MCB Transcript

Spring 2006 • Vol. 9, No. 1

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

New Profs Bring Expertise in Stem Cells and Innate Immunity

MCB welcomed three new assistant professors this year. Greg Barton and Russell Vance study how our bodies fight infections, and Andrew Wurmser is interested in adult stem cells as a way to form new tissue.

Greg Barton

The human immune system is constantly at war. It may not seem that way, particularly to healthy people who get only one or two colds a year. But at the molecular and cellular level, the body's defenses never stop sensing, isolating and destroying microbial invaders. How they do it has been something of a mystery, but advances in the last few years have cracked the door to understanding ajar. Among those pushing the door open wider is Greg Barton, who joined the department last fall. His research involves a class of proteins called Toll-like receptors, which have immunologists more than a little excited.

To understand what all the fuss is about, it's important to distinguish two types of immune response. Most people are familiar with antibodies, which continually sweep the blood for known enemies and activate cellular defenses. But antibodies are less help against new and unfamiliar infections, since they take days or weeks to develop the first time around.

The real front-line work is done by a less well-understood branch of immunity known as the innate immune system. Among our innate defenses are unpleasant things like runny noses and fevers. At the cellular level, macrophages, neutrophils and other specialized cells patrol the tissues and blood, where they spot and destroy pathogens even before antibodies enter the picture. But how do these cells tell friend from foe?

In 1989, renowned Yale immunologist Charles Janeway proposed that there must be molecular receptors that recognize unique characteristics of infectious organisms. This prediction was finally confirmed in 1997, when Janeway and then postdoctoral fellow Ruslan Medzhitov reported that Toll-like receptors (TLRs) fulfill this

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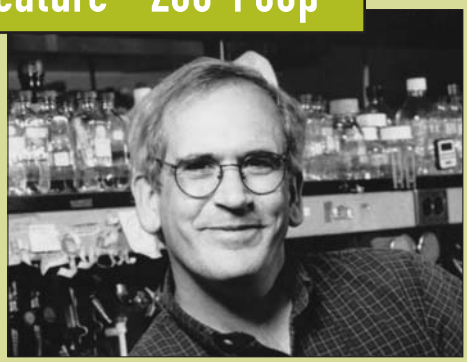
Undergrad Labs to Feature "Zoo Poop"



Jasper Rine

Take a biology laboratory course at just about any university today, and you might get the impression that science is like cooking. Mix reagents A and B, heat, and voilà, a result. But is following a recipe the best way to learn science?

To genetics & development professor Jasper Rine, the answer is "no." If discovery is the point of science, then the traditional cookbook approach to lab courses is its antithesis. "The students start out knowing what the answer is supposed to be, and they just go through the procedures and try to get that answer," Rine says. "It doesn't really reflect the way science is done."

Now Rine is doing something about it. The Howard Hughes Medical Institute has awarded him $1 million over four years to revise Biology 1A, the introductory lecture and lab course for MCB majors. New lab modules will range from isolating the students' own mitochondrial DNA to analyzing

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stranger-reporting role[1]. That discovery opened a new field of immunological inquiry.

Medzhitov set up his own lab at Yale, and together with Barton, one of his first postdocs, began teasing apart this recognition system. They learned, for instance, why some TLRs take up a position inside the macrophage, while others are posted on the cell surface, a spot that at least seems like a better vantage point for detecting invasions.

They engineered a version of one of the intracellular proteins, TLR9, to report instead to the plasma membrane. Normally, TLR9 recognizes viruses by signature CpG motifs in viral DNA. The relocated receptor no longer responded to viral nucleic acid. Instead, it gained the undesirable ability to react to self DNA, a property that could trigger an autoimmune response[2]. Barton and Medzhitov concluded that the internal localization of TLR9 is essential to prevent it from encountering self DNA as well as to expose it to viral DNA, which often ends up partially degraded in internal garbage-can vesicles called lysosomes.

Among the questions Barton now hopes to answer is how TLR9 and the other internal receptors are called into action. Normally they reside in the endoplasmic reticulum, and only migrate to lysosomes when there is something to detect. "They seem to be recruited to the lysosomes, but how and when is unknown," Barton says.

Understanding the TLR pathway could lead to medical advances in several areas. For instance, the inflammatory disease lupus appears to involve the inappropriate activation of TLR9 by self DNA, possibly due to mis-localization of the receptor. Vaccine research could also benefit, because one branch of the TLR pathway alerts the adaptive immune system to an infection. The field seems to be at the threshold of some very broadly applicable knowledge, says Barton. "We're at that level where we think we know the main players and want to know how the system works in general," he says. "At this point it can go a lot of different ways."

