MCB AT BERKELEY

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

New Faculty Join Neurobiology and BMB

MCB has three new faculty members. ***Mu-ming Poo*** *and* ***Richard Kramer*** *joined the Neurobiology faculty, and chemistry professor* ***Carolyn Bertozzi*** *was given a joint appointment in MCB as an associate professor of Biochemistry and Molecular Biology. Here's a look at their research.*

Use it or lose it. The phrase encapsulates one of the most important principles of modern neurobiology: the more you use a sense or exercise a muscle, the more space your brain devotes to it. Disused regions of cerebral cortex can be taken over by other neuronal inputs and possibly even other functions. This fierce competition for cortical real estate continues throughout life. On a finer scale we now know that experience can modify individual synapses in neural networks. Such continual plasticity may be the biological basis for learning, memory, behavior and even thought.

Mu-ming Poo, who came to Berkeley as a full professor from UC San Diego in November, has devoted himself to working out how animals wire up their nervous systems. In particular, he wants to understand the molecular basis of synaptic plasticity and neuronal growth.

Poo's lab uses cultured frog neurons to hunt down molecular pathways that show growing axons where to go. They expose the cells to gradients of secreted guidance molecules and try to work out how the tip of the growing axon interprets the signal and then executes a turn toward or away from it.

In an invited special lecture at the November meeting of the Society for Neuroscience in New Orleans, Poo described work published earlier this year on synaptic plasticity. He and a graduate student, Huizhong Tao, showed that potentiated synapses can spread their activated

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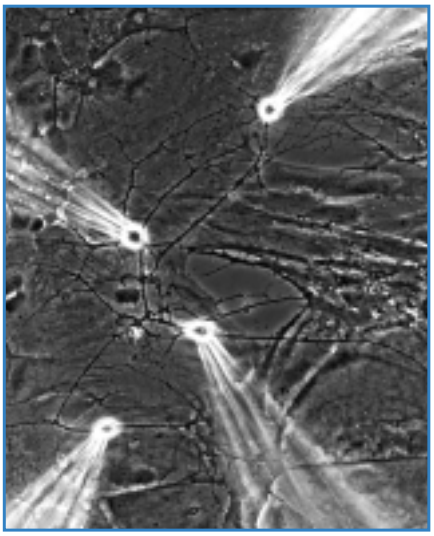

Quadruple patch recording from a network of cultured rat hippocampal neurons. Courtesy of H. Tao and M. Poo.

Where Have All Your Classmates Gone?

When Jonathan Dabora (Ph.D. 1996) decided to change careers, he knew that he could turn to his friends and fellow MCB graduate alumni for advice and support. The problem was: how to find them?

Whether we realize it or not, our tendency to move house, switch labs, change cities and sometimes even get jobs after leaving Berkeley makes us very hard to track. Yet we could be an invaluable resource to each other. Many other degree programs—business, engineering and law, to name a few—have extensive alumni networks. Recent graduates tap older alumni for advice or find out which of their classmates live in the same city through the network.

In the sciences, however, such networks are less common, because students have traditionally followed a straight path from grad school to postdoc to academic position. That's now changing. Today, more than a fifth of MCB graduate students leave that path soon after they get their degrees (*MCB At Berkeley*, Fall 1999, p 7), making the support of fellow alums more valuable than ever.

Dabora has already taken the first steps to creating an effective alumni network. But he can't do it alone. In the following letter on page 6, he reports on the current state of affairs and describes how we can help.

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state to other synapses in the same network in a highly selective manner, revealing for the first time one of the rules by which specific inputs modify neural networks. Computational biologists crave such rules to help them develop plausible simulations of brain functions. Ultimately, Poo hopes to tease out the molecular pathways that allow synapses to communicate.

Channel surfing. Electricity charges our nervous system, yet most of what we detect in our environment is not electrical at all. How does an aromatic molecule docking at a receptor in the nose become an electrical signal that the brain can interpret as an odor? How do photons of light striking the retina end up as membrane potentials zipping along axons to the visual cortex?

