Cold Spring Harbor Laboratory

Watson School of Biological Sciences Doctoral Program

The Watson School of Biological Sciences at Cold Spring Harbor Laboratory (CSHL) offers an accredited graduate training program, which leads to the Ph.D. degree, to a select group of self-motivated students of outstanding ability and intellect. The curriculum takes advantage of the unique and flexible environment of CSHL and includes the following innovative features: approximately four years from matriculation to Ph.D. degree; a broad representation of the biological sciences; a first year with course work and laboratory rotations in separate phases; emphasis on the principles of scientific reasoning and logic; continued advanced course instruction throughout the graduate curriculum; and two-tier mentoring.

The curriculum is designed to train self-reliant students who, under their own guidance, can acquire and assimilate the knowledge that their research or career demands require. The course work is varied, involving core courses, focused topic courses, and CSHL postgraduate courses.

The current fields of research expertise of CSHL faculty members are cancer & molecular biology, neuroscience, quantitative biology, plant biology, and genetics & genomics. The laboratories of all CSHL research faculty members are available to students in the program.

Requirements for the award of the Ph.D. degree are successful completion of all coursework, laboratory rotations, teaching at the Laboratory's Dolan DNA Learning Center, the qualifying exam, thesis research, and defense of a thesis dissertation that describes original research. The program aims to train future leaders in the biological sciences.

Admissions Process

Applicants must have received a baccalaureate degree or equivalent from an accredited academic institution prior to matriculation. Admission is based on the perceived ability of the applicant to excel in the program, without regard to gender, race, color, ethnic origin, sexual orientation, disability, or marital status. Suitable applicants are assessed on the basis of their academic record, recommendations from their mentors, and an on-site interview. Students must ensure that the school receives all application materials (transcripts, examination scores, letters of recommendation, etc.) no later than December 1 for the following fall term. Early application is advisable. All applicants must apply online. Interested students should inquire about an application fee waiver. Further information about the School and the application procedure may be found at http://www.cshl.edu/gradschool.

Student Group

The class size is approximately 10 students per year. Over the years students have come to the School from all over the world, with roughly half of students from the United States. The School aims to produce graduates in the biological sciences who are likely to become world leaders in science and society.

Cost of Study

The Watson School of Biological Sciences provides full remission of tuition and fees for accepted students. The School provides an annual stipend - $33,000 - and research costs for each student for four years, after which time their thesis advisor finances their studies. Students get an $8,000 annual research and training costs budget. Students receive a laptop, software, books and other study materials from the School. CSHL and the WSBS provide health insurance and subsidized housing and on-campus dining costs.

Living and Housing Costs

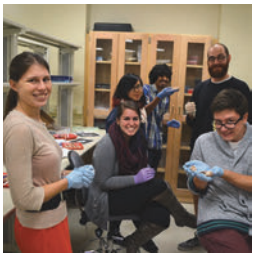
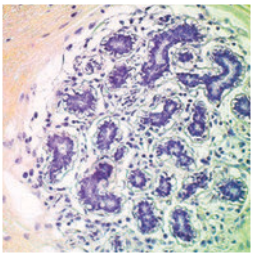
The Laboratory provides affordable housing through a network of on-site and off-site housing. Single graduate students are offered single rooms in shared houses with house-cleaning services; married students are housed in apartments. First-year students of the Watson School are offered housing in the Townsend Knight or Cutting Houses, both located on the shore of Cold Spring Harbor a short walk from the Laboratory.

Research Facilities

CSHL has state-of-the-art research facilities, including extensive next-generation sequencing capacity, computational infrastructure, genomic screening facilities, transgenic animal services, and other shared resources. Several libraries on campus maintain print and online journal collections. Library services also include database searches, and reference and interlibrary loan services. An information technology department provides campus-wide support for computing.

Location

The Laboratory is located on the wooded north shore of Long Island, 35 miles east of Manhattan in New York City, and offers many amenities, both cultural and recreational. CSHL has a fitness room, tennis and volleyball courts, a private beach, kayaks, and many quiet back roads for running or walking. Students are invited to classical music performances and art exhibitions sponsored by the Laboratory for scientists and the neighboring community.

Academic Support
Students select two dedicated faculty mentors to guide them in their graduate studies. The academic mentor monitors the student's progress and provides advice about laboratory selection or career paths. The thesis research mentor takes on the major mentoring role with respect to the student's professional development during the course of the thesis research.

