

## Department of Biology

The Department of Biology has 64 active faculty members; 14 are located in the Whitehead Institute, 13 are located in the Center for Cancer Research, 6 are joint appointees with the Department of Brain and Cognitive Sciences (BCS), 2 are joint with Chemistry, 2 are joint with Biological Engineering, and 1 is joint with the Department of Civil and Environmental Engineering. Three faculty members also hold appointments in Biological Engineering. Including active emeritus faculty, the department has 4 Nobel laureates, 24 members of the National Academy of Sciences, and 10 investigators of the Howard Hughes Medical Institute. The department has a stellar international reputation in research and teaching and has been a leading contributor to the development and application of molecular and cellular biology.

### Educational Activities

In AY2005, a total of 331 undergraduates were registered in the Department of Biology. During the year, 42 students added biology as a major while 19 students left it for another major. The bachelor of science in biology degree was awarded to 124 students from September 2004 through June 2005—87 in the Course 7 Program and 37 in the 7-A Program. Sixty-four freshmen declared biology as their major for fall 2005.

### Student Awards

Lori Huberman, a sophomore in Biology from Raleigh, NC, received the Richard and Jody Nordlof Award for distinguished service and musical contribution to the MIT Wind Ensemble. She also received a Ragnar and Margaret Naess Award for exceptional talent and commitment to private performance study.

Kelly Kuo, a junior in Biology from Farmington Hills, MI, received an Austin Kelly III Essay Prize, given to an undergraduate for outstanding scholarly or critical essays in one of the humanities fields, for her work, "The Nature of Vere: Quid est Veritas?"

Two juniors in Biology—Johanna Gaiottino from Sweden and Lakshmi Nambiar from Califon, NJ—received a Richard Douglas Traveling Fellowship, given to juniors for travel that supports study in the humanities or arts.

Jeffrey Hsu, a senior in Biology and Mechanical Engineering from West Hills, CA, received the John C. and Elizabeth J. Chato Award for excellence in bioengineering.

Alicia Zhou, a junior in Biology from Chicago, IL, received a Barry Goldwater Scholarship for students who plan to pursue careers in mathematics, the natural sciences, or an engineering discipline that contributes to the technological advances of the United States.

Peter Miller, a senior in Biology and Chemical Engineering from Atlanta, GA, received the Robert Haslam Cup for outstanding professional promise in chemical engineering.

Stephanie Cho, a junior in Biology, was a member of the MIT Panhellenic Association, which was awarded the William L. Stewart Jr. Award.

Laurel Lee, a senior in Biology and BCS from South Korea, received a Merage Fellowship.

Jennifer Caplin, a sophomore in Biology from Glencoe, IL, received a Public Service Fellowship for her 2005 Independent Activities Period (IAP) project.

Erika Cantu, a sophomore in Biology from McAllen, TX, Cameron Sadegh, a junior in Biology from Franklin Lakes, NJ, and Jennifer Wong, a junior in Biology from Baldwin, NY, received the In Search of Don Quixote Award for excellence in the Spanish Language.

Sheila Krishna, a senior in Biology and Foreign Languages and Literature from Anaheim, CA, received an Award for Excellence in Foreign Languages and Literatures (1st Prize), given to an undergraduate who best reflects the section's goals for achieving proficiency in a foreign language, cultural understanding, and enthusiasm in foreign language learning.

Anna Labno, a junior in Biology and Physics from Jaworzno, Poland, received the Lufthansa Award for excellence in German studies.

Three seniors in Biology—Melanie Cornejo from Lima, Peru, Gargi Khare from North Wales, PA, and Sidharth Puram from Edina, MN—received the Hans-Lukas Teuber Award for Outstanding Academics.

Ryu Yoshida, a junior in Biology from Bethesda, MD, received an honorable mention for an outstanding academic record in Brain and Cognitive Sciences.

Eun Mee Yang, a sophomore in Biology from Falls Church, VA, received a \$2,000 award for a solar water disinfection device as part of the IDEAS Competition, which recognizes innovative projects that make a positive change in the world.

Ilona Karmel Writing Prizes were awarded to a number of Biology students. Caroline Fu, a senior in Biology from Stafford, TX, received the Boit Manuscript Prize for a Work of Fiction (2nd Prize). Grace Lin, a senior in Biology from Beverly Hills, CA, received the Boit Manuscript Prize for a Work of Fiction (honorable mention). Benjamin Lee, a sophomore in Biology from Cupertino, CA, received a Dewitt Wallace Prize for Scientific Writing for the Public (2nd Prize). Theresa Shyr, a senior in Biology from Lafayette, LA, received a Robert A. Boit Writing Prize for an Essay (3rd prize). Craig Rothman, a senior in Biology and Electrical Engineering and Computer Science from King of Prussia, PA, received the S. Klein Prize for Scientific and Technical Writing (2nd Prize). Stephen Lee, a senior in Biology from Pittsburgh, PA, received the S. Klein Prize for Scientific and Technical Writing (honorable mention).