The answer, Richard Kramer will tell you, lies in the secrets of cyclic nucleotide-gated (CNG) ion channels. In the nose, for example, when an odorant binds one of the receptors on the surface of the olfactory neurons, a coupled G-protein switches on. Depending on the receptor, this may then activate adenylate cyclase, raising the level of intracellular cyclic AMP. CNG channels detect the change and open, allowing sodium ions to flow in and depolarize the cell.

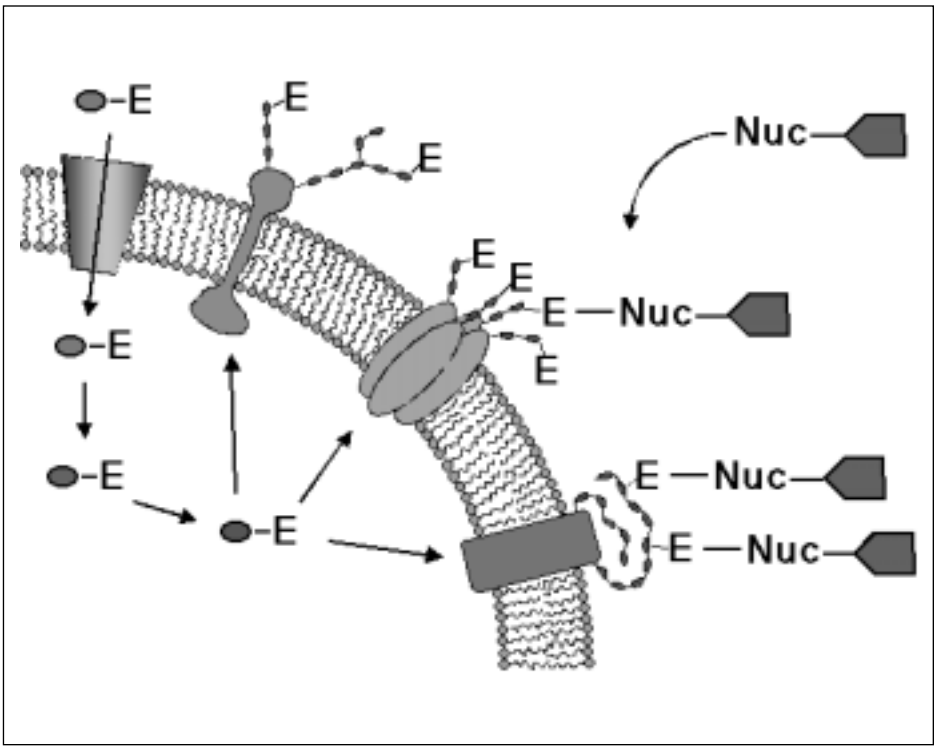
Kramer returned to the department over the summer as an Assistant Professor of Neurobiology (he was a Ph.D. student here in the early 1980's). The unifying theme of his research is the CNG channel—how it is activated and modulated and its precise role in signal transduction. His lab has discovered that growth factors from pigment epithelial cells in the eye regulate the channels, thereby rapidly changing visual sensitivity. And they have co-opted the CNG channel to develop the first technique that measures the real-time concentration of the critical messenger cyclic GMP in a living neuron.

Designer coats. For years the dense forest of carbohydrates that surrounds eukaryotic cells was thought of as nothing more than a protective shell to fend off damaging chemicals and foreign objects. But, in the past decade it has turned out to be much more. The oligosaccharides of the cell coat, or glycocalyx, are critical for processes like fertilization, blood clotting, viral infection and inflammation.

By working out the chemistry of the glycocalyx, Carolyn Bertozzi hopes to find out how the cell's sugar coating figures in disease, and how it might be manipulated for better drug targeting or the delivery of genes.

Some of the enzymes that manufacture oligosaccharaides for the cell surface are not terribly picky about their substrates. This makes it possible for Bertozzi to place chemical groups on the cell surface that would not otherwise be found there by slipping unnatural variants of glycoprotein or glycolipid precursors into cells. For example, adding an analog of a N-acetylmannosamine that has a ketone group results in ketone groups in the glycocalyx. The ketone can then serve as a chemical anchor for larger molecules such as a receptor for viral delivery of gene therapy.

