressage, a sport which Penhoet describes as "gymnastics for horses." They have two grown sons—one of whom attended Stanford and the other Berkeley, consistent with their father's divided loyalties between the two universities.

Penhoet attended the Oakland public schools, and he credits his initial interest in science to two of his high school teachers, a math teacher named Albrecht and a biology teacher named Thomas. Also while Penhoet was in high school, the Soviets launched Sputnik, which stimulated Penhoet's interest in science and technology to the extent that he decided to study engineering at Stanford. Soon after arriving at Stanford though, he changed to pre-med. It was not until he did undergraduate research that he thought he might like to be a scientist. "I didn't have a good appreciation for what scientists did, which is a common problem with kids," said Penhoet. "I had no experience with scientists in my family or my family's environment. Studying and doing science are two totally different things, and unless you are lucky enough to get experience doing science you never know that. So I was lucky. The most important single thing that happened to me in my life, probably, was the opportunity to do undergraduate research. That's why I push these programs so hard here on campus. The most important thing we can do here is give undergraduate students the opportunity to do research because I have seen it transform so many people's lives, including my own. "

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CORRECTION

The following 1997-98 Ph.D. graduates were mistakenly omitted from the Spring, 1998, issue. The list of 1998-99 Ph.D. graduates will appear in the next issue (Fall, 1999).

- **Kurt Ahrens** (Freeman) Response Dynamic of the Rat Entorhinal Cortex to Olfactory Input.
- **Nathaniel David** (Stevens, Chem) Biochemical and Biophysical Studies of the alpha-Factor Receptor (Ste2 protein) from *Saccharomyces cerevisiae*.
- **Paul Diaz** (Winoto) Identification and Characterization of a Locus Control Region at the T-cell Antigen Receptor Locus.
- **Leena Gandhi** (Collins) Biochemical Characterization of *Tetrahymena thermophila* Telomerase Proteins.
- **Nancy Hong** (Winoto) *In Vivo* Studies of the Mouse T-cell Receptor alpha/beta (Dad1) Locus.
- **Shivani Nautiyal** (Alber) Design and Characterization of a Heterotrimeric Coiled Coil.
- **Eric Powers** (Nelson/Kane) Mechanism and Regulation of the Stress Response in *Saccharomyces cerevisiae:* Identification and Analysis of Hsf1-Interacting Factors.
- **Kenneth Teter** (Moore) Mechanisms of Localization for Resident Organelle Proteins in the Exocytic and Endocytic Secretory Pathways.
- **Walter Yamada** (Lewis, EECS) Second-order Wiener Kernel Analysis of Auditory Afferent Axons of the North American Bullfrog and Mongolian Gerbil Responding to Noise.

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