## **Biology Department Awards**

Alicia Zhou, a junior from Chicago, IL, received a Goldwater Scholarship.

Veronica Zepeda, a senior from Houston, TX, received the Undergraduate Research Symposium Award, as well as the Salvador E. Luria Prize for outstanding scholarship and research of publication quality.

Three juniors—Lakshmi Nambiar, a junior from Califon, NJ, Leslie Rozeboom, a junior from Evergreen, CO, and Alicia Zhou, a junior from Chicago, IL—also received the Undergraduate Research Symposium Award.

Meisha Bynoe, a senior from St. Vincent and the Grenadines, received the Whitehead Prize for a student who has shown outstanding promise for a career in biological research.

Eric Van Nostrand, a senior from Port Washington, NY, received the Merck Prize for outstanding research and academic performance in biophysical or bioinformatics sciences.

Ryu Yoshida, a junior in Biology from Bethesda, MD, received the John L. Asinari Award for outstanding research in life sciences.

Johanna Varner, a junior from Salt Lake City, UT, received the Gene M. Brown Award for a student who has both an outstanding academic record and has made important contributions to the biology teaching program.

Danos Christodoulou, a senior from Cyprus, received the Ned Holt Prize for a student who has demonstrated excellence in scholarship and service to the department and the MIT community.

Orlando Jaquez Nanita, a senior in Biology and Management from Miami, FL, received the Randolph G. Wei Award.

The following 18 biology majors were chosen for Phi Beta Kappa: Cem Albayrak, Istanbul, Turkey; Nancy Benedetti, Fleetwood, PA; Meisha Bynoe, St. Vincent and the Grenadines; Melanie Cornejo, Lima, Peru; Julia Espel, Golden Valley, MN; Gul Gurkan, Mersin, Turkey; Sheila Krishna, Anaheim, CA; Jessica Lee, San Mateo, CA; Stephen Lee, Pittsburgh, PA; Yvonne Lee, Milpitas, CA; Yiuka Leung, Tuen Mun, Hong Kong; Douglas Levine, Stevenson, MD; Peter Miller, Atlanta, GA; Sidharth Puram, Edina, MN; Nathan Shapiro, Shorewood, WI; Albert Su, Ranchos Palos Verdes, CA; Sinae Vogel, Radcliff, KY; Frederick Wang, Parker, Texas, CA

Laurel Yong-Hwa Lee, a senior from Bothell, WA, was awarded a Rhodes Scholarship to pursue a doctorate in clinical medicine at Oxford University. Lee came to the United States at age 16 from Korea. Now a premed double-major in brain and cognitive sciences and biology, Lee conducts research at MIT's Center for Cancer Research and at the National Institutes of Health's Institute for Neurological Disorders and Stroke. A turning

point in her medical career aspirations occurred two years ago when she volunteered in a shelter for abandoned women and children and a hospital emergency room in Honduras. She became convinced that thorough research training is crucial to the eradication of indigenous infectious disease. Lee rows for MIT's varsity lightweight crew team, was selected a Burchard Scholar, and is a nationally recognized violinist. She was selected as one of *Glamour Magazine's* "Top 10 College Women" in its October issue.

Jessica Lee, a senior from San Mateo, CA, was awarded a Marshall Scholarship to pursue graduate studies in environmental conservation at Oxford University. Lee is a biology major with a minor in chemistry. She is also a Burchard Scholar who presides over MIT's Share a Vital Earth organization and helped organize and run MIT's Earth Day. Her interest in ecosystems began in high school with a four-week summer internship at an organic farm in Frankfurt, Germany. She has since studied with the Marine Science Institute in Redwood City, CA, and the Max-Planck Institute for Marine Microbiology in Bremen, Germany. At MIT, she has carried out research on *E. coli*, the tobacco plant's viral defense mechanisms, and on cyanobacteria and cyanophage in the open oceans. Lee speaks French, German, and English, is an accomplished ballroom dancer, and has played the piano since age four. She also designed and taught a popular course in kitchen chemistry and baking during IAP.

From July 1, 2004, to June 30, 2005, the department awarded a total of 31 PhD degrees and 3 SM degrees in biology. Four PhD degrees and one SM degree were awarded in the Joint Program in Biological Oceanography with the Woods Hole Oceanographic Institute (WHOI). The maximum number of PhD candidates registered in the Biology Department in AY2005 was 239, with another 40 in the Joint Program with WHOI. The incoming class for fall 2005 will be 23 students in the Biology doctoral program, with an additional 5 students in the Joint Program in Biological Oceanography with WHOI.