This could potentially become a powerful tool for cancer diagnosis. Some cancer cells are known to over-express the sugar sialic acid. To take advantage of this, Bertozzi has tested sialic acid precursor analogs in vitro and found that they preferentially decorate the surface of such tumor cells with a ketone tag. In theory, a diagnostic agent could then be linked to the tag to facilitate detection of a tumor at an early stage.



Cells can take up a tagged analog of a carbohydrate precursor and then display the tag on cell-surface glycoproteins. A nucleophile (Nuc) directed toward the elecrophilic tag (E) can then link designer molecules to the carbohydrates of the cell coat. Courtesy of C. Bertozzi.

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OR E-MAIL: *jonknight@nasw.org*

Current and past issues of the newsletter are available on the MCB web site (http://mcb.berkeley.edu/news/).

IN THEIR OWN WORDS

Mu-ming Poo

Please describe your work on growth cone guidance.
Over the past ten years, we have used a cell culture system to examine the cellular mechanisms regulating the behavior of nerve growth cones in response to microscopic gradients of growth factors and guidance molecules. Our main finding is that whether the growth cone is attracted to or repelled by the factor depends highly on the cytosolic level of cyclic nucleotides, which in turn depends on other coincident signals the neuron receives from the environment. Our current goal in this area is to understand how the growth cone amplifies signals conveyed by small gradients of guidance cues and how it adapts its sensitivity to accommodate a wide range of concentrations of the cues.

What are the major themes in synaptic plasticity emerging from your lab?
One is that persistent changes in synaptic functions can be induced rapidly by electrical activity and neurotrophic factors. Second, it is becoming clear that activity-dependent secretion and action of neurotrophic factors at the synapse are critical links between neuronal activity and the metabolic and structural changes of a neural network. Finally, we now know that synaptic plasticity does not occur in isolation. It reflects global changes in the neural network in response to activity.

What are the most exciting findings in your lab over the last year or so?
We found that long-term changes in synaptic strength can be induced by a brief period of stimulation of a network of cultured neurons. These changes are distributed to selective synaptic sites within the network in a manner that is specific to the pattern of stimulation. Also, we found that brief, repetitive "natural" visual stimuli can induce persistent synaptic potentiation in the developing visual system of the *Xenopus* tadpole.

What special contribution do you hope to make to the MCB department?
I hope that my work can serve as a useful bridge between cellular/molecular neurobiology and system neuroscience. I am particularly excited about the prospect of interacting with my colleagues at the Wills Neuroscience Institute who are concerned with system-level questions.

Selected Awards and Honors:
- Javitz Neuroscience Investigator Award of the NIH, 1998.
- Elected to the Academia Sinica of Taiwan, 2000.
- Special Lecture, Society for Neuroscience Annual Meeting, 2000.

Career History:
- BS in physics, 1970, Tsinghua University, Taiwan.
- Ph.D. in biophysics, 1974, Johns Hopkins University.
- Postdoctoral Research, 1974–1976, Department of Biological Sciences, Purdue University.
- Professor (Assistant, Associate and Full), 1976–1985, Department of Physiology and Biophysics, UC Irvine.
- Research Professor, 1985–1988, Section of Molecular Neurobiology, Yale University School of Medicine.
- Professor, 1988–1995, Department of Biological Sciences, Columbia University.
- Stephen W. Kuffler Professor in Neurobiology, 1995–2000, UC San Diego.

Personal:
I enjoy chamber music and downhill-skiing.

Richard Kramer

How would you describe your field of research?
We are at the interface between molecular and cellular neuroscience. On one hand, we are interested in how neurons transmit and store information, but we are also interested in the signaling proteins themselves—the ion channels, receptors, and signaling enzymes—that mediate cellular communication and memory. Most of our work involves cyclic nucleotides (cyclic AMP and cyclic GMP) and their effectors, cyclic nucleotide-dependent kinases, and cyclic nucleotide-gated (CNG) ion channels.