1. Medzhitov, R., Preston-Hurlburt, P. & Janeway, C.A. Jr. *Nature* **388**, 394-397 (1997).
2. Barton, G.M, Kagan, J.C. & Medzhitov, R. *Nature Immunology* **7,** 49-56 (2006).

Russell Vance

Part of the interest in innate immunity stems from its near universality. Plants, animals, and even protozoans must all constantly defend themselves against microbial threats, and they do this largely through receptor molecules that recognize the enemy, whether bacterial, viral or fungal. The system works so well, that parts of it have been around since before animals and plants diverged. Of course, pathogens have evolved ways around host defenses at the same time, with the result that host-pathogen interactions are as complex as they are interesting.

To get a better handle on the molecules and processes involved, Russell Vance studies *Legionella pneumophila*, the cause of Legionnaires' Disease. This gram negative bacterium was first identified when it sickened hundreds of delegates at the 1976 American Legion conference in Philadelphia. *Legionella* causes severe pneumonia, and is lethal up to 30% of the time, particularly in elderly or immune-compromised victims. Sporadic outbreaks have occurred both before and since Philadelphia, with some 8000 cases each year in the US alone. Many more probably go unreported. The bacterium typically inhabits warm, untreated water, and has been found in whirlpool spas, sprinklers, water storage systems and large air conditioners.

Despite its lethality in people, *Legionella* doesn't really need us at all. Amoebae are its usual host, making it something of an accidental human pathogen. Nevertheless, it could potentially tell us a great deal about our immune systems.

Two broad questions drive Vance's research: how the host clears an infection, and how the bacterium sometimes succeeds in replicating despite the host response. One clue in the case of *Legionella* is the recent discovery of a key susceptibility locus in mice called *Naip5*. Mice that express the gene only weakly are less resistant to *Legionella* infection[1,2]. Vance and coworkers now have evidence that *Naip5* protein is part of a pathway involved in detecting flagellin, the bacterial polypeptide that polymerizes to form the whip-like flagellum[3].

In the picture of parry and thrust that has emerged from these and other studies, *Legionella* starts an infection by invading host macrophages, innate immune cells that normally engulf and destroy foreign bodies. This ought to be suicide; but just as they do in amoebae, the bacteria then secrete factors that instruct the cell to provide a protective vacuole, a shelter in which to divide and grow. To defend the host, the macrophage must fall on its own sword. If *Naip5* is present and the macrophage senses flagellin, it will activate a rapid cell death pathway mediated by caspase-1, thus putting a stop to the infection.

Homologs of *Naip5* in plants do something similar. By activating cell death pathways at the first hint of infection, they create a wall of dead tissue that prevents the bacteria from spreading. The conservation of this pathway suggests that aspects of innate immunity arose even before plants and animals diverged.

To answer his big questions, Vance will employ a combination of skills he acquired during his two postdocs. After learning microbiology with John Mekalanos at Harvard Medical School in Boston, he joined Bill Dietrich's group, also at HMS, to learn mouse genetics. Among his plans for Berkeley is a genetic screen of mutagenized mice to isolate genes involved in resistance to infection. At the same time he plans to go after virulence genes in *Legionella*, which he says is a bacterium quite amenable to study. "You can do basically anything you can do in *E. coli*," Vance says.

Vance's official first day as a faculty member was May 1, when he was found busily unpacking on the fourth floor of LSA in space previously occupied by immunologist Jim Allison ("big shoes to fill," he says). Before going to Boston, Vance was a graduate student in immunology professor David Raulet's lab, and he says he is thrilled to be back in Berkeley. "It's a great opportunity," he says. "The host-pathogen work is now very strong here. It's going to be very exciting."

1. Diez E. et al. *Nat Genet* **33,** 55–60 (2003).
2. Wright E.K. et al. *Curr Biol* **13,** 27–36 (2003).
3. Ren, T. et al. *PLoS Pathog* **2**, e18 (2006).

Andrew Wurmser

MCB's commitment to regenerative medicine got a boost this year with the addition of Andrew Wurmser, who joined the department in January as an assistant professor of cell and developmental biology. Wurmser studies neural stem cells, progenitors of nerve cells that he recently found are able to differentiate into blood vessel cells, at least in culture. Wurmser hopes to determine the molecular basis for this striking plasticity as well as the extent to which it is important in living brains.

