Department of Biology

The Department of Biology has 52 junior and senior faculty members with primary appointments, located in six buildings: 21 in the Koch Building, 14 in the Whitehead Institute, 12 at the Center for Cancer Research, two each at the Broad Institute and the Picower Institute for Learning and Memory, and one at the McGovern Institute for Brain Research. Joint appointments include five with the Department of Brain and Cognitive Sciences, two each with the Division of Biological Engineering and the Department of Chemistry, and one with the Department of Civil and Environmental Engineering. Including active emeritus faculty, the Department has four Nobel laureates, 23 members of the National Academy of Sciences, and 11 Howard Hughes Medical Institute investigators. The Department is recognized nationally and internationally as a leader in research, scholarship, and education. Its strengths are displayed in the vigor of its research and training activities. Department research has produced significant advances in modern biology. A strong tradition and record in training both undergraduate and graduate students as well as postdoctoral fellows has made the Department a national resource. This is an exciting time as a technological revolution in the life sciences has given the study of biology more prominence in scientific, societal, and economic areas.

Educational Activities

Undergraduate Program

A total of 277 undergraduates registered as biology majors during the fall 2006 and spring 2007 terms. Of these students, 25 left biology for another major and 109 students declared biology as a major during the academic year, including 72 freshmen who declared biology as their major in spring 2007.

The bachelor of science in biology degree was awarded to 103 students from September 2006 through June 2007: 84 in Course 7 and 19 in Course 7-A.

Student Awards

Lori Huberman ‘07 from Raleigh, NC, was awarded the Louis Sudler Prize in the Arts for excellence or highest standard of proficiency in the arts.

Heidi Holley ‘07 from Poudre Canyon, CO, received the Richard and Judy Nordlof Award for distinguished service and musical contribution to the MIT Wind Ensemble.

Serenus Hua ‘07 from Lincroft, NJ, received the Ragnar and Margaret Naess Award for exceptional talent and commitment to private performance study as an Emerson fellow.

Christine Hsueh ‘09 of Fremont, CA, was awarded the Ragnar and Margaret Naess Award for exceptional talent and commitment to private performance study as an Emerson scholar.

Sarah Leu ‘07 of Lansdale, PA, Delbert Green ‘08 of Opelousas, LA, and Kriti Jain ‘07 of Chapel Hill, NC, received awards for travel during Independent Activities Period 2007.

MeiHsin Cheng ‘09 from Fredericksburg, VA, won the Boit Manuscript Prize in Drama as part of the 2006–2007 Ilona Karmel Writing Prizes Competition.

Zachary Wissner-Gross ‘07 of New Hyde Park, NY, won second place in The MIT Prize for Writing Science Fiction.

The Robert A. Boit Writing Prize for Poetry was given to Zachary Smith ‘08 of Brewster, MA.

The Brain and Cognitive Sciences Department awarded Shuai Chen ‘07 of Boca Raton, FL, an Outstanding Senior Research Award.

The Chemistry Department recognized Kapil Amarnath ‘07 of Brentwood, TN, with the Chemistry Research Award for outstanding contributions in the area of research.

Ting Ting Fu ‘07 from Lexington, KY, was recognized for excellence in teaching with the Todd Anderson Award.

Alicia DeFrancesco ‘08 of Milton, MA, and Nicole Koulisis of Worchester, MA, received the second and third place (respectively) Award for Excellence in Foreign Languages and Literatures.

The Physics Department chose Anna K. Labno ‘07 from Poland and Zachary Wissner-Gross ‘07 from New Hyde Park, NY, to receive the Joel Matthew Orloff Award.

Elizabeth Zhang ‘09 from South Pasadena, CA, and Julie Bharucha ‘09 from Middletown, NY, received Public Service Fellowships for summer 2007.

Varsha Keelara ‘07 from St. Louis, MO, received a Public Service Fellowship for Independent Activities Period 2007.

Jayodita Sanghvi ‘07 from Freemont, CA, shared a $7,500 award for his team project, Cabanga, in the MIT IDEAS Competition.

Elizabeth Gillenwater ‘07 of Baltimore, MD, shared a $5,000 award for her team project, New DOTS, as part of the MIT IDEAS Competition.

Paul Montgomery ‘07 from Corvallis, OR, shared a $2,500 award for his team project, Malaria Solutions, as part of the MIT IDEAS Competition.

YaaLirng Tu ‘07 of Califon, NJ, received the Lufthansa Award for excellence in German studies.