Can you give an example of your work with CNG channels?
If you change the cyclic nucleotide sensitivity of these channels you change the gain of sensory transduction. We are really excited by recent results showing this is exactly what happens in rod photoreceptors. Certain growth factors (IGF-I) rapidly (within seconds) increase the light response by triggering dephosphorylation of CNG channels, making them more sensitive to cyclic GMP. This is the first case where an extrinsic chemical signal has been shown to modulate phototransduction. Equally surprising, the chemical is a growth factor, not a conventional neurotransmitter. We are trying to understand the signaling mechanism used by IGF-I and the role that IGF-I plays in vision. Our working hypothesis is that IGF-I underlies circadian regulation of visual sensitivity

What is "patch cramming"?
Patch cramming is a method we developed for monitoring intracellular messengers in living cells in real time. In its current form, it involves a CNG channel genetically engineered to be

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ultra-sensitive and specific for cyclic GMP. We express the channel in frog oocytes and use a glass micropipette to excise an inside-out patch from the membrane. We calibrate the patch by applying different concentrations of cyclic GMP, and then "cram" it into a heterologous cell where we want to track changes in cyclic GMP in response to neurotransmitters. This crazy idea actually works, and using it we have discovered a new type of neuronal plasticity. We are trying to patch cram various neurons where cGMP plays an important role, including retinal horizontal cells and cerebellar Purkinje cells.

What special contribution do you hope to make to the MCB department?
I received my Ph.D. here, so I'm thrilled to return after many years away. In the interim, I've been at several universities, including medical schools. I've seen how graduate programs work and don't work. I think I can make some helpful suggestions about improving the Neuroscience curriculum and graduate program.

Selected Awards and Honors:
- American Heart Association (Florida Affiliate) Research Award 1999–2000
- Dean's Outstanding Research Award, University of Miami, 1999
- Stanley Glaser Foundation Award, 1998–1999.
- PhRMA Foundation Faculty Development Award, 1996–1998

Career History:
- B.Sci. in Biology and Psychology, 1978, SUNY Albany.
- Ph.D. in Neurobiology, 1985, UC Berkeley.
- Postdoctoral Research with Dr. Irwin Levitan, 1985–1988, Brandeis University.
- Associate Research Scientist in the laboratory of Dr. Steven Siegelbaum, 1989–1992, Columbia University College of Physicians and Surgeons.
- Professor (Assistant and Associate), 1993–2000, Department of Molecular and Cellular Pharmacology, University of Miami School of Medicine.

Personal:
My wife and I have been hiking nearly every weekend, either in the Berkeley Hills or Marin. On more ambitious trips we head to Big Sur or Lake Tahoe, two of my favorite places on earth. In our remaining free time we've been hunting out the best dim sum restaurants in the Bay Area—something you won't find too much in Florida.

Carolyn Bertozzi

Many biologists stop thinking about the glycocalyx after their last graduate cell biology course. What are they missing?
A lot of interesting and fun science. The glycocalyx encodes the language that a cell uses to communicate with its surroundings. Decoding that language and translating it into molecular and structural terms is the broad objective of the field of glycobiology.

What is the link between the cell coat and inflammation?
At sites of inflammation, specific glycoproteins allow white blood cells to attach to endothelial cells that line the blood vessel wall. This ultimately leads to migration of the white blood cells into the surrounding tissue and subsequent tissue damage that we associate with inflammation. By understanding this process at the molecular level we can develop ideas for anti-inflammatory drug design.

What do you hope to achieve by engineering the carbohydrates on the surface of the cell?
This technology allows us to build new cell surface landscapes in a chemically defined fashion, and this, in turn, allows us to test what is the effect of presenting certain molecules on cell surfaces. In addition, we use cell surface engineering to translate the biological information encoded in cell surface molecules into chemical information that we can apply to new diagnostic strategies for cancer. Cancer cells have differences in sugar structures and abundances compared to normal cells, and this can be witnessed through delivery of chemical tags into those sugars by feeding cells tagged metabolic precursors. The tags provide a signature for the type of sugars on the cell, which can perhaps tell us if that cell is healthy or diseased.

What special contribution do you hope to make to the department?
I hope to further bridge the gap between biology and chemistry and to facilitate research at the interface of these disciplines, including the undergraduate level (I now have 5 MCB undergraduate students in my lab). I also have several collaborations with groups from MCB.