Turning stem cells into therapies for degenerative illnesses depends on a thorough understanding of the various kinds of stem cells and the molecular basis of their differentiation and subsequent behavior. Neural stem cells were first found in the adult brain less than ten years ago, and appear to have a role in learning and memory. As a postdoc in Fred Gage's lab at the Salk Institute in La Jolla, California, Wurmser showed that isolated neural stem cells (NSCs) could be prodded into becoming smooth muscle and endothelial cells, which line capillary walls. To do this he mimicked the native proximity of the NSC to the vasculature by culturing mouse NSCs together with endothelial cells. As a result, some six percent of the NSCs began expressing endothelial cell markers and could even form capillary networks in vitro[1].

This finding is all the more significant in the context of previous work. Initial reports that bone marrow stem cells, which normally differentiate into blood, could be coaxed into forming other tissues such as skeletal muscle led to hope that adult stem cells were quite pliable and might even be useful in place of more controversial embryonic stem cells. But those hopes were dashed in 2002 when it emerged that this trans-differentiation was more likely the result of the stem cells fusing with the stimulatory cells cultured in the same dish[2]. Wurmser took great care to ensure that the cell fate change he observed was not the result of fusion, but was rather the NSCs' response to an external signal.

Despite the dramatic nature of the change from NSC to endothelium (nerves and blood vessels derive from different embryonic germ layers), Gage and Wurmser prefer to describe the phenomenon as plasticity, rather than trans-differentiation. This, Wurmser explains, is to highlight the potential physiological relevance of the change. When new neurons form in the adult brain, they may require new vasculature to nourish them. Answering whether NSCs spawn blood vessels *in vivo* for this purpose is a top priority for Wurmser.

If they do, it would represent a novel type of vessel formation. It would then be important to determine when NSC-derived vessels come into play as opposed to those arising by angiogenesis. Do NSCs help vascularize the hippocampus during memory formation, for instance? Might they also provide new vessels to feed growing brain tumors? If they do, elucidating the pathway that regulates the process could provide a molecular target for novel cancer drugs analogous to the successful anti-angiogenic drug Avastin.

Wurmser says he is excited to have the opportunity to pursue these questions at Berkeley. Besides the outstanding graduate students and colleagues, he cites the Bay Area's emerging role as a hub of stem cell research. Last year, San Francisco was chosen as the headquarters of the Institute for Regenerative Medicine, created by voters in 2004 through Proposition 71. MCB researchers have already applied for funding from the institute (see Fall 2004 *Transcript*), and a number of private donations are helping to fund the completion of the Health Sciences Initiative, begun in 1999. Last summer, Chancellor Birgeneau announced a $40 million donation from the Li Ka Shing Foundation, which will help fund the construction of a new health science building to house, among other things, Berkeley's growing stem cell research program.

Another attraction of the Bay Area is the steady summer breeze. Wurmser has sailed competitively since childhood and says he plans to continue racing on the bay. He and his partner Vicki Sciorra, a Ph.D. biochemist who currently works in his lab, are quickly putting down roots. They recently bought a house and are expecting two Vizsla puppies in August.

1. Wurmser, A.E. et al. *Nature* **430,** 350-356 (2004).
2. Terada, N. et al. and Ying, Q.L. et al. *Nature* **416,** 542-548 (2002).

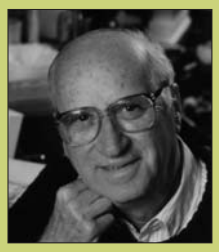
FACULTY NEWS

The following MCB faculty were among 110 "everyday heroes" named by students in last fall's Undergraduate Experience Survey. Each received a congratulatory letter from the chancellor in January.

- Sharon Amacher (G&D)
- Robert Beatty (Immuno)
- Caroline Kane (BMB)
- Helen Lew (CDB)
- David Presti (Neuro)
- Paola Timiras (CDB Emerita)
- Jeffery Winer (Neuro)

■ **Mike Botchan** (BMB) and **George Oster** (CDB) were elected to the American Academy of Arts and Sciences.

Jamie Cate



Daniel Koshland

■ **Jamie Cate** (BMB and Chemistry) was one of six Berkeley faculty members to receive a Sloan Foundation Research Fellowship. The $45,000 grant is provided over two years to help early-career scientists establish their research programs.

