Department of Biology

The Department of Biology has 53 primary faculty members, located in five buildings: 23 in the Koch Building, 14 in the Whitehead Institute, 12 at the Center for Cancer Research (now the David H. Koch Institute for Integrative Cancer Research), and two each at the Broad Institute and the Picower Institute for Learning and Memory. Joint appointments include six with the Department of Brain and Cognitive Sciences, two with the Department of Biological Engineering, two with the Department of Chemistry, and one with the Department of Civil and Environmental Engineering. Including active emeritus faculty, the Department has four Nobel laureates, 24 members of the National Academy of Sciences, and 11 Howard Hughes Medical Institute investigators.

We are witnessing a truly remarkable era of achievement and opportunity in the life sciences. A technological revolution has given rise to the study of biology as one of the most active and exciting scientific disciplines, deeply connected to a variety of societal and economic areas. The prominence of the Department of Biology is not only derived from the intensity of its research activities—the Department is known as one of the great international centers of fundamental research and scholarship in molecular life sciences—but also is recognized as a national resource because of its long and distinguished record of training undergraduate and graduate students, as well as postdoctoral fellows, to become future leaders in biological and biomedical sciences.

Educational Activities

Undergraduate Program

A total of 281 undergraduates registered as biology majors during the fall 2007 and spring 2008 terms. Of these students, 28 left biology for another major and 121 students declared biology as a major during the academic year, including 64 freshmen who declared biology as their major in spring 2008.

The bachelor of science degree was awarded to 95 students from September 2007 through June 2008: 66 in Course 7 and 29 in Course 7-A.

Student Awards

Notable awards received by biology majors in 2007–2008 include the following:

Rishi Venkata Puram (2008) from Boston, MA, received the Merck Index Award for outstanding scholarship in chemistry.

Carmel Mercado (2009) from Coral Springs, FL, received the Peter and Sharon Fiekowsky Award for outstanding contributions to the Experimental Study Group community.

The Department of Brain and Cognitive Sciences awarded Gloria Lee (2009) from Bayside, NY, honorable mention for outstanding academic record.

Alicia DeFrancesco (2008) from Milton, MA; Lauren McLendon (2008) from Marietta, GA; and Carmel Mercado (2009) from Coral Springs, FL, were named January Scholars in France for excellence in the French language.

Anne Liu (2008) from Voorheesville, NY, won the Legacy Award, presented to a member of a living group or student organization for making a sustained and outstanding contribution to the MIT community.

The MIT Public Service Center awarded Shammi Shawkat Quddus (2010) from Chittagong, Bangladesh, a summer 2008 Public Service Fellowship for building capacity in underserved communities and organizations. Additionally, the following students received Public Service Center grants for public service with underserved communities and organizations: Anne Liu (2008) from Voorheesville, NY; Desh Mohan (2010) from Flower Mound, TX; Gloria Lee (2009) from Bayside, NY; Jacob McGrane (2010) from Mead, CO; Katrina Saulrieta (2008) from Kingston, NY; Richard Lin (2009) from Taipei, Taiwan; Shammi Quddus (2010) from Chittagong, Bangladesh; and Tracy Yun-Shin Chang (2008) from Port Jefferson Station, NY.

Katie Thomas (2010) from Machesney Park, IL, received a Student Leaders in Service AmeriCorps Education Award. Students who are selected for the program must successfully complete 300 hours of community service over the course of one year to receive an education award of $1,000.

Caroline Barker (2008) from Farmingdale, NY, received the Frederick Gardner Fassett Jr. Award.

Allison Berke (2008) from Berkeley, CA, won first place in the Boit Manuscript Prize in drama. Zachary Smith (2008) from Brewster, MA, won first place in the Boit Manuscript Prize in poetry. Anneke Schwob (2010) from West Roxbury, MA, won first prize in the Robert A. Boit Writing Prize for her short story; Allison Berke (2008) won an honorable mention in the same category.

In the IDEAS Competition, Justin Tan (2009) from Montreal, Quebec, Canada, won a $5,000 award for Wiihabilitation.

Jennifer Lai (2011) from Honolulu, HI, received a Ragnar and Margaret Naess Award in recognition of exceptional talent and commitment to private performance study as an Exceptional Emerson Piano Scholar.

Justin Tan (2008) from Montreal, Quebec, Canada, and Stephanie Wu (2010) from Boca Raton, FL, won a Kelly-Douglas Summer 2008 Traveling Fellowship from the School of Humanities, Arts, and Social Sciences; and Natalie Rodriguez (2009) from Miami, FL, won an Independent Activities Program travel award.

The following 12 biology majors, all in the class of 2008, were chosen for Phi Beta Kappa: Alexander Bagley from Needham, MA; Sanjay Divakaran from East Meadow, NY; Laura Jacox from Park Ridge, IL; Lauren McLendon from Marietta, GA; Peter Mulligan

from Media, PA; Chensi Ouyang from Mason, OH; Rishi Puram from Boston, MA; Katherine Romer from Oakland, CA; Zachary Smith from Brewster, MA; Dana Sun from Marlborough, MA; Kenneth Yan from Potomac, MD; Patricia Zheng from South Pasadena, CA.

