

# MCB

AT BERKELEY

FALL 1998

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

## HHMI Awards \$1.6 Million

### Education Grant

The Undergraduate Biological Sciences Education Program at UC Berkeley has recently received \$1.6 million from the Howard Hughes Medical Institute for an additional four years of funding. The principal investigators are Howard Hughes Professor of Neurobiology Corey Goodman and Adjunct Associate Professor of Biochemistry and Molecular Biology Caroline Kane. The grant funds two separate programs, the Biology Fellows Program and the Biology Scholars Program, both of which are designed to increase the number of women and underrepresented minorities in the biological sciences. The programs were started in 1992 with funds from HHMI, and their demonstrated success has led to the additional funding.

The Biology Scholars Program is a comprehensive program for promoting the academic success of students throughout their undergraduate years. The program includes study groups led by tutors, academic advising seminars, career options seminars, and access to faculty, staff, and student mentors. This popular program now has over 350 students, many more than it was designed to accept.

The Biology Fellows Program provides stipends for undergraduate research in summer and during the academic year. This highly competitive program has made awards to 200 different undergraduates, mostly MCB majors, of whom 111 are women and 57 are minorities. Of the 135 former Biology Fellows who have graduated, over 90% are in graduate school or medical school.

As director of the Biology Fellows Program, Caroline Kane helps students arrange to do research projects in biology labs both on and off campus. She points out that over 50 MCB faculty have hosted Biology Fellows for research projects in their labs.

The Biology Scholars Program was designed and organized by its director, Dr. John Matsui. Matsui conceived of the program while at his previous position in UC Berkeley's Student Learning Center. Matsui knew that while many excellent minority students were admitted to Berkeley with the intent to major in biology, relatively few graduated with biology degrees. As for women, their graduation rate is almost 50%. However, they are underrepresented in the sciences as professionals, and this has been attributed in part to their experiences as undergraduates. "I saw many students with a great deal of potential who were discouraged and who weren't succeeding," says Matsui. "I designed this program because I strongly believe that success is learned."

For example, the Biology Scholars Program helps students succeed with its study groups for the large introductory science courses. Matsui says that these courses "weed out rather than cultivate," and as a result often discourage students from pursuing biology majors. Providing study groups is one of the ways the program tries to "scale down the large public university."

Matsui reports that the Biology Scholars Program is enormously successful



*Caroline Kane, chair of UC Berkeley's Coalition for Excellence and Diversity in Math, Science and Engineering, and Michele de Coteau, director of the Multicultural Engineering Program, pose in front of the Executive Office Building on September 10, 1998, following a White House ceremony. They are holding the commendation they had just accepted on behalf of the Coalition from President Clinton as part of the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring. The Presidential Award includes a \$10,000 grant for future mentoring activities. The Coalition's seven partner programs, including the Biology Scholars Program, share the goal of recruitment and retention of women and underrepresented minorities.*

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# ANNE GOOD RETIRES

This year Senior Lecturer Anne Good retired from the Immunology Division after 32 years as a dedicated and respected teacher, advisor, and administrator. “Anne was truly a treasure to the Department,” remarks MCB Department Co-Chair Jim Allison. “She could always be counted on to pull things together in a crisis. She had a genuine and abiding commitment to the students and their well-being that made her a very special and appreciated member of our faculty.” Good served as Vice-Chair of the former Department of Microbiology and Immunology for several years and as the Head Undergraduate Advisor in that department and later in the Division of Immunology, together for almost twenty years.

As a teacher, Good was “remarkable,” says Immunology Division Head David Raulet. “Not only did she do a lot of teaching, but she brought a level of dedication and effort that was admirable.” For the past fifteen years, Good taught the undergraduate immunology laboratory course, and she co-taught the undergraduate immunology lecture for the past twelve years.