Several biology students have been recognized as January Scholars in France for excellence in the French language. They include Ting Ting Fu ‘07 of Lexington, KY; Anna Poukchanski ‘07 of Forest Hills, NY; Natalie Rubinstein ‘07 of Chapel Hill, NC; and Gerardo Trejo ‘07 of South Houston, TX.

The following biology majors were chosen for Phi Beta Kappa: Anupama Bhimavarapu, Sharon, MA; Derek Chu, Hong Kong; Jennifer Huang, Naperville, IL; Lori Huberman, Raleigh, NC; Chalida Nakornchai, Washington DC; Jayodita Sanghvi, Fremont, CA; Zachary Wissner-Gross, New Hyde Park, NY; Michael Xiang from Bridgewater, NJ; and Sylvia Yang from Catasauqua, PA.

Biology Department Awards and Prizes

Annie Vo '07 from Prosser, WA, received the Whitehead Prize for outstanding promise for a career in biological research through academic scholarship as well as contributions to research and the MIT community.

Nicole De Nisco '07 from Covina, CA, received the Merck Prize for outstanding research and academic performance in biophysical or bioinformatics sciences.

Rishi Puram '08 from Boston, MA, received the Gene Brown Prize for outstanding academic scholarship and demonstrated excellence as a teaching assistant.

Kathy Xie '08 from Belmont, 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.

Danielle Pigneri '07 of Louisville, KY, received the Ned Holt Prize for demonstrated excellence in scholarship as well as service to the Biology Department and the MIT community.

Max Juchheim '07 of Grenada, MS, received the Salvador E. Luria Prize for outstanding scholarship and research of publication quality.

Anupama Bhimavarapu '07 from Sharon, MA, received the John L. Asinari Award for outstanding research in the field of life sciences in the Undergraduate Research Opportunities Program.

The spring 2007 7.16 class was awarded the John L. Asinari Award for outstanding project lab research in the field of life sciences. Class members included Cindy Chen '08 of Elkridge, MD; Katie Chong '08 of Boston, MA; Amber Durrell '08 of Auburn, CA; Robert Lindsay '08 of Great Falls, VA; Bin Ni '08 of Hilliard, OH; Zachary Smith '08 of Brewster, MA; EunMee Yang '07 of Falls Church, VA; Sylvia Yang '07 of Catasauqua, PA; Alicia Zha '07 of Nashville, TN; and Sharon Zhang '08 of Boca Raton, FL.

On February 1, 2007, 10 students spoke in the Undergraduate Research Symposium, at the invitation of their research faculty mentors. Of those students, three seniors were named prizewinners for their presentations: Heidi Holley from Poudre Canyon, CO; Elizabeth Gillenwater from Towson, MD; and Ryan Pester from Anaheim, CA.

Graduate Program

From July 1, 2006, to June 30, 2007, the Department awarded a total of 36 PhD degrees and 1 SM degree in biology. Eight PhD degrees 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 2006–2007 was 225, with another 36 in the Joint Program with WHOI. The incoming class for fall 2007 will be 30 students in the biology doctoral program, with an additional six students in the Joint Program.

Research

The Department of Biology is widely recognized as one of the best in the country and in the world. Its strengths are displayed in the vigor of its research activities. Research conducted in the department has produced major advances in modern biology that have had, and continue to have, an impact on basic science in the applications of biology to medicine and biotechnology. Traditionally, the Department has excelled in research in biochemistry, genetics, microbiology, cancer biology, cell and developmental biology, immunology, neurobiology, virology, and structural biology. The following research achievements have occurred over the past year.

Susan Lindquist and a multi-institutional team found that the Parkinson's disease process may be curtailed by regenerative processes in yeast and fruit flies. The group has found a way to reverse the damage in yeast, and confirmed the same defect and cure in dopamine-producing neurons of fruit flies, roundworms, and rats.

Anthony Sinskey and his researchers discovered that natural polyester makes new sutures stronger and safer. Eventually, patients who get stitches may never need to have them removed. A biopolymer suture is made of materials that the human body produces naturally, so they can be safely absorbed once the wound heals.

Graham Walker, along with Harvard researchers, discovered the final piece of the synthesis pathway of vitamin B12—the only vitamin synthesized exclusively by microorganisms. The researchers reported that a single enzyme synthesizes the fragment, and they outlined a novel reaction mechanism that requires cannibalization of another vitamin.