If students need academic assistance, either at the recommendation of faculty or through their own self-assessment, tutoring is offered at no expense. Likewise, students with undergraduate degrees in non-biological sciences, such as physics, engineering, and mathematics, are encouraged to come to CSHL several weeks before the start of the Fall Term to review their background in molecular biology. Tutors, recommending readings, and other support measures are provided free of charge.

Accreditation
Cold Spring Harbor Laboratory's Watson School of Biological Science is institutionally accredited by the New York State Board of Regents and the Commissioner of Education, a nationally recognized accrediting agency, located at
89 Washington Avenue, Albany, NY 12234, (518) 474-1551.

Career Development
CSHL exposes students to a variety of scientific careers, from traditional academic research careers to non-research careers in science writing, education or administration. Through informal discussion or targeted career development opportunities, students gain valuable experience that will help them refine their future careers.

Students gain teaching experience as part of the Watson School first-year curriculum. Students work with educators at CSHL's Dolan DNA Learning Center (www.dnalc.org), helping with curriculum development and teaching laboratory classes.

The Career Development Program at CSHL provides students with information about careers in academia, including the job search and transitioning to an independent position. The Career Development Program hosts workshops on preparing for a chalk talk, an integral part of the academic job search, and "Getting to Know Your Faculty," a series in which CSHL faculty members share stories of their careers and highlight their philosophies toward identifying interesting scientific questions, lab management, work-life balance, and what it takes to be successful.

The Bioscience Enterprise Club provides information for students interested in non-academic scientific careers through an extensive series of seminars and workshops. The topics cover a wide range of non-academic and non-research careers, from biotechnology and intellectual property to scientific publishing, non-profit administration, and venture capitalism. The Bioscience Enterprise Club has worked with local biotechnology start-up companies to offer on-campus recruiting interviews.

Graduate Outcomes
The Watson School's retention rate is over 90%, and all students have graduated within six years of starting their studies. Directly after graduating from the School, over 80% of Ph.D. awardees pursued postdoctoral training in academic research labs, 10% took up independent positions in academia or industry, and 6% followed non-reasearch science-related careers. Currently, of our Ph.D.s who graduated six or more years ago, over half are in tenure-track faculty or independent research positions at major US or international research institutes; about 20% are continuing with postdoctoral training. The remaining graduates are employed in non-research, science-related careers such as consultancy, publishing, or biotech management, or non-science careers.

CONTACT
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www.cshl.edu/gradschool

THE FACULTY AND THEIR RESEARCH

Florin Albeanu, Assistant Professor; *Ph.D., Harvard, 2008*. Neuronal circuits; sensory coding and synaptic plasticity; neuronal correlates of behavior; olfactory processing.

Gurinder "Mickey" Atwal, Associate Professor; *Ph.D., Cornell, 2002*. Population genetics; bioinformatics; cancer; stochastic processes; statistical mechanics and information theory.

Anne Churchland, Associate Professor; *Ph.D., UC San Francisco, 2003*. Decision-making; electrophysiology; sensory processing; vision; audition; neural computation; modeling; behavior.

Camila Dos Santos, Assistant Professor; *Ph.D., U Estadual de Campinas (BR), 2006*. Breast cancer; mammary gland development; stem cells; gene regulation; enhancer biology.

Josh Dubnau, Associate Professor; *Ph.D., Columbia, 1995*. Learning; memory; genetics; behavior.

Mikala Egeblad, Associate Professor, *Ph.D., Copenhagen (DK), 2000*. Tumor microenvironment; intravital imaging; tumor-associated myeloid cells; breast cancer.

Douglas Fearon, Professor; *M.D., Johns Hopkins, 1968*. Cancer immunology, pancreatic cancer, mouse models

Hiro Furukawa, Associate Professor; *Ph.D., Tokyo (JP), 2001*. Membrane proteins, X-ray crystallography, electrophysiology, neurodegenerative disease.

Jesse Gillis, Assistant Professor; *Ph.D., Toronto (CA), 2007*. Gene networks; gene function prediction; guilt by association; neuropsychiatric; hub genes; multifunctionality; computational genomics.

Thomas Gingeras, Professor; *Ph.D., NYU, 1976*. Genome-wide organization of transcription and the functional roles of nonprotein coding RNAs.

Christopher Hammell, Assistant Professor; *Ph.D., Dartmouth, 2002*. Post-transcriptional gene regulation; control of animal developmental timing; RNA biology.