Good was hired in 1966 to teach only one course, graduate immunology laboratory (“grad lab”), because it was so time-consuming to teach. This unusual position was the innovation of Professor emeritus Leon Wofsy when he was in the Department of Bacteriology and Immunology. Good began teaching at the height of the free speech movement on campus, and she remembers times when the class was interrupted by rioting, tear gas, and fires in the stairwell. At that time, graduate students generally did not come to graduate school with laboratory experience and so most incoming immunology graduate students took this course. Over the years, however, more of the students in the class were from other departments on campus. These students took the class to learn immunological techniques like monoclonal antibody technology, but, starting in 1987, students

could learn such techniques in the undergraduate laboratory which Good also taught. Since grad lab was no longer needed and was relatively expensive, it was taught for the last time by Good in 1990. Perhaps setting an unbeatable teaching record, Good taught some laboratory course, either grad lab or undergraduate lab, every semester and, before that, every quarter of every one of her 32 years at UC Berkeley.

In the 1970’s, Good did research on immunity to parasitic worms. During the course of the research, she supervised one graduate student and two postdoctoral researchers. But with three young children, Good decided she had to choose between teaching and research in order to reduce her 80-hour work week. Another factor in her choice was the difficulty in obtaining research grants at that time, especially in her field of immunoparasitology. In the end, Good chose to focus on teaching, because she found teaching “more rewarding than research”. Good says, “It was great to teach the excellent students at Berkeley, but it was especially rewarding when a struggling student finally understood something I had been trying to explain.” Good has enjoyed seeing her former students become “successful and productive,” as physicians, as faculty, and in industry.

In 1979, Good was promoted to Senior Lecturer with security of employment—the equivalent of tenure. During her career, Good served on many doctoral preliminary examination and thesis committees and arranged many off-campus research opportunities for undergraduates as an independent study sponsor. Good served on departmental and university-wide committees too numerous to mention. Most notably, she served on the Animal Care and Use Committee in the 1980’s during the period of extensive animal rights demonstrations and the reorganization of animal-care facilities on the Berkeley campus. During that time, she often appeared as a panelist on television news programs about the animal rights controversy.



Good was also instrumental in the departmental reorganization of the biological sciences on campus. As Vice-Chair of Microbiology and Immunology up to the time of the reorganization, she planned for the reorganization of staff. As Head Major Advisor, she helped determine the equivalence between new and old courses and revise the major requirements accordingly. As instructor of the undergraduate immunology laboratory, she planned and supervised the move to a new teaching lab and helped coordinate the remodeling of the department’s other teaching labs.

From her first year at Berkeley until her retirement, Good spent countless hours advising students as an undergraduate immunology advisor. She served first as a non-major advisor, then as a major advisor, then since 1980 as head major advisor, except for one year when she was a graduate advisor. Good especially remembers advising one student who intended to major in immunology, but was doing very poorly in her science classes. Good advised the student to take an aptitude test, and the results showed that the



## New Faculty Member to Succeed Good

student was well below average in quantitative and mathematical abilities, but well above average in verbal skills. When the student took Good's suggestion to major in the history of science, she excelled. Over the years, Good encountered many other examples of "square pegs trying to fit into round holes." This often resulted, Good was sad to find, from parents pressuring children to enter fields which were counter to the child's likes and aptitudes. As a result, Good saw struggling, unhappy pre-med students, as well as students who wished to study science but were studying business instead.

Good was interested in medicine from the time she was a child, and, after graduating from Wellesley College in 1952, she entered the Yale University School of Medicine. Good received an M.D. in 1957, but by then she had decided she wanted to do research. Since she knew that medical school had not been good training for doing research, for her internship and residency she chose a teaching hospital with a good research program, University Hospitals of Cleveland and Western Reserve University (now Case Western Reserve University). As a resident in pathology, Good spent a lot of time diagnosing illnesses by looking at slides, and she decided that this was something she did not want to continue "for the rest of her life." While still a resident, she began immunology research and received a Ph.D. in 1963 from Western Reserve University.

Also in 1963, she began postdoctoral research with Professor S.J. Singer in the Department of Biology at UC San Diego. She received an American Cancer Society Postdoctoral Fellowship for her research which involved affinity labeling to determine the active site of antibodies. While at UCSD, she met her husband who was also a postdoctoral researcher, but in physics. In 1966, they moved their family, which by then included one child, to the Bay Area so that Anne could take the position at UC Berkeley. Her husband began a career at California State University at Hayward, where he is currently a professor of physics.

In her retirement, Good will continue her volunteer work on science education in the local public schools through the Lawrence Hall of Science. Good would also like to become active in conservation efforts and in preserving open space, since she is an avid backpacker and cross-country skier.