■ Professor in Residence **Abby Dernburg** (CDB) received the Leukemia and Lymphoma Society Scholar Award.

■ **Daniel Koshland** (Professor of the Graduate School) won the 2006 Welch Award in Chemistry for his work on enzymes and protein chemistry. The $300,000 prize is given by the Welch Foundation of Houston, Texas, for contributions in chemical research that have had a significant, positive influence on mankind.

■ **Michael Marletta** (BMB and Chemistry) was elected to the National Academy of Sciences.

■ **Jeremy Thorner** (BMB) spent March as a Distinguished Visiting Lecturer at the European Molecular Biology Laboratory (EMBL) in Heidelberg, Germany.

NICHOLAS R. COZZARELLI 1938–2006

My first encounter with Nick Cozzarelli outside of a lecture hall became one of my favorite memories of graduate school. The year was 1987, and I was a second-year student in Mike Botchan's lab, which at that time was just down the corridor from Nick's in the old Stanley Hall. Mike and I had been discussing how a certain transcription factor might bind to DNA. We knew the recognition sequence, but needed a way to picture it in three dimensions. Fortunately, Nick had a three-foot model of the double helix on prominent display in his office, so we walked down to take a look.

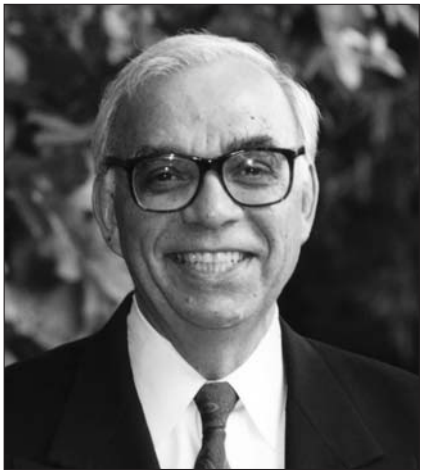
Nick's door was open, as it always was. Soon the three of us were standing around the model considering what a transcription factor would see. As we peered and pointed, Nick talked about the physical properties of the molecule he knew so intimately. Suddenly, I was gripped by the feeling that I had stepped into the famous photo of Watson and Crick examining their newly-built model of DNA. It was electric and unforgettable.

Nick passed away on March 19, 2006, following complications from treatment for Burkitt's lymphoma, which he had been fighting for two years. He was 67. His death is a tremendous loss for the department, where he was a professor and devoted mentor for 24 years, as well as for the scientific publishing world, where as editor-in-chief of the *Proceedings of the National Academy of Sciences* he championed and promulgated numerous reforms. Yet he touched so many people with his passion for science, his engaging manner, his dedication to excellence, his commitment to students, and his love of life that his legacy will endure.

Nick was the son of Italian immigrants and grew up in a working-class household in New Jersey. With prodding from his father, who was poorly educated, Nick worked hard in school and ended up with a scholarship at Princeton. Although he set out to study law, he became hooked on biology as an undergraduate, and eventually went on to do graduate research on bacterial metabolism at Harvard Medical School in Boston. It was during his postdoc at Stanford from 1966-1968 with Nobel laureate Arthur Kornberg that Nick began to study the synthesis and structure of DNA, the molecule that became his passion for the rest of his life.

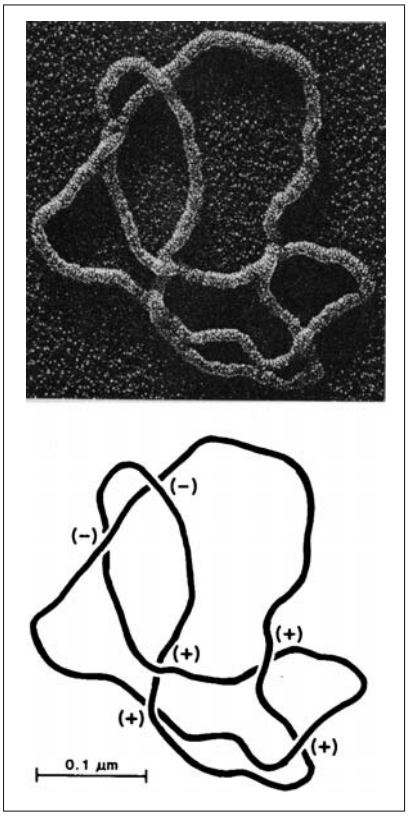
DNA can be long and unwieldy, and much of Nick's research was aimed at understanding how cells manage this cumbersome repository of their genetic code. He worked out how proteins twist, coil and wrap DNA into manageable packages. He discovered how antimicrobial and anti-cancer drugs called quinolones and coumarins halt DNA replication by interfering with these proteins. He found that some proteins, such as gyrases, relieve twists by breaking both strands of the helix, passing another stretch of DNA through the opening, and then resealing the break.