Molly Hammell, Assistant Professor; *Ph.D., Dartmouth, 2003*. Gene regulatory networks; integrated genomic analysis; bioinformatics; RNA biology; small RNAs.

Z. Josh Huang, Professor; *Ph.D., Brandeis, 1994*. Neuroscience; experience-dependent development of the neocortex; mouse genetics; neurotrophins.

Ivan Iossifov, Assistant Professor; *Ph.D., Columbia, 2008*. Computational biology; molecular networks; human genetics; human disease; applied statistical and machine learning; biomedical text-mining; molecular evolution.

David Jackson, Professor; *Ph.D., East Anglia (UK), 1991*. Plant development; genetics; cell-to-cell mRNA and protein trafficking.

Leemor Joshua-Tor, Professor; *Ph.D., Weizmann (IL), 1991*. Structural biology; nucleic acid regulation; RNAi; molecular recognition; X-ray crystallography.

Adam Kepecs, Associate Professor; *Ph.D., Brandeis, 2002*. Decision-making; neural circuits; behavioral electrophysiology; theoretical neuroscience; neuroeconomics.

Justin Kinney, Assistant Professor; *Ph.D., Princeton, 2008*. Sequence-function relationships; machine learning; biophysics; transcriptional regulation.

Alexei Koulakov, Professor; *Ph.D., Minnesota, 1998*. Theoretical neurobiology; quantitative principles of cortical design; computer science; applied mathematics.

Adrian R. Krainer, Professor; *Ph.D., Harvard, 1986*. Posttranscriptional control of gene expression; pre-mRNA splicing mechanisms, fidelity and genetic diseases; alternative splicing; RNA-protein interactions; cancer.

Alexander Krasnitz, Associate Professor; *Ph.D., Tel Aviv (IL), 1990*. Genomics of cancer; machine learning for biology; inference from noisy biological data; large-scale numerical computing.

Je H. Lee, Assistant Professor; *M.D., Ph.D., Tufts, 2002*. Single-cell, in situ RNA-seq, non-coding RNA, spatial genomics, cancer microenvironment

Dan Levy, Assistant Professor; *Ph.D., UC Berkeley, 2005*. Computational biology; human genetics; phylogenetics; copy number variation.

Bo Li, Associate Professor; *Ph.D., British Columbia (CA), 2003*. Neuroscience; glutamatergic synapse; synaptic plasticity; schizophrenia; depression; rodent models of psychiatric disorders.

Zachary Lippman, Associate Professor; *Ph.D., Watson School, Cold Spring Harbor Laboratory, 2004*. Plant development; genetics; flowering; inflorescence architecture; sympodial growth, phase transition, heterosis; quantitative genetics.

Gholson J. Lyon, Assistant Professor; *M.D., Weill Cornell 2004; Ph.D., Rockefeller, 2003*. Human genetics; neuropsychiatric diseases; whole genome sequencing; ethics.

Robert Martienssen, Professor; *Ph.D., Cambridge (UK), 1986*. Plant genetics; transposons; development; gene regulation; DNA methylation.

W. Richard McCombie, Professor; *Ph.D., Michigan, 1982*. Genomics of psychiatric disorders; genomics of cancer; computational genomics; plant genomics.

Alea A. Mills, Professor; *Ph.D., UC Irvine, 1997*. Cancer; development; aging; senescence; epigenetics.

Partha P. Mitra, Professor; *Ph.D., Harvard, 1993*. Neuroscience; theoretical biology.

Pavel Osten, Associate Professor; *M.D., Charles University (CZ), 1991; Ph.D., SUNY Downstate Medical Center, 1995*. Autism and schizophrenia; gene expression-based mapping of brain activity; anatomical mapping of brain connectivity; high throughput microscopy.

Darryl J. Pappin, Associate Professor; *Ph.D., Leeds (UK), 1984*. Proteomics; mass spectrometry; protein chemistry.

Michael C. Schatz, Associate Professor; *Ph.D., Maryland, College Park, 2010*. Genomics; genome assembly and validation; sequence alignment; multicore computing; parallel algorithms; cloud computing.

Stephen Shea, Assistant Professor; *Ph.D., Chicago, 2004*. Olfaction; audition; communication behaviors; in vivo electrophysiology; individual recognition.

Adam Siepel, Professor; *Ph.D., UC Santa Cruz, 2005*. Computational biology, population genetics, computational genomics, molecular evolution, gene regulation

Raffaella Sordella, Associate Professor; *Ph.D., Turin (IT), 1998*. Molecular therapeutics; signal transduction.