Taking over for retiring Lecturer Anne Good is another immunologist who especially enjoys teaching, Visiting Assistant Professor P. Robert Beatty. Although Beatty just left his postdoctoral position this year, he is already an experienced teacher. While Beatty was a postdoctoral fellow, he taught immunology at California State University at Hayward and in UC Extension courses and a summer class at UC Berkeley.

Beatty's postdoctoral research was conducted at Stanford University Medical Center in the laboratory of Olivia Martinez (a former UC Berkeley graduate student in Leon Wofsy's laboratory). Beatty received a postdoctoral fellowship from the National Institutes of Health for his research demonstrating cytokine IL-10 as an autocrine growth factor for Epstein Barr virus (EBV)-transformed B cells and on the growth-enhancing effects of the drugs cyclosporine A and tacrolimus (FK506) on EBV-transformed B cells.

Beatty was a graduate student in immunology here at UC Berkeley. In the laboratory of Richard Stephens in the School of Public Health, Beatty characterized T cell-mediated immune responses to *Chlamydia trachomatis*. Beatty received his Ph.D. degree in 1994. He received a B.S. degree from Tulane University in 1982.

In his current position, Beatty has assumed many of Anne Good's former responsibilities including teaching the undergraduate immunology laboratory, co-teaching the undergraduate immunology lecture, advising undergraduate immunology majors, and, as the instructor for MCB196 and MCB199, sponsoring undergraduates doing research outside of the MCB Department. Beatty is also introducing a new immunology course for nonscience majors (MCB 50).

Despite a full teaching schedule, Beatty plans to do research in the laboratory of Assistant Professor of Public Health Eva Harris (a former MCB graduate student). In collaboration with Harris, Beatty will study immune responses to dengue virus, which is endemic to Southeast Asia, India, and South America. Dengue virus infection can result in dengue hemorrhagic shock which is often fatal, especially in children.

Beatty has traveled to South America and Indonesia in recent years, but not to collect dengue virus samples. This year Beatty, who describes himself as a "traveling fiend," went to Australia, and he had to postpone next year's planned trip to Egypt when he took this position.

# NEW FACULTY



This semester's new faculty are no strangers to UC Berkeley. Assistant Professor Matthew Welch and Visiting Assistant Professor Robert Beatty (see page 3) were both MCB graduate students. Assistant Professor Eva Nogales only had to move her lab down the hill from Lawrence Berkeley National Laboratory where she had been a Staff Scientist since 1996 and, before that, a postdoctoral researcher.

Both Nogales and Welch are studying the cell's internal structure, or cytoskeleton, although each is interested in different cytoskeletal components. Nogales is interested in the cytoskeletal microtubule and its building block, the protein tubulin. Her postdoctoral research resulted in the determination of the structure of tubulin by electron crystallography. Solving this structure was not only a significant advance in the study of the cytoskeleton, but also in the process of cryoelectron microscopy. At Berkeley, Nogales will use cryoelectron microscopy to continue to study the microtubule cytoskeleton and to begin to study large protein and nucleic acid complexes.

Welch is interested in how the cytoskeletal components known as actin filaments enable cells to move. As a postdoctoral fellow, he purified a protein factor named the Arp2/3 complex which appears to play a key role in controlling the assembly of actin filaments. To study the complex process of cell locomotion, Welch uses a simpler model system involving the pathogenic bacterium *Listeria monocytogenes*. Once inside a cell, this bacterium exploits the cell's actin filaments to spread from cell to cell. The *Listeria* model system was initially developed by MCB Professor Dan Portnoy who was featured as a new faculty member in last semester's issue of this newsletter (Spring, 1998). Portnoy and Welch plan to collaborate in the study of *L. monocytogenes* motility.





## Matthew Welch

*Assistant Professor of Cell and Developmental Biology*

**Education:**

- B.S. in Cell and Molecular Biology, 1988, University of Michigan, Ann Arbor.
- Ph.D. in Molecular and Cell Biology, 1993, University of California, Berkeley, Thesis advisor: David Drubin.  
*Dissertation title:* Genetic identification of proteins important for actin cytoskeleton function in yeast.