In other research news, Jianzhu Chen will lead the first research group of eight MIT faculty members and 17 Singaporean researchers from universities, industry, and research institutes in Singapore, through the proposed Singapore-MIT Alliance for Research and Technology Center, sponsored by the Singaporean National Research Foundation. The research program will focus on infectious diseases, the goal being how to develop an integrated, cutting-edge research program to study pathogen–host interactions of infectious diseases of importance to Singapore, Asia, and the world. This includes respiratory syncytial virus, influenza, tuberculosis, and malaria.

Also, the Center for Cancer Research's new building project is advancing. Through this planned state-of-the-art cancer research and technology facility (the CRF), MIT is mobilizing a new attack on the cancer problem in the largest initiative it has undertaken

since spearheading research on radar technology in World War II. MIT is reinventing the cancer discovery and development process. In the facility, scheduled to open in December 2010, MIT will bring together 13 top cancer biologists (all members of the current Center for Cancer Research and the Department of Biology) with a similar number of its world-class engineers. The core technologies in this building will provide the most sophisticated research tools available. With its expertise in cancer biology and technological innovation, as well as the tradition of collaborative cancer research efforts at MIT, the CRF will be at the leading edge in translating this new era of biomedical research to the ultimate benefit of cancer patients.

Personnel

Within the past year, the Department welcomed Dianne K. Newman. Dianne, who moved her lab from the California Institute of Technology, received her PhD from MIT in 1997. Her lab research investigates how bacteria have shape and respond to the chemistry of their environment through interactions with metals. Her approach relies on a wide variety of methods spanning chemistry, biochemistry, genetics, and genomics.

In fall 2007, we will be joined by four new junior faculty members: Laurie Boyer, Paul Chang, Iain Cheeseman, and Jeroen Saeij. Laurie did her postdoc at the Whitehead Institute in the labs of Rudolph Jaenisch and Rick Young. She and her research group will focus on analyzing the regulatory decisions that occur in the early stages of development of embryonic stem cells. Laurie's lab, working in the Koch Building, will work on the molecular basis by which chromatin structure controls the global regulatory state of stem cells.

Paul Chang, who did his postdoc at Harvard Medical School, focuses on understanding the role of a newly discovered form of protein modification by polyADP-ribose (PAR). He and his research lab will be located in the Center for Cancer Research where they will continue to probe the role of PAR in mitosis by identifying targets of PAR modification and studying the enzymes that control PAR addition, polymerization, and branching.

Iain Cheeseman, recruited from the University of California at San Diego, will be working on the structures that link eukaryotic chromosomes to the microtubule spindle, known as kinetochores. Iain has helped to identify dozens of the molecular components of kinetochores. His research group will be on the fourth floor of the Whitehead Institute, where they will work on the dissection of kinetochore function in cell division and will study their regulation during the cell cycle.

Finally, Jeroen Saeij did his postdoc at Stanford. Working in the Koch Building, Jeroen will use molecular and genetic approaches to identify the *Toxoplasma* gene products responsible for modulating host cell-signaling pathways and to identify the mechanisms responsible for *Toxoplasma* strain-specific differences in causing disease.

Within the past year, Catherine Drennan of Chemistry accepted a joint appointment in the Department. Peter Sorger left the Department and is now on the faculty of Harvard Medical School. Vernon Ingram died on August 17, 2006, from injuries suffered during a fall. He was 82. Vernon was a dedicated teacher and researcher. He is greatly missed.

Effective July 1, 2007, the following faculty received promotions:

- Professor J. Troy Littleton was promoted to associate professor with tenure.
- Professor Angelika Amon was promoted to full professor.
- Professor Amy Keating was promoted to associate professor.

Honors and Awards

Biology faculty received various awards and honors in the past year.

Angelika Amon received the 2007 American Society for Biochemistry and Molecular Biology Amgen Award and the School of Science Prize for Excellence in Undergraduate Teaching.

Tania Baker was elected to the National Academy of Sciences.

Christopher Burge received the 2007 Schering-Plough Research Institute Award.

Richard Hynes is the recipient of the 2007 E.B. Wilson Medal of the American Society of Cell Biology and was appointed the Scientific Governor for the Wellcome Trust, the UK's largest charity.

Peter Reddien received the 2006 Rita Allen Foundation Scholars award, and Michael Hemann received the 2007 award.

Thomas Schwartz was the recipient of a Pew Scholars Award.

Rick Young was awarded the Wilber Cross Medal, Yale University, and was named to the 2006 Scientific American Top 50 US Science and Business Leaders.

Chris A. Kaiser
Department Head
Professor of Biology

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