Career History:
- BA in chemistry, *summa cum laude*, Harvard, 1988.
- Ph.D. in chemistry, 1993, UC Berkeley. Thesis advisor: Mark Bednarski.
- Postdoc, 1993–1996, with Steven Rosen in the Immunology Program at UC San Francisco.
- Professor, 1996–present, Department of Chemistry, UC Berkeley.

Selected Awards and Honors:
- MacArthur Foundation Fellowship, 1999.
- Camille Dreyfus Teacher-Scholar Award, 1999.
- Arthur C. Cope Scholar Award, 1999.
- American Chemical Society Pure Chemistry Award, 2000.
- Presidential Early Career Award in Science and Engineering, 2000.

Personal:
I play the piano and participate in the occasional pickup band.

FACULTY NEWS

PROMOTIONS

▲ Steven Beckendorf was promoted from Associate Professor to Professor of Genetics and Development.

Tracy Handel was promoted from Assistant Professor to Associate Professor of Biochemistry and Molecular Biology.

▲ Nilabh Shastri was promoted from Associate Professor to Professor of Immunology.

APPOINTMENTS

▲ Michael Botchan became Head of the Biochemistry and Molecular Biology Division on July 1.

▲ Mary Beth Burnside will take over as the University's Vice Chancellor for Research on January 1, 2001.

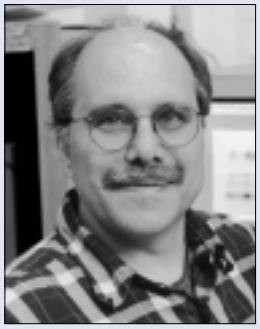
DEPARTURES

Lester Packer retired following the Spring semester.

Tito Serafini resigned his professorship to help found Renovis, Inc., a neuroscience company in Oakland.

HONORS

Richard Calendar is now serving on the Editorial Board of the *Journal of Virology.*



▲ Gary Firestone received the MCB Honorary Award from the MCBcDNA and MCBUSA undergraduate student associations for service and dedication to the undergraduate students. He was also elected Chair of the 2001 Gordon Research Conference entitled Hormone Action and appointed to the Beckman Scholars Program Executive Committee.

John Forte was elected as an honorary member to the British Society of Gastroenterology.

Stuart Linn was elected to the publications committee of the *Journal of Biological Chemistry* for a three-year term.

Edward Penhoet accepted an invitation to join the Kaiser Foundation Health Plan and Hospitals' board of directors in September.

▲ Alan Sachs has been appointed Associate Editor for the journal *Cell.*

Randy Schekman was elected to the American Academy of Arts and Sciences and made a foreign member of the European Molecular Biology Organization.

▲ Fred Wilt was elected vice-chair (2002) and chair (2004) of the Gordon Conference on Biomineralization.

GRADUATE ALUMNI NETWORK

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Get Connected

by Jonathan Dabora, Ph.D. 1996

Over the last several months I have been generating momentum for an MCB graduate program alumni network. As a first step, the members of my entering class of 1991 have already shared contact information and career updates with each other. Soon, we will deposit this information in a password-secure online directory hosted on the MCB web-server. This directory could be available to all alumni as soon as the end of this academic year. It will be searchable by name, entering class, job title, location, research area and other categories. Eventually it could be expanded to include a calendar of events and tools for planning your own alumni get-together.