**Postdoc:**

- 1994-98, University of California, San Francisco, National Institutes of Health Postdoctoral Fellowship and Leukemia Society of America Special Fellowship, Advisor: Timothy J. Mitchison.
- *Project:* Mechanisms that control actin polymerization in cells.

**Current Research:**

My lab is working towards elucidating the mechanisms of cell locomotion. We are taking both cell biological and biochemical approaches to dissect the mechanism of Arp2/3-complex function and its interaction with other cytoskeletal proteins in *L. monocytogenes* propulsion. We are also interested in determining how the activities of the Arp2/3 complex and other cytoskeletal proteins work in concert to coordinate eukaryotic cell motility.

**What do you like best about being a MCB professor at UC Berkeley?**

So far I have enjoyed getting the lab started and seeing the first experiments being done. I have also really enjoyed interacting with students.

**What special contribution do you hope to make to the department?**

The MCB department is now becoming one of the premiere scientific communities for research in cell biology. I hope to contribute to the continued development of cell biological research and teaching in the department. I also want to help foster interactions between labs within and outside the department.

**As you begin your career, what is the goal you would most like to accomplish?**

I want to build a research group that makes significant contributions to the study of cell locomotion.

**Personal information:**

My partner is Chris Patane, who works as a machinist in Palo Alto. We live with our eleven-year-old daughter Christina.

## Eva Nogales



*Assistant Professor of Biochemistry and Molecular Biology*

**Education:**

- B.S. in Physics, 1988, Universidad Autonoma de Madrid, Spain.
- Ph.D. in Physics, 1992; Synchrotron Radiation Source, Daresbury Laboratory, England; Thesis Advisor: Joan Bordas.  
*Dissertation title:* The assembly of microtubules and drug-induced tubulin polymers: An X-ray diffraction and cryoelectron microscopy study.

**Postdoc:**

- 1993-95, Lawrence Berkeley National Laboratory, Life Sciences Division, Advisor: Kenneth H. Downing.
- *Project:* Structure of tubulin by electron crystallography.

**Current Research:**

Using cryoelectron microscopy, we are studying the changes in tubulin conformation that result in the depolymerization of microtubules. We are studying the binding of the kinesin-like protein XKCM1 and its effects on the disruption of the microtubule lattice. In another project, we are initiating the structural analysis of large molecular complexes involved in the regulation of transcription.

**What do you like best about being a MCB professor at UC Berkeley?**

My colleagues and the quality of the students.

**What special contribution do you hope to make to the department?**

I hope to introduce the special capabilities of cryoelectron microscopy to the study of large molecular complexes and their regulation. This is a new, exploding field, and both my colleagues and the students will have the chance to learn about it firsthand.

**As you begin your career, what is the goal you would most like to accomplish?**

Scientifically, I would like to make an important contribution to our understanding of the microtubule cytoskeleton. Academically, I would like to educate and help form a new generation of structural biologists who will bring cryoelectron microscopy to the realm of atomic resolution.

**Personal Information:**

I am married, and my husband is also a scientist. This is helpful because he understands the time demands of my career. I like traveling, meeting new people, and I love dancing.

# RESEARCH HIGHLIGHTS

## MCB Enters the Microarray Era

A group of MCB labs is collaborating to build a microarray facility. Microarray technology has introduced a new era in the study of gene expression in which the activity of every gene in an organism can be monitored simultaneously. Until recently, it was only practical to monitor one or a few genes at a time. Tito Serafini is spearheading the effort by his lab and the labs of Corey Goodman, John Ngai, Gerald Rubin, and Robert Tjian.

The first of two microarraying robots was built in Serafini's lab by postdoctoral researcher Daniel Emerling and graduate student Percy Luu. They followed an assembly guide provided on the web site of Patrick Brown's lab at Stanford University, a lab that pioneered this technology. In addition to the microarrayer, the MCB labs have purchased and set up other needed equipment and instruments including a dual-laser, scanning confocal microscope, a device which reads the experimental results.

The microarraying robot is used to generate an array of thousands of different DNA samples on a small glass slide. The robot deposits very small volumes of liquid containing DNA onto a microscope slide in an array of tiny spots. It can deposit up to 30,000 spots on one standard microscope slide. To achieve the level of precision needed for the robot to array so many spots so close together, parts are used that were originally designed for the semiconductor manufacturing industry.