## Research

The research activities of the department cover most areas of modern biology, including biochemistry, genetics, microbiology, cancer biology, cell and developmental biology, immunology, neurobiology, virology, and structural biology. The research achievements over the last year are too numerous to be discussed here, and only a few are listed.

- The Burge and Bartel labs developed new experimental and bioinformatics methods to identify new regulatory microRNAs and their target genes.
- The Jacks and Horvitz labs developed a method based on profiling of microRNA expression patterns as a way to classify tumors.
- The Weinberg lab made fundamental discoveries about how interactions among different cell types can contribute to the growth and development of a tumor.
- Michael Yaffe and his lab have suggested a new approach to achieving the same response using a lower dose of chemotherapy, thereby limiting the harmful side effects of the drugs.
- The Sauer and Baker labs gained new insight into the mechanism of substrate recognition and interactions among ATPase subunits of the ClpX protein-unfolding machine.

- The Lindquist group, using a model protein from yeast, uncovered the structural basis for “species” specificity in protein folding diseases.
- By whole genome l profiling, the Young lab has developed a comprehensive map of the transcriptional regulatory sites in the yeast genome.

## Personnel

Professor Michael Yaffe was promoted to associate professor with tenure effective July 1, 2005.

We are pleased to report that Peter Reddien PhD '02 and Dennis Kim have accepted assistant professor positions in the department. Peter will be located in the Whitehead Institute, where he will apply modern genetics, genomics, and inhibitory RNA techniques to identify the genes controlling regeneration. Dennis will set up his lab in the Koch Building and he will use *C. elegans* as a model system to study mechanisms of innate immunity to bacterial infection.

In other faculty news, Hidde Ploegh returned to the department. He was previously in the Center for Cancer Research before he moved to the Harvard Medical School for several years. An acclaimed researcher whose work focuses on the immune system, Hidde has set up his lab at the Whitehead Institute.

Dr. Frank L. Douglas, who has a distinguished history as a clinician/scientist from the pharmaceutical industry, accepted a joint appointment as professor of the practice in the department. His primary appointment is with the Sloan School of Management, where he will establish the MIT Center for Biomedical Innovation.

After more than 20 years of service at MIT, Robert Rosenberg retired this year. We are grateful to him for his many years of wonderful science and service.

The Genome Center transferred from the Whitehead Institute to MIT and became the Broad Institute, culminating two years of effort. Eric Lander, who remains a member of the Whitehead and of the department, is the first director of the Broad Institute. David Page was appointed interim director of the Whitehead Institute. Susan Lindquist, the previous director, stepped down to return to the bench after guiding the Whitehead through the successful spin-off of the Genome Center. This was a tremendous undertaking. We are extremely appreciative of Susan's efforts.

The Computational Systems Biology Initiative (CSBi), under the leadership of Peter Sorger, has been aggressively pursuing its mission to make MIT preeminent in the emerging field of systems biology by establishing new research, education, and outreach programs. CSBi is a distributed activity that includes over 90 faculty members from 12 different academic units based in the Schools of Science, Engineering, and Management. Under Peter's direction, CSBi has been a tremendous success, earning national and international recognition. This year, CSBi moved from the start-up phase into maturity. In its next phase, Paul Matsudaira and Bruce Tidor will cochair the program's management activities, thus freeing Peter to focus on running the National Institutes

of Health's Cell Decisions Processes Center, an important CSBi-related program that mandates a substantial portion of his effort.

### **Honors and Awards**

Faculty received the following notable honors in the past year: Angelika Amon and Chris Burge were honored with the Boston Museum of Science "Next Generation" Award; David Bartel won the National Academy of Sciences Award in Molecular Biology and was selected as a HHMI Investigator; Jonathan King was honored with the Annual International RECOMB Conference Distinguished Biology Award; Susan Lindquist received the Senior Award, Women in Cell Biology; Terry Orr-Weaver was named chair of the Scientific Advisory Committee of the Damon Runyon Cancer Research Foundation and president of the Genetics Society of America; David Page was elected to the National Academy of Sciences; Phillip Sharp was the University College Dublin Ulysses inaugural lecturer, Dublin, Ireland; and Robert Weinberg received the 2005 Raymond Bourguine Award.

The following faculty chairs were appointed this year: Whitehead professor of biology Monty Krieger; Fred and Carole Middleton career development professor J. Troy Littleton; Howard S. and Linda B. Stern career development professor David Sabatini; and Pfizer-Laubach career development professor Thomas Schwartz.

**Chris A. Kaiser**  
**Department Head**  
**Professor of Biology**

*More information about the Department of Biology can be found online at <http://mit.edu/biology/www/>.*