

MCB Transcript

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

Computational Biology Emphasis

Gives Students New Options

When she was an undergraduate at the Massachusetts Institute of Technology, Liana Lareau declared a double major in mathematics and biology. That left some of her classmates puzzled. "People looked at me strangely. They wondered if I was doing pre-med," she recalls.

Now some six years later, Lareau's interests, which may once have seemed eclectic, have led her naturally to Berkeley and to the emerging discipline of computational biology. Researchers in this area combine expertise in fields such as cell biology,

bioengineering, statistics and computer science to mine genomic databases for new biological insights. With several departments having hired computational faculty years ago, Berkeley has enjoyed an early lead in the field, and this was apparent to Lareau when she was applying to graduate schools. "Berkeley was way ahead of most places in the number of people doing computational biology," she says.

Yet until two years ago, there was no formal recognition of the campus's

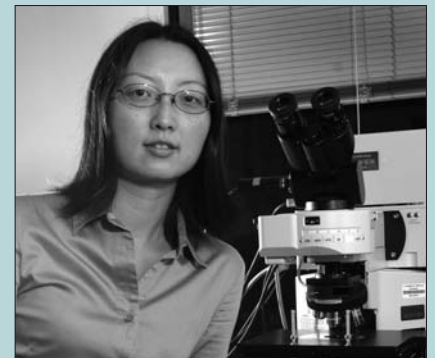
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Liana Lareau was one of the first MCB graduate students to declare a Designated Emphasis in computational biology

MCB Nets Two

"Genius" Awards



Lu Chen

Two of MCB's youngest faculty members, Nicole King (35) and Lu Chen (33), each got a big surprise on September 14 when the director of the MacArthur Fellows program called to say they were among this year's recipients of the prestigious, no-strings-attached grants, sometimes referred to as "genius" awards.

"It took a remarkably long time for it to sink in," says King, who thought at first she was being called for her opinion about a nominee.

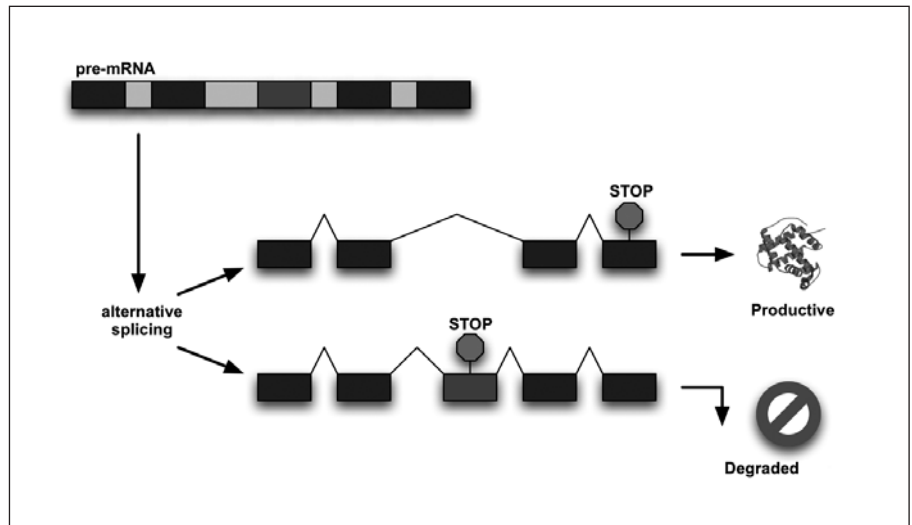
The fellowships are awarded on the principle that the best way to foster innovation and creativity is to fund people, not projects. The \$500,000 grant, paid over five years, comes with no reporting requirements or performance measures, and the recipient may spend the money in any way. Fellows range from artists and activists to poets and

continued on page 5 . . .

computational assets. Then the university established a Designated Emphasis in Computational and Genomic Biology. It both formalized and enhanced the interdisciplinary bridges that some faculty and graduate students, like Lareau, were already building. Along with it, a Graduate Group, composed of computationally-minded faculty from a dozen different departments—including nine faculty from MCB—came together to mentor the students, set course requirements, sponsor seminars and organize retreats. If Berkeley had critical mass in computational biology before, the new emphasis ignited it.