This work led Nick naturally to an interest in topology, the mathematical study of spatial relations. By the time he came to Berkeley to join the Department of Molecular Biology (a predecessor of MCB) in 1982, after 14 years as a professor at the University of Chicago, he



was regularly introducing his less numerically-gifted colleagues and students to rigorous mathematical concepts like linking number, twist and writhe, used to describe the topological state of DNA. In 1988 he founded the Program for Mathematics and Molecular Biology with funding from the National Science Foundation. His intention was to bring together leading mathematicians, biologists and physicists to address cross-disciplinary problems in science. As Bruce Alberts pointed out in a memorial article in *PNAS*, this was long before such collaborations were trendy. "Nick was the first person I knew who successfully connected leading mathematicians to first-rate molecular biologists, resulting in valuable contributions to both fields," Alberts wrote[1].

Yet Nick was never one to rest on his laurels but remained right on the cutting edge of his highly competitive field. In recent years he collaborated with Carlos Bustamante (BMB and LBNL) to examine the movement and force of gyrase bound to DNA by manipulating individual protein molecules with optical tweezers[2]. He used DNA microarrays, pioneered by his former graduate student Patrick Brown at Stanford, to track the effect of supercoiling on gene expression[3]. The elegance and state-of-the-art nature of these studies is all the more remarkable considering that, after 1995, Nick spent half his time running a journal, one which he transformed from a dusty academic publication into a must-read weekly that vies with *Science* and *Nature* for top papers.



A classic Cozzarelli topology experiment showing catenation (knotting) of a DNA circle by Tn3 resolvase. The DNA was relaxed and coated with bacterial recA *protein to enhance visibility in the electron microscope. Each node is assigned a value of + or - by a mathematical convention that depends on the orientation of the strands. (Wasserman, S.A., Dungan, J.M. & Cozzarelli, N.R.* Science ***229,*** *171-174; 1985)*

Nick became editor-in-chief of *PNAS* in 1995 and immediately went to work. Before his arrival, all papers in the journal were either submitted by academy members from their own labs, or communicated by them on behalf of other scientists. Within months of Nick's taking over, *PNAS* added a third means of submission, known as Track II, through which anyone could publish. Track II papers go out for peer review much as they do at other journals, while academy members handle the editing. This shift, after almost a century of exclusivity, came at a time of rapid growth in the scientific enterprise, and so led to much greater competition for *PNAS* ink. It was perhaps the most significant step in the revitalization of the journal.

Nick kept *PNAS* on the forefront of changes in scientific publishing. In 2000, it became one of the first journals to publish online ahead of the print edition, and in the same year became a charter participant in PubMed Central, the free, publicly-funded repository of journal articles that anyone can access without a subscription. All *PNAS* papers are deposited in PubMed Central six months after publication.

Nick was a champion of the open access movement, and continued to look for ways to make more journal content available sooner for free while keeping the operation in the black. In 2002, *PNAS* granted free online access to 81 developing countries around the world. In 2004, authors were allowed to make their papers immediately free online by paying an upfront fee of $1000, which was lowered the following year to $750. All he while, submission rates continued to rise until the journal had enough quality papers to move from biweekly to weekly publication in January 2004.

I was working as a reporter for *Nature* while much of this was going on. I wrote a number of stories about developments in open access, such as the founding of the Public Library of Science by Nick's former student Brown and his MCB colleague Michael Eisen (Nick served on the editorial board of the first resulting open-access journal *PLoS Biology*). Open access was a challenge to the established order, and as a result many other journal editors were only to be reached through a communications department, if at all. Nick, in contrast, simply picked up the phone when I called and immediately offered his unvarnished opinion for the public record. His candor was as refreshing as it was rare for someone in his position. But that was Nick. For him the truth and the unflinching pursuit of it were paramount.