Biology Department Awards and Prizes

The Department of Biology presented the following awards and prizes. Andrew Glazer (2008) from Northbrook, IL, received the Whitehead Prize for outstanding promise for a career in biological research. This award was based on academic scholarship and contributions to research and the MIT community.

Katherine Romer (2008) from Oakland, CA, received the Merck Prize for outstanding research and academic performance in biophysical or bioinformatics sciences.

Stephanie Wang (2008) from Sugar Land, TX, received the Gene Brown Prize for outstanding academic scholarship and demonstrated excellence as a teaching assistant.

Sunny Lou (2009) from Wayland, MA, received the Susan Hockfield Prize in Life Sciences for a third-year MIT undergraduate student in any area of the life sciences who has demonstrated both exceptional performance and promise for graduate study and research.

Rebecca Motola-Barnes (2008) of Tacoma, WA, received the Ned Holt Prize for demonstrated excellence in scholarship as well as service to the MIT community.

Cindy Chen (2008) of Elkridge, MD, received the Salvador E. Luria Prize for excellent scholarship and research of publication quality.

André Green (2008) from Opelousas, LA, received the John L. Asinari Award for outstanding UROP research in the field of life sciences.

Alicia DeFrancesco (2008) from Milton, MA, was awarded the John L. Asinari Award for outstanding project lab research in the field of life sciences.

On January 31, 2008, 11 students spoke in the Undergraduate Research Symposium, at the invitation of their research faculty mentors, including Alia Carter (2008) from Sierra Vista, AZ; Scott Chilton (2008) from Stockton, CA; Jonathan Fu (2008) from Duluth, GA; Andrew Glazer (2008) from Northbrook, IL; André Green (2008) from Opelousas, LA; Shuo Han (2009) from Diamond Bar, CA; Hanna Kuznetsov (2009) from Lexington, MA; Lauren McLendon (2008) from Marietta, GA; Colleen Mosley (2009) from Midland, MI; Samir Zaidi (2009) from Riverdale, NY; and Dan Yuan (2008) from Colebrook, CT.

Graduate Program

From July 1, 2007, to June 30, 2008, the Department awarded 39 PhD degrees and 4 SM degrees in biology. The Joint Program in Biological Oceanography with the Woods Hole Oceanographic Institute (WHOI) conferred 4 PhD degrees and 2 SM degrees. In total, there were 220 graduate students registered in the Biology Department in 2007–2008 with another 31 in the Joint WHOI Program. In fall 2008, 27 students will matriculate for

the biology doctoral program and an additional 4 students will enter the Joint Program in Biological Oceanography with WHOI.

Microbiology Program

The Graduate Program in Microbiology is a new, interdepartmental, interdisciplinary initiative. MIT has a long-standing tradition of excellence in microbiological research, and there are more than 50 faculty from several departments and divisions who study or use microbes in significant ways in their research. The Graduate Program in Microbiology will integrate educational resources across the participating departments, building connections among faculty with shared interests from different units, and fostering an educational community for training students in the study of microbial systems. The first class of eight students will enter this fall (2008).

Research

The Department of Biology is widely recognized as one of the best in the country and in the world. Research conducted in the Department continues to produce major advances in the basic science of biology and in its application to medicine and biotechnology. Traditionally, the Department has excelled in biochemistry, genetics, microbiology, cancer biology, cell biology, developmental biology, immunology, neurobiology, virology, and structural biology. The following research highlights exemplify achievements that have occurred over the past year.

Angelika Amon's research group has new findings that show that proteins controlling cell division play a far more nuanced role than researchers previously thought in the cell division process that gives rise to reproductive cells. The work, reported this year in *Cell*, could help scientists understand why errors occur in meiosis. In humans such mistakes are a leading cause of miscarriage and birth defects such as mental retardation.

Leonard Guarente and his researchers have found a link between a gene believed to promote long life span and a pathway that removes cholesterol from the body. This finding could assist researchers in creating drugs that lower the risk of diseases associated with high cholesterol, including atherosclerosis and Alzheimer's disease. Dr. Guarente's research focused on the *SIRT1* gene, which the researchers found prevents cholesterol buildup by activating a cellular pathway that clears cholesterol from the body via HDL (high density lipoprotein).

Dietary restriction extends life span and retards age-related disease in many species, although the phenomenon's underlying mechanisms remain a mystery. Guarente's lab has also recently discovered a link between the longevity induced by calorie restriction and the regulation of hormones instrumental in metabolism.

The Michael Laub lab has established how bacteria ensure that they respond correctly to hundreds of incoming signals from their environment. They studied genomes of nearly 200 bacteria, which can have hundreds of different pathways that respond to different types of external stimuli. The researchers also successfully rewired the cellular

communications pathways that control those responses, raising the possibility of engineering bacteria that can serve as biosensors to detect chemical pollutants.