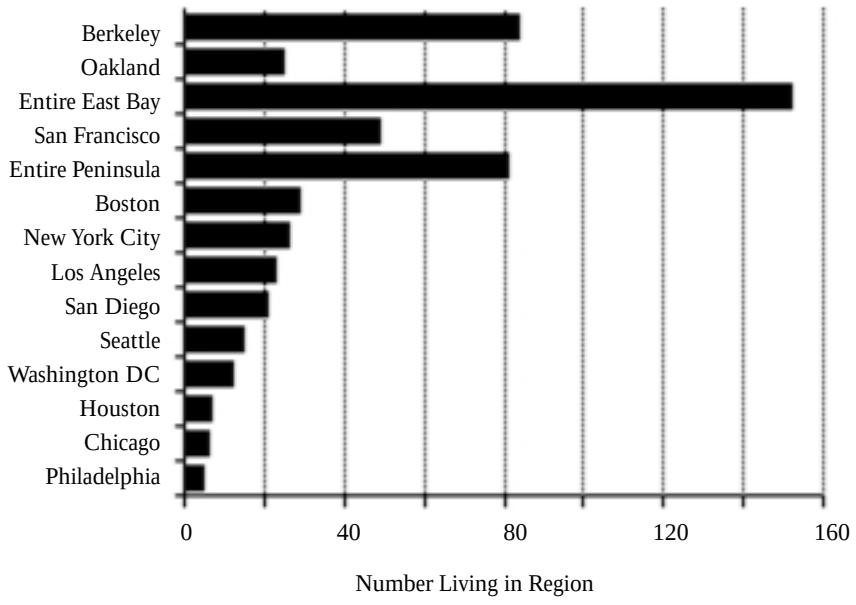
My class has already planned its first event: a reunion in Berkeley to coincide with the tenth anniversary of our entry into the MCB program. We are aiming for a weekend near the end of April. Friday might include lunch with faculty members, a panel discussion for current students, and/or a seminar on science policy. Also it would be great for alumni to meet informally with current students during beer hour. Perhaps it would be beneficial to open up beer hour to Bay Area alumni from other classes as well. We are also planning a trip to wine country on Saturday and various activities on Sunday possibly to include dim sum in the City or a picnic in Tilden Park.

A comprehensive online directory would make it easy for alumni anywhere to plan such get-togethers and connect with colleagues. There could be a monthly beer hour in Boston, for example, a biotech picnic in Palo Alto, or a beach party in Los Angeles. But I can't do it alone. If, like me, you remember graduate school as a stimulating time, when each of us was surrounded by creative and diverse people, I hope you will consider volunteering to help establish and expand this network. It's not a huge commitment, and the rewards for present and future alumni will be enormous.

The main job now is to gather contact and career information from as many of us as possible. MCB Co-Chair Randy Schekman and Eileen Bell in the Graduate Affairs Office have offered administrative help for creating and maintaining the Web site and online directory. This newsletter has already collected some information with its continuing alumni survey, for which responses keep rolling in (see next page). But most alumni remain uncounted. Luckily, with Berkeley's strong history of grassroots movements, I feel confident that I will receive offers to volunteer to make a strong alumni network a reality. I look forward to hearing from interested alumni, faculty, and current students. More importantly, I hope that old friends will reconnect with one another!

Editor's note: If you have suggestions, comments, or would like to help build the MCB graduate alumni network, please contact Jonathan Dabora (Home: 310-477-9709, Cell: 310-721-5328, jonathan.dabora.2002@anderson.ucla.edu).

Graduate Alumni Since 1989 in Major Metropolitan Areas



ALUMNI NEWS

Responses are still rolling in for this popular column. If you haven't told us what you are up to yet, please take a minute to send in the form below. You can also answer the survey online at *http://mcb.berkeley.edu/alumni/survey.html* or send email to *jonknight@nasw.org.* For address changes, or to change the salutation before your name (Dr., Mrs., Prof.) in the alumni address database, please write *alumrecs@dev.urel.berkeley.edu*.

Undergraduate Alumni

1991

- Ilan D. Zipkin, Science Editor, BioCentury Publications Inc. Before his promotion in January, Zipkin had been a staff writer with BioCentury for three years. He received his Ph.D. in Cell Biology from UC San Francisco in 1997, and was a Grace Fimognari memorial award recipient as an undergraduate in Richard Harland's lab. E-mail: i*zipkin@ biocentury.com*. Phone: (650) 595-5333.