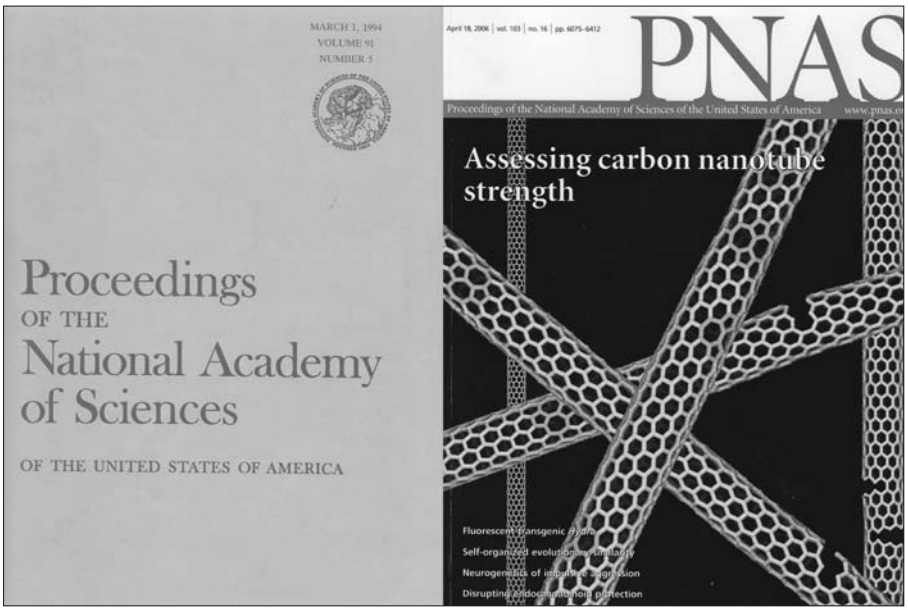
Nick never forgot that the future of excellent science lay in the hands of students and post-doctoral trainees. Claire Wyman, who rotated in Nick's lab in 1984 and came to know him well during her decade or so as a grad student and then postdoc in Berkeley (in part because she met her future husband Roland Kanaar in his lab), remembers him as a skilled promoter of the up-and-coming. He always introduced the younger or newer members of his group to other prominent scientists in the field, for instance. "He was a sociable guy and had the gift of making people feel comfortable," she recalls. "He made a point of organizing informal parties at his house or in the department for graduate students and visiting guests. These were a great opportunity to help those of us just starting out get to know other scientists as people and get to enjoy the community of science."

Nick remained active in the department throughout his illness despite the debilitating treatments he endured. He had been invited by the chancellor to give a Faculty Research Lecture, a great honor about which Nick was thrilled and excited, Mike Botchan recalls. It was scheduled for March 1 and the title was "Giant Proteins That Push DNA Around: Bullies of the Nuclear Playground." By this time, however, he had become quite ill and the talk had to be postponed. Sadly, we will never get to hear it.

Remembrances of Nick have appeared in *Cell*[4], *Science*[5] and *PNAS*[1,6], and more are expected soon. Scores of friends, family and colleagues attended a private service at the house he shared with his wife Linda in the Berkeley hills on April 30. A still larger crowd is likely to attend a memorial symposium on campus June 10 (see sidebar below). And of course those who knew Nick will continue to remember the many ways, from the little Watson-and-Crick moments to the huge mark he left on science, that he touched their lives.

– Jonathan Knight

1. Alberts, B. *PNAS* **103**, 6077 (2006).
2. Gore, J. et al. *Nature* **439,** 100-104 (2006).
3. Peter, B.J. et al. *Genome Biology* **5**, R87 (2004).
4. Kanaar, R. & Sherratt, D. *Cell* **125,** PP (2006).
5. Kennedy, D *Science* **312, 159** (2006).
6. Nuzzo, R. & Zagorski, N. *PNAS* **103**, 6078-6080 (2006).



Cozzarelli transformed PNAS *from a dusty academic publication to a must-read weekly. Although the changes were far more than superficial, a comparison of covers from 1994 and 2006 tells all.*

Symposium in Memory of Nicholas Cozzarelli

June 10, 2006
9 a.m. to 5 p.m.
Cox Auditorium (GPB 100)

Speakers include:

Mike Botchan
Mark Krasnow
Mike Carey
Jim Bliska
Roland Kanaar
Lisa Postow
Jim Wang
Pat Higgins
Lynn Zechiedrich
De Witt Sumners
Alex Vologodskii
Pat Brown
Akio Sugino
Paul Pease
Bruce Alberts
Arthur Kornberg

AWARD WINNERS

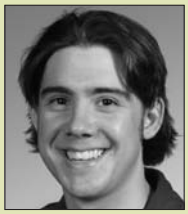
OUTSTANDING GRADUATE STUDENT INSTRUCTORS

Aaron T. Garnett (Amacher/Eisen labs)