The field of computational biology has arisen somewhat spontaneously over the past five or ten years as scientists from diverse backgrounds have begun looking for ways to dig into the mountains of biological data building up on computers around the world. Biological research continues to produce vast stores of digitized information on everything from genome sequences to protein interactions to gene expression patterns. It is widely believed that a great deal of biological insight resides in the data. What's needed are people with enough brains and energy to dig it out. Thanks to the new designated emphasis (DE for short), Berkeley is now officially training those people.

The DE works a little like a declared minor subject. It appears on the degree below the name of the department that admitted the student, and it comes with additional course requirements. For the DE



Computational results: the analysis of splice variants by Lareau and colleagues suggests alternative splicing may be a common form of gene regulation.

in Computational and Genomic Biology, a graduate student may be accepted into any one of 11 graduate programs (see DE in CGB Facts, page 3) and must then join the research group of one of the 28 affiliated faculty members. A critical feature of computational biology is that it's not just for biologists. The associated programs range from chemistry to statistics.

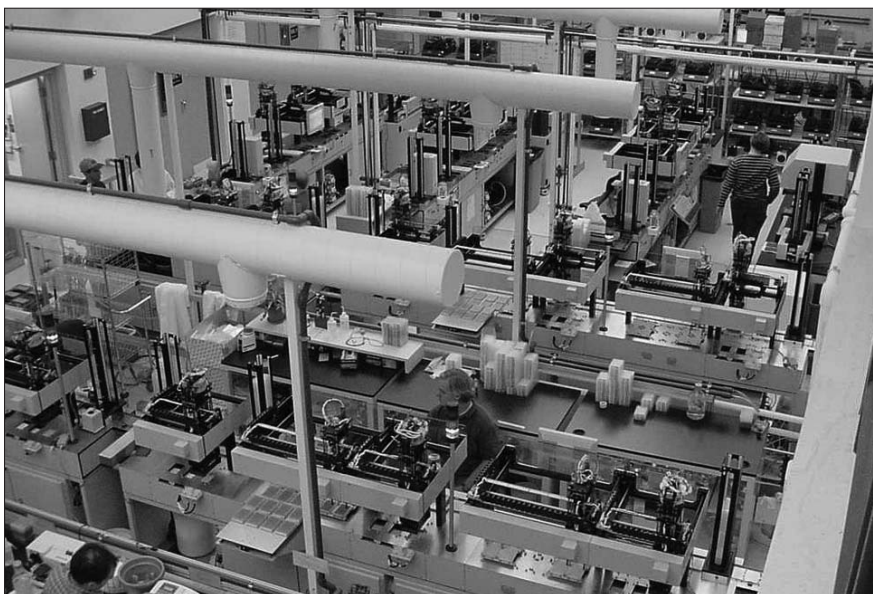
Once admitted, DE students continue their degree according to the requirements of their associated program. But they also have many additional opportunities to interact with other silicon-loving students



Derek Chiang

and faculty, whether it's at seminars, the annual retreat, or just networking through the graduate group. The added coursework is minimal, and it emphasizes breadth. Each DE student must take at least one course from three of five categories (computer science, statistics, biology, chemistry and physics, computational biology), with at least two courses being outside his or her associated program.

The program not only benefits students, it also strengthens the research infrastructure at Berkeley, says genetics & development professor and Lawrence Berkeley National Lab researcher Michael Eisen, who helped spearhead the drive to create the DE and graduate group. "We



High-throughput sequencing centers, like this one at the Whitehead Institute in Cambridge, Massachusetts, have sprung up worldwide.

DE in CGB Facts

have probably the best collection of computational biology people here, but because they were so spread out, people both inside and outside the campus tended not to know it," he says.

By 2003, a small group of faculty had put together a proposal to change that. "The challenge was getting 12 or so departments to agree on what a computational biologist looks like," says Eisen. The job description may vary depending on whether one is trained as a biochemist or a statistician. But in the end it was possible to create a program that provides both a broad scope of opportunities while ensuring the training was still quite rigorous, Eisen says.