Once microarrays are made from a particular source, experiments can be performed which measure changes in the expression of thousands of genes simultaneously. One such experiment might determine how changes in one gene's expression affects the expression of every other gene in an organism. A simple example given by Serafini involves a temperature-sensitive yeast mutant. Such a mutation disrupts the function of the product of the mutated gene when the temperature is raised. To do the experiment, a sample is taken at a lower or permissive temperature, and then another sample is taken at a higher or nonpermissive temperature. From both samples cDNA probes are generated, each with a different fluorescent label. The two fluorescently labeled probes represent the genes expressed under each of the two conditions. The probes are simultaneously hybridized to the microarrayed DNA. Since yeast have only about 6400 genes, the entire complement of genes, known as the genome, will easily fit on one slide. The scanner measures the relative intensities of hybridization at each spot providing a reading of the change in each gene's expression.

From each experiment, enormous amounts of data will be generated. Serafini points out that one experiment may generate a ratio for each of thousands of spots on hundreds of slides each of which represents a different experimental condition or



From left, Tito Serafini, Percy Luu and Daniel Emerling with the microarraying robot they assembled.

point in a time course. To handle all the data, a database server is being developed in the Serafini lab that will allow data to be retrieved and analyzed from a web browser. Undergraduate Lisa Simirenko and research assistant Camin Dean Miller are developing this system with the guidance of Ellen Bergeman, a first-year graduate student.

For now, access to the microarray facility is limited to the labs involved, but the eventual goal is to make it available to the entire department. "It would be great to have it as a departmental facility," says Serafini, "but funds must first be garnered for a technician, maintenance, and upgrades, since heavy use is expected." Meanwhile, a collaboration has been arranged to provide a set of microarrays to six MCB labs whose research involves the yeast *S. cerevisiae*. The Kane, Kaufman, Rine, Schekman, Thorner and Weis labs will start the large-scale PCR amplification of each of the 6400 yeast genes beginning next month.

**Assistant Professor of Cell and Developmental Biology Tito Serafini** plans to use microarray technology to identify distinct types of brain cells. Researchers know that among the 100 billion cells called neurons that are present in the human brain, there seem to be many different types with different shapes and different functions. However, the various types have not been identified, and researchers do not even know how many types exist.

To identify distinct types of neurons, Serafini's lab will define the genes expressed in different cells. Using this information, they will find genetic markers or identifiers for each cell type. Serafini describes these genetic markers as "molecular tools for studying, manipulating, and healing the nervous system." His research could lead to treatments for epilepsy and other disorders of the nervous system that involve the aberrant function of a particular set of neurons.

# FACULTY NEWS

## PROMOTIONS AND APPOINTMENTS

EFFECTIVE JULY 1, 1998

The following faculty were promoted to Associate Professor:

- Ehud Isacoff, Neurobiology
- John Ngai, Neurobiology
- Susan Marqusee, BMB
- Alan Sachs, BMB
- Richard Harland was appointed Genetics and Development Division Head.
- Sydney Brenner was appointed Adjunct Professor of Genetics and Development. Brenner is currently the Director of the Molecular Sciences Institute, a private research organization which recently relocated to Berkeley.
- MCB Adjunct Professor Edward Penhoet was appointed Dean of the School of Public Health. He will be a Professor of Public Health and of Biochemistry and Molecular Biology.

## FACULTY AWARDS

### AND HONORS

RECEIVED SINCE APRIL, 1998

- **Daniel E. Koshland, Jr.**, received the Albert Lasker Award for Special Achievement in Medical Science on September 25, 1998. The Lasker awards are often called "America's Nobels" because many Lasker recipients also receive Nobel Prizes.
- **Bruce Ames** was named by President Clinton as a recipient of the National Medal of Science on December 8, 1998.
- **G. Steven Martin** was elected a Fellow of the Royal Society of London for Improving Natural Knowledge on May 14, 1998.

The following MCB faculty were recently elected as Fellows of the American Association for the Advancement of Science (AAAS). The award ceremony will be held on January 23, 1999.