Melissa L. Mott (Berger lab)

Jerod Louis Ptacin (Cozzarelli lab)

Emily Derbyshire (Marletta lab)



Kyle R. Simonetta (Kuriyan lab)

Leonid Teytelman (Eisen/Rine labs)

Nathan D. Thomsen (Berger lab)

Michael I. Whang (Raulet lab)

Oliver A. Zill (Rine lab)

Danielle Liubicich (Patel lab, IB)

Bradley Voytek (Knight lab, HWNI)

Noopur Amin (Theunissen lab, HWNI)

Cindy Chang (Klinman lab, Comp. Biochem.)

Christine Hancock (Health & Medical Science Program)

Darcy Wooten (Health & Medical Science Program)

NO PHOTO AVAILABLE FOR

Scott A. Weitze
(graduated with master's)

Jenny Wilson
(Health & Medical Science Program)

UNDERGRADUATE AWARDS

University Medal Finalist
- Nicole C. Swann (Robert Knight lab, HWNI & Psychology)

Barry M. Goldwater Scholarship.
- Amar Kishan (Jeffery Winer lab)

Departmental Awards

MCB Departmental Citation
- Shankar Sundar (Jamie Cate lab)

MCB Outstanding Scholar
- Christopher J. van Belle (Steven Brenner lab)

Division of Biochemistry & Molecular Biology

Grace Fimognari Memorial Prize
- Jimmy L. Zhao (Paola Timiras lab)

Kazuo Gerald Yanaba & Ting Jung Memorial Prize
- Yu-San Huoh (Brian Staskawicz lab, PMB)

F. H. Carpenter Memorial Prize (2005-2006)
- Ming Mai (James Berger lab)

Division of Genetics & Development

Spencer W. Brown Award
- Alvin Tamsir (Robert Fischer lab, PMB)

Edward Blount Award
- Victoria C. Chen (Jennifer Fletcher lab, PGEC)

Division of Immunology

Outstanding Undergraduate Immunologist Award
- Ying Xim Tan (David Raulet lab)

Divisions of Cell & Developmental Biology and Neurobiology

I.L. Chaikoff Memorial Awards
- Camellia D. Asgarian (Ehud Isacoff lab)
- Daniel Mahefasoa Brady (John Ngai lab)
- Stephanie Ching (Iswar Hariharan lab)
- Nancy M. Hoo (Richard Harland lab)
- Gary Sijia Huang (Zac Cande lab)
- Michelle Tiffany Iwaki (Richard Harland lab)
- Kendon W. Kuo (Richard Harland lab)
- Jun (Jake) Ma (Jeremy Thorner lab)
- Kelly Ma (Elissa Epel lab, UCSF)
- Andrea M. Steely (Gary Firestone lab)
- Annie Ya Qing Zhang (Bing Jap lab, LBNL)
- Kevin Yee (Stephen Bonasera lab, UCSF)

CLASS NOTES

- **Gabriel Alvarado** (BA 2004) is a product team associate at Invitrogen. (gabrielduque5@yahoo.com)
- **Michael Chang** (BA 1997) is in his last year of a physical medicine and rehabilitation residency at the Rusk Institute of Rehabilitation Medicine at NYU. "Although I love New York City, I will be back in California for fellowship training next year," Chang says. He and Nancy Lam (BA 1997) are to be married in June. They took several MCB classes together and were re-acquainted in NYC. (changmichaely@gmail.com)
- **Brian Dynlacht** (PhD 1992) was promoted in September, 2005, to Professor of Pathology at New York University School of Medicine. Dynlacht is also the director of the genomics program for the NYU Cancer Institute.
- Last fall, **Sarah Gaffen** (PhD 1994) was promoted to Associate Professor with tenure at the University at Buffalo, SUNY, in the Departments of Oral Biology & Microbiology/Immunology. (sgaffen@buffalo.edu)
- **Nancy Lam** (BA 1997) is a doctoral candidate at New York University Stern School of Business in the management department. Prior to school, she worked in consulting and start-ups in San Francisco. Lam is engaged to Mike Chang (BA 1997). They will be married in June. She invites friends and classmates to drop her a line. (lamnancy@gmail.com)
- **Michael Lin** (BA 1993) finished his MD at Baylor College of Medicine and completed his residency in dermatology at Thomas Jefferson University in Philadelphia. He currently practices both general and cosmetic dermatology in Los Angeles, where he lives with his wife and two kids. (drlin@drmichaellin.com)
- **Brian Yang** (BA 1994) earned his DDS at Columbia University in 2000 and his MD at UCSF in 2003. He is currently chief resident in oral and maxillofacial surgery at UCSF and will graduate this year. He then plans to continue on to private practice in the Bay Area. (byang38@yahoo.com)

MCB Transcript

The MCB Transcript is published twice a year by the Department of Molecular and Cell Biology at the University of California, Berkeley.