Credit also goes to a handful of students who, like Eisen, saw a need for more formal links among campus members doing computational work. Derek Chiang, a recent graduate from Eisen's lab who now holds a postdoctoral fellowship at the Broad Institute at MIT, compiled information for a website and e-mail list which flagged relevant seminars, gave the details of interdisciplinary courses, and listed faculty and students doing computational work. Alan Moses, another recent graduate from the Eisen lab who is now at the Sanger Institute in Cambridge, UK, organized a series of

informal faculty and student research presentations which could be taken for course credit. All these activities were highlighted in the formal proposal for the new DE.

Lareau is now a graduate student in Steven Brenner's lab, where she works on human gene splicing. This is a key step in gene expression in which non-coding sequences are trimmed out of gene transcripts. The availability of the human genome, as well as thousands of gene transcript sequences, makes splicing a good candidate for a computational approach. In particular, Lareau is investigating the idea that alternative splicing—when a transcript may be cut and rejoined in more than one way—is a key regulator of gene activity.

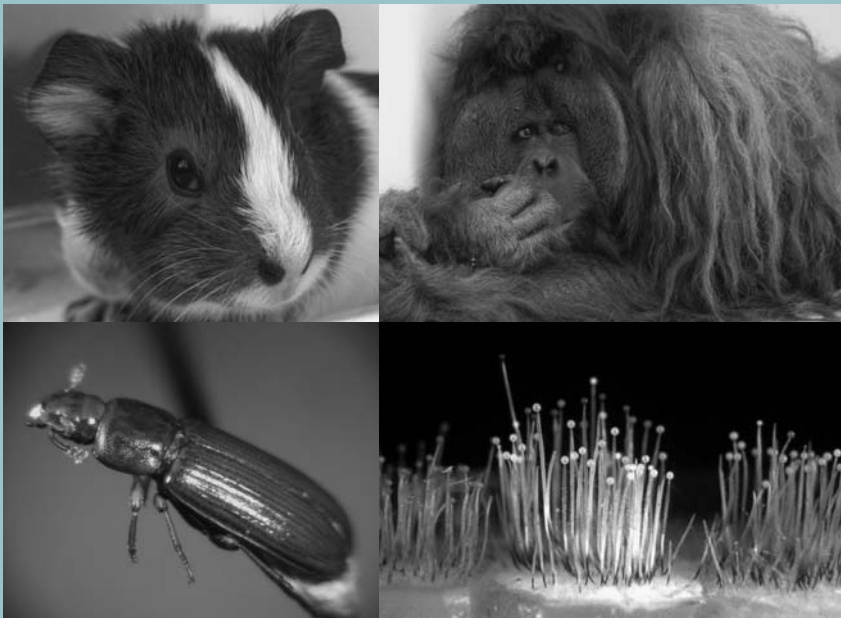
Will MCB now be turning out biologists who have never passaged tissue culture cells or subcloned a gene? In fact, it looked at first like Lareau might be able to complete her thesis entirely *in silico*. But last year, Brenner hired two postdocs with wet lab experience to test some of these ideas in mammalian cell culture. Lareau intends to get her feet wet too. "I used to joke that I would be the first MCB student to graduate without doing an experiment," she says. "But now I think I'll end up doing some after all."

Associated Programs

- Bioengineering/UCSF & UCB Joint Graduate Group
- Biophysics
- Biostatistics (School of Public Health)
- Chemistry
- Electrical Engineering and Computer Sciences (EECS)
- Integrative Biology
- Mathematics
- Molecular & Cell Biology
- Physics
- Plant Biology & Graduate Group in Microbiology
- Statistics

Associated MCB Faculty

- Thomas C. Alber
Structure/function studies of regulatory switches
- James Berger
Macromolecular assembly, structure & function
- Steven E. Brenner
Structural & functional genomics
- Michael B. Eisen
Regulatory sequence analysis
- Tracy M. Handel
Protein design & chemokine biology
- Susan Marqusee
Protein folding, stability & function
- Daniel S. Rokhsar
Genome assembly & comparative genomics
- Jasper D. Rine
Yeast genetics & genomics
- George Oster
Mathematical models of molecular, cellular and organismal systems



*Genomes galore: DNA sequence data is fueling the computational biology frenzy. Among the organisms being sequenced (clockwise from top left): the guinea pig (*Cavia porcellus*), the orangutan (*Pongo pygmaeus*), a light-sensitive fungus (*Phycomyces blakeslecanus*), and the red flour beetle (*Tribolium castaneum*).*

Educators Study

MCB Diversity Program

by Camille Mojica Rey

Scientists and science educators from around the state descended on Cal this Fall to get a closer look at MCB's Biology Scholars Program (BSP), nationally recognized as a model science diversity program. The occasion was a two-day conference in October entitled "The Science of Diversifying Science", where participants learned how to develop academic assistance programs for disadvantaged students on their own campuses.