David L. Spector, Professor; *Ph.D., Rutgers, 1980*. Cell biology; gene expression; nuclear structure; microscopy.

Arne Stenlund, Associate Professor; *Ph.D., Uppsala (SE), 1984*. Papillomavirus; cancer; DNA replication.

Bruce Stillman, Professor; *Ph.D., Australian National, 1979*. DNA replication; chromatin assembly; biochemistry; yeast genetics; cancer; cell cycle.

Jessica Tollkuhn, Assistant Professor; *Ph.D., UC San Diego, 2006*. Transcriptional regulation; chromatin; critical periods in neurodevelopment; steroid hormones and behavior

Nicholas Tonks, Professor; *Ph.D., Dundee (UK), 1985*. Posttranslational modification; phosphorylation; phosphatases; signal transduction; protein structure and function.

Lloyd Trotman, Associate Professor; *Ph.D., Zurich (CH), 2001*. Molecular mechanisms of tumor suppression; cancer modeling and treatment; molecular cancer visualization; PTEN regulation.

David Tuveson, Professor; *M.D., Ph.D., Johns Hopkins, 1994*. Pancreatic cancer; experimental therapeutics; diagnostics; mouse models; cancer genetics.

Chris Vakoc, Assistant Professor; *M.D., Ph.D., Pennsylvania, 2007*. Chromatin; transcriptional regulation; acute myeloid leukemia; BET bromodomains; lysine methyltransferases.

Linda Van Aelst, Professor; *Ph.D., Leuven (BE), 1991*. Signal transduction; Ras and Rho proteins; tumorigenesis; neural development.

Doreen Ware, Adjunct Associate Professor; *Ph.D., Ohio State, 2000*. Computational biology; comparative genomics; genome evolution; diversity; gene regulation; plant biology.

Michael Wigler, Professor; *Ph.D., Columbia, 1978*. Human genetic disorders; population genetics; cancer genomics.

Anthony Zador, Professor; *M.D./Ph.D., Yale, 1994*. Neural circuits; sensory processing, attention and decision making; attention; molecular tool development; connectomics.

Hongwu Zheng, Assistant Professor; *Ph.D., Boston, 2003*. Malignant gliomagenesis; animal modeling; stem cell renewal/differentiation; genetic and epigenetic regulation.

THE CURRICULUM

Scientific Reasoning and Logic (8 credits)
A fundamental aspect of earning a Ph.D. is training in the pursuit of knowledge. In this core course students (1) acquire a broad base of knowledge about the biological sciences, (2) learn the scientific method, and (3) learn to think critically. The beginning of the course is divided into 4-5 modules, each of which has a different general theme, and proceeds with the goal of considering an open, still unanswered, scientific question.

Scientific Exposition and Ethics (2 credits)
This core course offers instruction in the fundamental elements of scientific exposition—writing skills and public speaking—and ethics. The ability to communicate effectively and to appreciate the intricacies of ethical issues are essential skills for biologists; both subjects are taught in a series of example-based lectures and discussion groups. A primary objective of the course is that students consider exposition and ethics an integral part of scientific research.

Specialized Disciplines in Biology (1.5 credits each, 4 required)
The Specialized Disciplines in Biology courses provide in-depth instruction on defined topics. These four-week courses are generally divided into lectures and discussions. The courses enable students to identify key issues in the field, to propose experimental or theoretical solutions to those issues, and to evaluate the published literature. The courses demonstrate biological principles that resonate beyond the limits of the course topics themselves.
Cancer Biology
Genetics and Genomics
Systems Neuroscience
Quantitative Biology

Bootcamps
Bootcamps are short, intensive courses aimed to get all students to a similar level of proficiency in a defined topic in preparation for the core courses. Bootcamps have been offered in molecular biology and the quantitative biology, and are required for all students, regardless of academic background.

Research Topics (0.5 credits)
Faculty members describe their current research topics and methods of investigation. Here students learn how to identify and approach important problems in biology.