The Aviv Regev lab has broken new ground by developing a method, described last fall in an advance online edition of *Nature*, that can reveal the ancestry of all genes across many different genomes. First applied to 17 species of fungi, the approach has unearthed some surprising clues about the design or gene regulatory networks and how they evolve.

Researchers in the Anthony Sinskey lab have provoked soil-dwelling bacteria into producing a new type of antibiotic by pitting them against another strain of bacteria in a battle for survival. The antibiotic holds promise for treating *Helicobacter pylori*, which causes stomach ulcers in humans. Also, understanding how the new antibiotic was produced could help scientists develop strategies for finding other antibiotics.

Phillip Sharp's lab has developed a new way to study the function of microRNAs. MicroRNAs help regulate at least 25% of mammalian genes, and malfunctions in microRNA regulation have been linked with cancer, but very few direct relationships have been established between specific microRNAs and the genes they regulate. The new technique could shed light on microRNA's hypothesized role in tumor development.

Graham Walker's lab has shown that short bacterial protein is surprisingly versatile. Researchers discovered why an unusually short bacterial protein can have many more interactions than would normally be expected of something its size. The team, led by biology professor Graham Walker, found that the protein, UmuD, belongs to a recently discovered class of proteins called intrinsically disordered proteins.

Personnel

This fall, Dr. Wendy Gilbert, a structural biologist with interests in the physical and chemical properties of RNA, will join the Department. She recently completed her postdoctoral studies with Jennifer Doudna at the University of California, Berkeley, in the area of translational regulation. She earned her PhD with Christine Guthrie, where she studied mRNA processing and export from the nucleus in yeast.

The Department welcomed Elaine Glebus as its new administrative officer effective Tuesday, May 27, 2008. Elaine comes to us from Harvard Medical School where she has extensive experience in the administration of finance, research, and medical education programs. Her portfolio spans more than 24 years of experience in academic administration. On the same note, Mary Markel Murphy left after 7 years to become the director of human resources in the Media Laboratory.

Effective July 1, 2008, David Sabatini was promoted from associate professor to associate professor with tenure.

Sadly, this past year we suffered the loss of two emeritus faculty. Eugene Bell, renowned for his pioneering work in the field of regenerative medicine, passed away on June 22. He was 88. John M. "Jack" Buchanan, Wilson professor emeritus of biology, died on June 25. He was 89.

Administrative Initiatives

This past year we have improved funding for our graduate program by developing stronger relationships with local biotech companies. We are in the second year of our pilot program and our graduate students and postdoctoral fellows are enjoying their interactions with scientists in private industry. In turn, the companies are thrilled with their ability to recruit some of the finest young minds. Alumni contributions to the Frank Solomon Graduate Student Fund are also helping to enhance the graduate experience by assisting with expenses for student travel to conferences and by hosting special speakers, receptions, and seminars.

The support and development of junior faculty are paramount for the continued success and vitality of the Department. Recent recruitment efforts have proved challenging because of the availability and high cost of childcare in the greater Boston area. I am pleased to report that Edward Scolnick recently pledged funding to establish a childcare benefit for junior faculty in the Department of Biology. This program, which will bear his name, will be supplemented with Department funds. His generosity will undoubtedly support our efforts in recruiting and retaining talented young scientists.

Honors and Awards

Biology faculty received various awards and honors in the past year including the following:

Angelika Amon was awarded the National Academy of Sciences Award in Molecular Biology supported by Pfizer, Inc. She also shared the Paul Marks Prize for Cancer Research with Todd R. Golub of MIT and the Broad Institute, and Gregory Hannon from Cold Spring Harbor Laboratory.

Tania Baker was selected as a MacVicar Faculty Fellow.

Laurie Boyer received a Pew Scholar Award. Subsequently, Laurie Boyer and Jeroen Saeij were both named recipients of the Massachusetts Life Science Center (MLSC) grant. These awards are slated to begin in July 2008.

Alan Grossman was elected to the American Academy of Arts and Sciences.

Susan Lindquist received the Otto Warburg Medal by the German Association of Biochemistry and Molecular Biology. This award is considered the most prestigious prize in biochemistry in Germany and has been awarded annually since 1963. She also received the 2008 Genetics Society of America Medal.

Harvey Lodish will chair the MLSC Scientific Advisory Board.

Aviv Regev was named a 2008 Alfred Sloan Foundation research fellow. She was also named the International Society for Computational Biology 2008 Overton Prize Winner.

Alexander Rich, received the Welch Award in Chemistry from the Welch Foundation for his fundamental insights into the structure and function of RNA and DNA.

Lisa Steiner, the first woman faculty member to join the Department of Biology at MIT in 1967, was honored at a special luncheon by her friends and colleagues at MIT on May 22 to celebrate her service and 75th birthday.

Robert Weinberg was named first recipient of the new Swedish science prize.

Chris A. Kaiser
Department Head
Professor of Biology

More information about the Biology Department can be found at http://mit.edu/biology/www/.