BSP was founded in 1992 with the help of MCB faculty as an attempt to level the playing field for undergraduates from underserved racial and ethnic groups (*Transcript*, Fall 2004, p.1). But despite BSP's reputation as a model, one important lesson from the conference is that there is no cookie-cutter solution to the problem. As BSP director John Matsui told the attendees, what works at Cal may not work elsewhere.

"We need to critically analyze what works and what doesn't on our own campuses," Matsui said during his opening remarks on October 7 at the Alumni House. "We can not simply provide the same standard list of services. We need to listen to our students,

find out what they need and hold ourselves accountable for providing those services in a way that allows them to succeed," Matsui said.

The conference agenda focused on the design, implementation and evaluation of science diversity programs. Conference attendees participated in a brainstorming session, aimed at designing an optimal program for their campus. In one session, a panel of BSP staff and former students spoke to the particulars of how components of BSP are delivered.

At least as important as getting the pieces right are interdisciplinary collaborations, said Patricia Gándara, a professor of education at UC Davis who has researched diversity programs across the country. In her keynote speech, Gándara urged attendees to form new partnerships in order to properly evaluate their programs. "Take a social scientist to lunch," she said. "The folks in science fundamentally do science. It's not their job to design the kind of rigorous evaluations we need."

When done properly, diversity programs do appear to work. In 2003, Matsui, MCB professor in residence Caroline Kane and BSP's assistant director, Roger Liu, published data showing that despite having lower high school grades and SAT scores, minority BSP members graduated in biology at the same rate as non-minority students and with similar GPAs. BSP targets economically disadvantaged students, but is open to anyone with an interest in the biological sciences.

BSP has been funded by the Howard Hughes Medical Institute since 1992. Last year, the program was awarded a \$5.6 million grant from the Gordon and Betty Moore Foundation. Those funds allowed BSP to expand its staff and formalize a "Pre-Health Professions" pathway within the program. This year's conference is the first in a series of five also sponsored by the foundation.

Craig Byus, dean of the Division of Biomedical Sciences at UC Riverside, said meeting with BSP students over meals was one of the best parts of the conference. "You really cannot arrive at a real understanding of what the program does without talking to the students," said Byus, who recently started the Medical Scholars Program on his campus.

Christine Des Jarlais, the assistant dean for graduate outreach and postdoctoral affairs at UCSE, said she learned from BSP students about the importance of the sense of community that BSP provides. Students with ethnic backgrounds that are poorly represented in the sciences can feel isolated, especially at a large, competitive institution like Cal, and students report that BSP can help, Des Jarlais said. "It's not just a feel-good effort," she said. "It enhances self-confidence and provides some degree of motivation for the student to remain a part of that community."

David Weisblat (CDB), who attended the conference, said he hoped to see BSP grow in the coming years. Faculty members are balancing many competing demands, he explained. "We need programs like BSP to fill in the gaps and we need to support its efforts," Weisblat said.



BSP conference panelists (from left to right): Edward O'Neil of UCSE, Assemblywoman Carol Liu, Alex Barnum of the Moore Foundation and Barbara Johnston of the California Telemedicine & eHealth Center

FACULTY NEWS

ENDOWED CHAIRS AND PROFESSORSHIPS

Iswar Hariharan (CDB) has been named C.H. Li Chair in Biochemistry and Molecular Endocrinology. The appointment lasts four years.

Richard Harland (BMB and MCB Chair) has been awarded the C.H. Li Distinguished Professorship

Mu-ming Poo is the first holder of the Paul Licht Distinguished Professorship in Biology. The appointment lasts five years.

Donald Rio (G&D) is now the C.H. & Annie Li Chair in the Molecular Biology of Diseases. The appointment lasts four years.

Nilabh Shastri has been named the Class of 1933 Chair in Biological Sciences. The appointment is for three years beginning July 1, 2005.