1992

- Mark A. Hoffman is now a first-year Medicine/ Pediatrics Resident Physician at Baylor College of Medicine in Houston. He received his M.D. from the University of Southern California Keck School of Medicine this year. E-mail: *markandrewhoffman@earthlink.net*. Address: 2222 Maroneal Road #313, Houston, TX 77030

1995

- Arash Michael Davallou received his MBA from Harvard Business School in the Spring and now works at a wireless startup in the Bay Area. Previously he managed the online medical and scientific distance learning programs for broadcast.com (now Yahoo! Broadcast). "I caught dot.com fever after graduation and still have it!" E-mail: *adavallou@mba2000.hbs.edu.*

1996

- Minang Turakhia is a first-year resident in internal medicine at Brigham & Women's Hospital, Harvard University School of Medicine, in Boston. He finished his M.D. this year at UC San Francisco along with classmates Curtis Chan, Joshua Dusick, and Grete Porteous.
- Eda Chao is a pediatrics intern at New York Presbyterian Baby's and Children's Hospital in the Columbia Medical Center. She received her M.D. this year from UC San Diego. She says she would be happy to hear from any MCB pre-meds seeking advice. E-mail: *edachao@yahoo.com*.
- Marc K. Chinn has been in medical school at UC San Diego since 1999. Before that he was a staff research associate at the UC San Francisco Cardiovascular Research Institute, where he started with a summer research grant from the American Heart Association in 1996. He currently holds an NIH Research Fellowship in the Department of Ophthalmology at UCSD.

1998

- Holly Chang, Business Development Associate, ePocrates, a startup in San Carlos, California, that provides Palm applications for physicians. Previously, Chang was an Associate Consultant with The Wilkerson Group/IBM Healthcare Consulting. She is also involved in MCBeyond, a professional alumni association for MCB undergraduate alumni and would be happy to talk to undergrads interested in business, consulting, or joining a start up. E-mail: *hollychang@yahoo.com.*

Graduate Alumni

1988

- Gisela Storz received the 2000 Eli Lilly & Company Research Award from the American Society for Microbiology. She works at the National Institute of Child Health and Human Development in Bethesda, Maryland. E-mail: *storz@helix.nih.gov.*

1989

- Curtis Okamoto, Assistant Professor, Department of Pharmaceutical Sciences, University of Southern California. Until 1994, he was a postdoc in the Department of Anatomy at UC San Francisco. E-mail: *cokamoto@hsc.usc.edu*.
- Brian Condie has been an assistant professor at the Medical College of Georgia in Augusta since 1996.

1991

- Roxanne Y. Morse spent three years in Melbourne, Australia, as a postdoc in Leonard Harrison's lab at the Walther and Eliza Hall Institute of Medical Research. Since returning to the US in 1994, she has stayed at home to raise her three children. She now lives in Massachusetts. E-mail: *morse@hardlink.com*.
- Yishi Jin, Assistant Professor of Biology at UC Santa Cruz. In 1999 she received the Presidential Early Career Award for Scientists and Engineers and this year was made an assistant investigator with the Howard Hughes Medical Institute. E-mail: *jin@biology.ucsc.edu.*

1993

- Karl Klose, is an assistant professor at the University of Texas Health Science Center in San Antonio. He did his postdoc in John Mekalanos' lab at Harvard Medical School.

Alumni Survey

Let your classmates know what you have been doing. Please complete the following and mail it to:

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

NAME

DEGREE(S) CONFERRED AND YEAR

ADDRESS

CITY/STATE/ZIP

E-MAIL ADDRESS

May we print your e-mail address?
❍ Yes ❍ No

What's your current position and how long have you been there?

Other activities since graduation:

Any additional information or news:

1999–2000 PhD Graduates

Fall 1999

- Shane Albright (Tjian) Gene Targeting of a Tissue-Specific TBP-Associated Factor.
- Scott Crowder (Alber) Structural Studies of RNA Recognition by the Splicing Reglator Sex-lethal.
- Adalberto Erives (Levine) *cis*-regulation of Two Gene Sets in the *Ciona* Embryo: The Tail Muscle Genes and the Notochord Genes.
- Andrea Itano (Robey) Lineage Commitment in T Cell Development.
- Daniel Kuebler (Tanouye) Modifications of Seizure Susceptibility in *Drosophila:* Understanding the Etiology of Seizure Disorders.
- Michael Kuhns (Allison) CTLA-4-Mediated Tuning of Secondary CD4+ T Cell Responses.
- José Meza (King) Structural and Functional Analysis of BRCA1 and BARD1 RING Finger.
- Scott Ruffner (Owen) Master's degree.
- Soojin Ryu (Tjian) Identification and Characterization of Cofactors required for Transcriptional Activation by Sp1.
- Thomas Schlumpberger (Zucker) Effects of a Mobile Chelator on Transmitter Release in Crayfish/Simulations of a Calcium Diffusion-Reaction Model.
- Ben Spiller (Stevens) Structural Analysis of Functional Divergence in Antibodies and Enzymes.
- Ginger Stewart (Robey) Master's degree.
- Zlatko Todorow (Schekman) Intracellular trafficking of two *S. cerevisiae* Mannosyltranferase complexes.
- Jeffrey Wallin (Sha) Characterization of J chain Transcription Regulatory Elements and B7h, a Novel Costimulatory Homologue of B7.1 and B7.2.