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EDITOR: Jonathan Knight

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

CLASS NOTES WANTS TO HEAR FROM YOU

Do you have a bachelor's, master's or Ph.D. 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
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Presti Tastes Golden Apple

Neurobiology lecturer David Presti was named the 2006 winner of the Golden Apple Award for Outstanding Teaching, the only teaching award on campus nominated and conferred entirely by students. According to the ASUC, which cosponsors the award, it was established to honor professors who "consistently teach each lecture as if it were their last." At the award ceremony on May 4, Presti received a $1000 prize and delivered what the prize committee titled "An Ideal Last Lecture."

Presti's teaching has long been renowned among students. His course entitled "Brain, Mind, & Behavior" (MCB 61) is always heavily subscribed, and had an enrollment of 646 this Spring. His fall semester course "Drugs and the Brain" (MCB 62) has be selected as a College of Letters and Sciences Discovery Course for the second year running. Students shouted praise for Presti last fall on the on the 2005 UC Undergraduate Experience Survey, when more than 20 singled him out as an "everyday hero" for teaching and mentoring above and beyond the call of duty. "An awesome professor"; "the coolest guy around"; and "a god" were just a few of the comments submitted. As a result, Presti received a letter from Chancellor Robert Birgeneau in January expressing deep appreciation for his contributions (the Chancellor wrote to 110 faculty heroes in total, including 6 more from MCB—see page 3).

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the microbes in rhinoceros dung, a lab tentatively titled "zoo poop." This fall he will begin recruiting teaching fellows to help him design and implement modules that emphasize discovery over rote learning.

The traditional approach to lab courses certainly has its merits. Students come away with a broad base of biological knowledge that will serve them well as they advance in their majors. They get hands-on experience with basic tools like microscopes and micropipettors, and they are exposed to essential techniques like dissection and DNA ligation.

But it could be much better, Rine and others believe. When students perform a cookbook experiment, they are left with a false impression of the way science works. What's more, many commonly-used lab modules have been around for so long, that the cutting edge of research must seem impossibly distant. For instance, students might transform bacteria with plasmids containing antibiotic resistance genes, or induce expression of the *lac* operon of *Escherichia coli.*

New lab modules are no cinch to create. Not only must the procedures be carefully thought out and tested, the entire package must be interesting, instructive and relevant. Even dedicated teachers like Rine, who won Berkeley's Distinguished Teaching Award in 1997, face an enormous task if they choose to build a new lab module from scratch. As a result, lab classes change little from year to year.

But how can you get students in a lab class to do something truly novel? In one planned lab, students will isolate DNA from their own cheek cells and sequence a region of their mitochondrial genomes. This region, known as the D-loop, is quite variable, and has been used to trace human migrations and ancestry. The advantages of this lab are that students get a truly novel piece of data to work with and learn to use sequence comparison tools to get a result that they have a strong personal interest in.

Although the procedures are still written in protocol form, the data that emerges is novel. This helps students appreciate, perhaps for the first time, how in science the truth emerges from the data. Another goal of the mitochondrial DNA module is to help create in informed citizenry in California, Rine says. "Many people misunderstand the power of genetic information, and yet it is increasingly used in policy decisions, family planning decisions, and so on," he says.

"Zoo poop" is Rine's moniker for another planned module, in which students collect stool samples from zebras, elephants and other large mammals at a local zoo in order to characterize their gut flora. The lab would teach basic microbiology, while also giving students something new to work on. "If you look at the literature, it is amazing how few people have studied the phage of the lower intestines of the rhinoceros," Rine says.

Rine and his team will have about a year to develop the new modules. The first one will be taught in fall semester 2007. The plan is to add two or three modules per year, so that by the end of the grant, the entire class will be new. Upper level lab courses stand to benefit as well, Rine says. The zoo samples could be sent out for sequencing, giving those students a novel dataset for doing community sequence analysis.

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