Giovanna Ames (BMB) and **Hiroshi Nikaido** (BMB) have been elected to the American Academy of Arts and Sciences. (<http://www.amacad.org/>)

James Berger received the ASBMB Schering Plough Research Institute Award for outstanding research contributions to biochemistry and molecular biology. He also was awarded the ACS Pfizer Award in Enzyme Chemistry, given for outstanding work in which “the presence of enzyme action is unequivocally demonstrated.”



▲ **David Bilder** and **Michael B. Eisen** are among this year’s recipients of the Hellman Family Faculty Fund awards, which were established in 1995 by F. Warren Hellman for the purpose of supporting promising assistant professors who show the capacity for great distinction in their research. (<http://vpaaafw.chance.berkeley.edu/hellman.html>)

Rebecca Heald has received the 2005 Women in Cell Biology Junior Career Award, given by the American Society for Cell Biology. According to the ASCB website: “The Award is given to a woman in an early stage of her career who has made exceptional scientific contributions to cell biology and exhibits the potential for continuing a high level of scientific endeavor while fostering the career development of young scientists.” (<http://www.ascb.org/membership/awards.html>) She also received the Hamilton College Alumni Medal for outstanding achievements in biochemistry.

Eva Nogales has received the American Society for Cell Biology Early Career Life Scientist Award, given for outstanding research achievement in the first 12 years following a doctorate. (<http://www.ascb.org/membership/awards.html>)

Gerald Westheimer (Professor of the Graduate School, Neuro) received his third honorary doctorate, an M.D. from the University of Tübingen (Dr. med. h.c.). Westheimer is also a Fellow of the Royal Society (F.R.S.).

... *Genius Awards continued from page 1*

scientists. None of the 25 recipients knows he or she has been chosen until that fateful phone call.

Chen’s research is directed at the synapse, the structures on the ends of nerves that transmit signals from one cell to another. In particular she studies the role of the protein stargazin in the function of the AMPA receptor, which responds to glutamate, the most common excitatory neurotransmitter in the nervous system. One of her goals is to build a synapse from scratch as a way to confirm a detailed understanding of how it works. Such knowledge will be critical in devising treatments for a host of neurological ailments. (See Chen’s profile in the Fall 2002 *Transcript*.)

King studies the evolutionary origins of multicellularity. She works primarily with choanoflagellates, single-celled organisms with a colony-forming stage, to gain insight into the genetic requirements for cells to cooperate. There is little evidence in the fossil record from this critical period in life’s history, and so molecular-genetic approaches appear to be the best way in. (See King’s profile in the Fall 2003 *Transcript*.)

Neither King nor Chen has decided how they will use the money.

For more see: <http://www.macfound.org/>



Nicole King

2004-2005 GRADUATES

FALL 2004

- **Andrew Conery** (Luo) Regulation of TGF-beta-induced apoptosis by the serine/threonine kinase Akt/Protein Kinase B
- **Doreen Cunningham** (Collins) Biochemical and Biological Functions of *Tetrahymena thermophila* Telomerase
- **Gidon Felsen** (Dan) Cortical processing of natural visual stimuli
- **Tinya Fleming** (Garriga) Anterior-Posterior Guidance of Embryonic Cell Migrations in *Caenorhabditis elegans*
- **Sharat Gadde** (Heald) Analysis of Anaphase in *Xenopus* Egg Extracts
- **Shefa Gordon** (Dickinson, IB) Neural Control of Aerodynamics Power During Flight in *Drosophila* Indirect Flight Muscles
- **Michael Hutchinson** (Shastri) Master's thesis: Compartmentalization of the antigen-processing pathway
- **Marjorie James** (Sha) MA
- **Charles Lee** (Winer) Structure of the Cat Auditory Cortex
- **Eric Martens** (Martin) Transcriptional Regulation by the Oncogene v-Src
- **Susan Mashiyama** (Ames) Folate and other B-vitamins: Effects of deficiency on DNA-uracil content, chromosome damage, homocysteine, and interactions with gene polymorphisms
- **Joseph Mougous** (Bertozzi) The Role of Sulfated Molecules in *Mycobacterium tuberculosis* Pathogenesis