- **Nicholas Cozzarelli**
- **Alexander Glazer**
- **Jeremy Thorner**
- **Robert Zucker**

#### Biochemistry and Molecular Biology Faculty

- Bruce Ames was given the Medal of the City of Paris and received the Joseph Priestley Award, Dickinson College, PA.
- Kathleen Collins received a Burroughs Wellcome Fund New Investigator Award in the Basic Pharmacological Sciences.
- Nicholas Cozzarelli was elected to a three-year term as Chair of the Biochemistry Section of the National Academy of Sciences.
- Daniel Koshland was appointed to the California Council on Science and Technology.
- Alan Sachs was elected Co-Chair of the Nucleic Acids Gordon Conference for the year 2000.
- Howard Schachman received the Theodor Svedberg Award.
- Randy Schekman is Faculty Research Lecturer for 1998-99. He gave the Fawcett Lecture at Harvard Medical School in May, 1998, and the Cape Lecture at McGill University in Montreal, Canada, in November, 1998.

#### Cell and Developmental Biology Faculty

- Gary Firestone was elected Vice Chair for 1999 and Chair for 2000 of the Gordon Conference on Hormone Action.
- John Forte was awarded the 1998 Annual Lecturer in Physiology by the Swedish Royal Academy of Science.
- George Oster was the Nathan O. Kaplan Lecturer at UC San Diego School of Medicine and was named to the Scientific Advisory Committee of the Santa Fe Institute.
- Fred Wilt delivered the Keynote Address to the 12th Meeting on the Developmental Biology of the Sea Urchin.

#### Genetics and Development Faculty

- David Drubin was appointed Chair of the Program Committee for the 1999 Annual Meeting of the American Society for Cell Biology.
- Donald Rio received an award from the Faculty Research Fund for the Biological Sciences.

#### Immunology Faculty

- James Allison is a founding member of the Academy of Cancer Immunology and is on the Roll of Honor of the International Union Against Cancer.
- Ellen Robey received an award from the Faculty Research Fund for the Biological Sciences.
- Nilabh Shastri was Chair of the Antigen Processing Workshop at the 10th International Immunology Congress in New Delhi, India, and was the 1998 Keynote Speaker for the British Immunology Society.

#### Neurobiology Faculty

- Yang Dan received an award from the Hellman Family Faculty Fund.
- Corey Goodman was a co-winner of the Wakeman Award for Research in the Neurosciences, gave the special honorary Runnström Lecture at Stockholm University in October, 1998, and delivered the 1998 Grass Keynote Lecture at the Annual Meeting of the Society for Neuroscience.
- Carla Shatz was elected to a three-year term on the Council of the National Academy of Sciences.
- Robert Zucker was appointed Research Professor of the Miller Institute for Basic Research in Science for Spring, 1999.

in increasing the graduation rates of minorities. In the first five years of the program, the graduation rates of minorities in the program were twice that of minorities not in the program. The program also increases the graduation rate of majority students.

The success of both programs is due in large part to the tireless efforts of their directors, Kane and Matsui, who both received recognition for their work recently. Matsui received a Chancellor's Outstanding Staff Award this year for his exceptional efforts as program director. Kane received the Faculty Award for Outstanding Service to Undergraduates from the MCB undergraduate student associations, MCBcDNA and MCBUSA, at the 1998 MCB Commencement. This annual award was created in 1997 to recognize the exceptional service by a faculty or staff member to undergraduates.

When Kane is asked if she finds all her hard work on the undergraduate education programs rewarding, she replies, "I love it! I like seeing students who know their options developing into whoever they want to be. The students become powerful individuals by the time they graduate."

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## Koshland Science Center

MCB Professor Daniel Koshland has donated an endowment of approximately \$25 million to the National Academy of Sciences for a new science center to be named for his wife Marian Koshland who died last year. Marian Koshland was an MCB Professor of Immunology and was elected to the academy in 1981. Dan Koshland was elected in 1966. The center's exhibits and programs will focus on the public understanding of science. It will be located on NAS grounds in Washington, D.C.

## Berkeley's Largest Major

Molecular and Cell Biology is the largest undergraduate major at UC Berkeley again this year with approximately 1100 declared MCB majors. MCB majors constitute about 10% of the undergraduates graduating each year.

## Name Change

The name of the Genetics Division has been changed to the Division of Genetics and Development in order to better reflect the research interests of its faculty.

## Change of Address

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