Spring 2000

- Lisa Bell (Firestone) Regulation of the Serum- and Glucocorcticoid-Inducible Protein Kinase, Sgk by Environmental Stress.
- Jennifer Blanchette (Sachs) Investigating the role of the *Saccharomyces cerevisiae* Poly (A) Binding Protein in 5'-Cap Complex Formation *in Vitro.*
- Sasha Blaug (Miller) Mechanisms of Ion and Fluid Transport in Mammary and Eye Epithelia.
- Heather Dawes (Meyer) The Key Switch Gene for Hermaphrodite Development in *Caenorhabditis elegans.*
- Marc Dionne (Harland) New Biological Activities for BMP Antagonists.
- Benjamin Eaton (Moore) Membrane Remodeling During Secretory Granule Biogenesis.
- Anna (Friedman) Edlund (Keller) Ectodermal Cell Mixing Patterns During Neurulation in *Xenopus laevis.*
- Eric Green (Flannery) Pathogenesis and Rescue of Phoreceptor Cell Death in an Animal Model of Retinitis Pigmentosa.
- Jeanne Hardy (Nelson) Role of an α-helical Bulge and Kink in Heat Shock Transcription Factor.
- Michael Holmes (Tjian) Promoter Selective Properties of the TBP-Related Factor, TRFI.
- Audrey Huang (Rubin) Signal Transduction in the Development of *Drosophila melanogaster.*
- Herbert Kasler (Winoto) A Novel Type of MAP Kinase Containing a Transcriptional Activation Domain: ERK5 Regulation of the Transciption Factor MEF2D in T cell Apoptosis.
- Lisa Komenda (Beckendorf) Genetic Control of the Specification and Morphogenesis of the Embryonic Salivary Glands in *Drosophila melanogaster.*
- Jonghui Lee (Kustu) Phosphorylation-induced Interdomain Communication of Response Regulator Ntrc of *Salmonella typhimurium.*
- Eli Loots (Isacoff) Structural Rearrangements of Channel Gating.
- Per Malkus (Schekman) Protein Sorting in the Endoplasmic Reticulum (ER): ER-resident Accessory Proteins and Positive Sorting Signals Required for Transport of Secretory Proteins.
- James Mitchell (Collins) Structure/Function Analysis of the Human Telomerase Ribonucleoprotein.
- Brian Peter (Cozzarelli) Topology and Structure of Replicating DNA in *Escherichia coli.*
- Stephen Ribisi (Harland) Ras-Mediated FGF Signaling is Required for the Formation of Posterior but Not Anterior Neural Tissue in *Xenopus laevis.*
- Yasar Sahin (Campisi/LBNL) Master's degree.
- Thomas Serwold (Shastri) Analysis of the Cellular Processes that Generate Peptides for Major Histocompatibility Complex Class I Molecules.
- David Stellwagen (Shatz) Spontaneous Retinal Waves: Mechanism of Propagation and Influence on LGN Layer Segregation.
- Pamela Torrance (Thorner) Regulation and Function of the Protein Kinases Ypk1 and Ykr2 in the Yeast *Saccharomyces cerevisiae.*
- Russell Vance (Raulet) Natural Killer Cell Receptors for Nonclassical Major Histocompatibility Class I Molecules of the Mouse.
- Hong Wan (Goodman) A Molecular and Genetic Analysis of Neuromuscular Connectivity and Synaptic Growth in *Drosophila melanogaster.*

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