- **Jeff Tan** (Tanouye) Understanding Seizure Susceptibility in *Drosophila* Bang-sensitive Mutants: The Characterization of *slam-dance* and its Interaction with Laminin
- **Herman Yue** (Winoto) Functional Analysis of the murine TRAIL receptor

SPRING 2005

- **Derek Chiang** (Eisen) Computational and Experimental Analyses of Promoter Architecture in Yeasts
- **Carla DiGennaro** (Rio) Master's thesis: DNA Double-Strand Break Repair in *Drosophila melanogaster*
- **Kariena Dill** (Amacher) Genetic Analysis of somitogenesis in Zebrafish *Danio rerio*
- **Heather Dionne** (Bilder) MA
- **Michael Dybbs** (Scott) Elucidating pathways that modulate neurotransmission in *C. elegans* through genetics RNA interference and computational approaches
- **Jan Erzberger** (Berger) Structural Studies of Bacterial DNA Replication Initiation
- **Hunter Fraser** (Eisen) Studies of evolution from a genomic perspective
- **John Gladden** (Meyer) Mechanisms of Sex Determination and Dosage Compensation in *Caenorhabditis elegans*
- **Albert Glasscock** (Tanouye) Genetic Modification of Seizure Susceptibility in *Drosophila*
- **Richard Green** (Brenner) Gene regulation via alternative splicing and nonsense-mediated mRNA decay
- **Benjamin Hayden** (Gallant) Mechanisms of Working Memory Attention and Decision in Visual Area V4

- **Elsa Jimenez** (Shastri) Master's thesis: The Mechanism of Presentation of Exogenous Antigens onto Class I MHC Molecules
- **Seth Kostek** (Nogales) The Molecular Architecture of Human Transcription-Coupled DNA Repair Complexes
- **Annie Lee** (Meyer) Analysis of box-1: Gene Loss Bypasses the Role of *sdc-1* in Dosage Compensation
- **Alexis Madrid** (Weis) The Role of Transmembrane Nucleoporins and the Secretory Pathway in Nuclear Pore Complex Assembly and Function
- **Thomas Maresca** (Heald) Dissecting the Molecular Mechanisms of Chromosome Condensation and Spindle Assembly using *Xenopus* Egg Extracts
- **Benjamin Martin** (Amacher) Genes Involved in Hypaxial Muscle Development of *Xenopus laevis* and *Danio rerio*
- **Xiaoyun Ren** (Weisblat) Isolation and Characterization of PAR-1 and PAR-6 Homologs in *Helobdella robusta*
- **Rachel Shreter** (Tjian) Master's thesis: Structural Characterization of a *Drosophila* Chromatin Remodeling Complex
- **Mark Stern** (Beckendorf) Analysis of the Role of the Non-receptor Kinase in *Drosophila* Oogenesis
- **Mark Voorhies** (Handel) Design of Aspartate Aminotransferase Mutants with Increased Affinity for Maleate
- **Gordon Wang** (Poo) The Essential Role of TRP Channels in Axon Guidance by Chemotropic Factors
- **Christine Weirich** (Weis) The function of the DEXD/H-Box protein Dbp5 in mRNA export

CLASS NOTES

- **Tamara Davis** (PhD 1996) was promoted to Associate Professor with tenure at Bryn Mawr College, where she has been teaching and doing research since January 2000. (tdavis@brynmawr.edu)
- **Adam Diament** (BA 1997) received his PhD in genetics from UC Davis in 2004 where he worked on obesity. This past year he was a post-doc at UCLA studying the genetic causes of polycystic kidney disease. He has decided to go to law school in order to shift his focus to bioethical and legal issues in science. (adamlists@adamdiament.com)
- **Ian Glomski** (PhD 1997) is a post-doctoral fellow at the Pasteur Institute's Division of Toxins and Bacterial Pathogens in Paris. He is working on protective adaptive immunity to *Bacillus anthracis*. (iglomski@pasteur.fr)
- **Linda Hammond** (MA 1996) finished her PhD in nutritional biochemistry at the University of North Carolina at Chapel Hill in December 2004. She received the department's 2004-2005 A. Hughes Bryan Outstanding Doctoral Student Award. She is now doing a post-doc in the Department of Molecular Biology and Biochemistry at UC Irvine.
- **Pamela Lee** (BA 2001) is working at Wells Fargo as an administrative assistant in small business banking for the San Francisco Bay region. She started with Wells Fargo Investments a little over a year ago as an operations assistant and transferred to her current position in January 2005. She says she loves the people she works with. Formerly in cosmetics retail, Lee can still occasionally be found at various skincare events or at the facial salon. (pam@pamlee.net)
- **Matthew Levine** (BA 1994) has finished a fellowship in endocrinology and metabolism at Scripps Clinic in San Diego and will be entering private practice in endocrinology in Orange County in July 2005. He got married in 1998 while in medical school at the University of Southern California and is the proud father of a two-year-old boy. (clonedoc@earthlink.net)
- **Sophia Lin** (BA 2005) is in her third year of an emergency medicine residency in New York City (Cornell-Columbia). She finished her pediatrics residency at UCSF in 2003. (soph_lin@yahoo.com)

continued on page 8 . . .

CLASS NOTES WANTS TO HEAR FROM YOU

Do you have a Bachelor's, Master's or PhD in Molecular and Cell Biology from Berkeley? Let your classmates know what you are up to by sending in a Class Note for publication in the next issue.

To send your Class Note, you can

- Clip and mail this form
or
- go to mcb.berkeley.edu/alumni/survey.html
or
- Send e-mail to tscript@berkeley.edu

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MCB DEGREE _____ YEAR _____

E-MAIL _____

May we print your e-mail address? Yes No

Tell us what you have been up to:

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MCB NEWSLETTER
Department of Molecular
and Cell Biology
142 LSA #3200
University of California
Berkeley, CA 94720-3200

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University Relations
2440 Bancroft Avenue
University of California
Berkeley, CA 94720-4200

CLASS NOTES

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- **Jeffrey de Castro Mariano**, MD (BA 1996) got his medical degree at UCSF in 2001. After an internal medicine residency at UCLA and a geriatric fellowship at UCLA/VA, he started as an assistant clinical professor in geriatrics at UCLA in September. He says he is also a proud member of Berkeley's Pilipino American Alumni Association. (jcmariano@sbcglobal.net)
- **Kala M. Mehta** (BA 1993) is an assistant adjunct professor at UCSF, Department of Medicine, Division of Geriatrics, where she was appointed to the faculty in 2003. She studies the epidemiology of aging. Mehta has a two-year-old daughter named Sarika. (kala@itsa.ucsf.edu)
- **Fernando "Chino" Rodriguez** (BA 1998) is a first year resident in radiology at the University of New Mexico. He completed a joint MD/MBA degree at UCLA in December 2004. He continued to teach organic chemistry and molecular biology to undergraduates nearly every year as he did for the Biology Scholars Program (BSP) at Berkeley. He says it not only provided the satisfaction that comes from teaching others, but it also funded two and a half years of travel that he has managed to squeeze in along the way. (chino@cal.berkeley.edu)
- **Benjamin S. Santos** (BA 1995) has just graduated from the UC Davis School of Medicine. He is now an intern at the Kern Medical Center in Bakersfield, after which he will begin a residency in emergency medicine at the Los Angeles County and University of Southern California Medical Center. Before medical school, Santos earned an MPH from Loma Linda University. He and his wife, Jennifer Jaramillo ('95), are expecting their first child in July. (ben_santos@yahoo.com)
- **Julio Soto** (PhD 1994) was awarded tenure and promotion to the rank of associate professor of Biology and Science Education at San Jose State University. (jsoto3@email.sjsu.edu)
- **Darrell Sutijono** (BA 1999) graduated from Chicago Medical School this June and began residency in emergency medicine at SUNY Downstate Medical Center (Kings County Hospital) in Brooklyn. He married Liezl Raguindin (BA 1999) this June in San Francisco. Raguindin is a fourth-year optometry student at the Illinois College of Optometry in Chicago. (labprolnr@yahoo.com)

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DESIGNER: Betsy Joyce
EDITOR: Jonathan Knight

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University of California
Department of Molecular and Cell Biology
142 Life Sciences Addition #3200
Berkeley, CA 94720-3200

tscript@berkeley.edu

Send address changes to:

Alumni Records
2440 Bancroft Way
University of California
Berkeley, CA 94720-4200

Or e-mail alumrecs@dev.urel.berkeley.edu

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Department of Molecular and Cell Biology
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