Topics in Biology (2 credits each, 4 required)
Each year, invited instructors offer seven-day courses exploring specialized topics outside the expertise of the Cold Spring Harbor Laboratory faculty. Each course includes morning or evening lectures, as well as afternoon sessions during which students read assigned papers. The Topics in Biology include:

- Immunology
- Evolution
- Microbial Pathogenesis
- Physical Biology of the Cell

CSHL Elective Postgraduate Courses (1 credit each, 3 required)
The program of postgraduate courses at Cold Spring Harbor Laboratory provides training in interdisciplinary subjects that are either new or so specialized that they are not adequately treated by universities. Students select to attend the lecture sessions of any three postgraduate courses, allowing students to mould their academic programs to their research interests.

Exams

- Fall Term exam
- Qualifying exam
- Thesis proposal defense
- Thesis dissertation defense

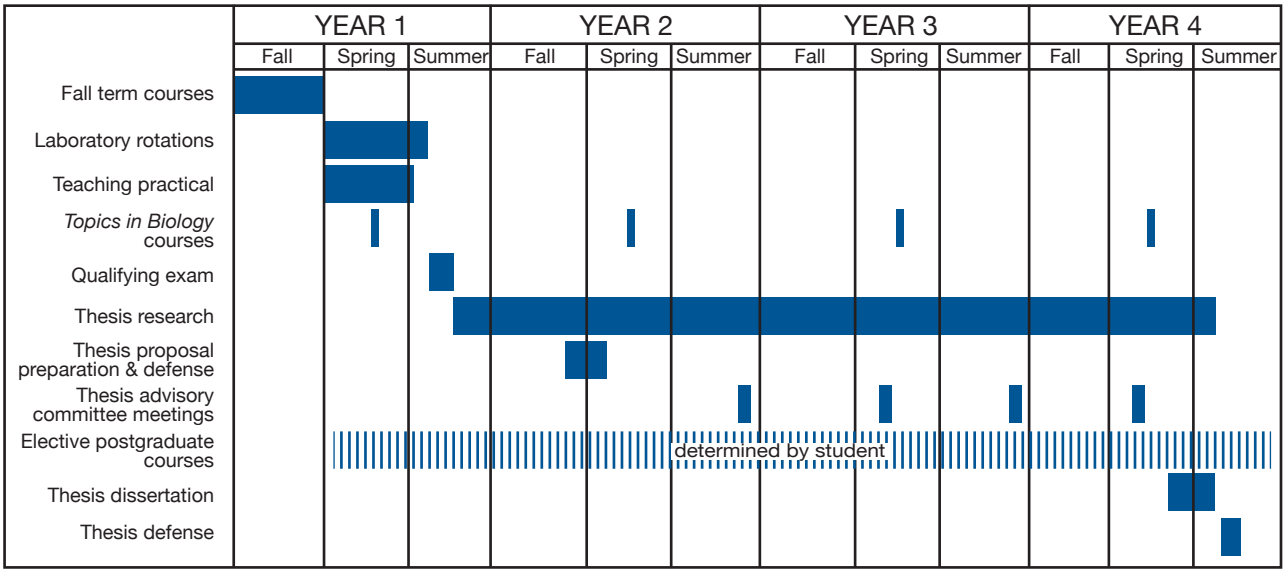
Meetings and Seminars

- CSHL In-House Symposium
- Graduate Student Symposium (1 credit)
- CSHL In-House seminars (0.5 credits)
- CSHL Building-wide seminars (1 credit)
- CSHL Invited Speaker seminars (0.5 credits)
- Gavin Borden Lecture

Teaching practical at CSHL's Dolan DNA Learning Center (http://www.dnalc.org/) (1 credit)

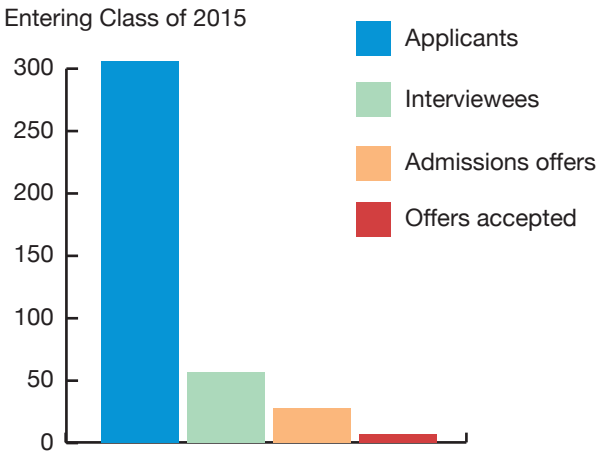
Research

- Three 6-week laboratory rotations (2 credits each)
- Full-time thesis research (3 credits, summer of 1st year only)

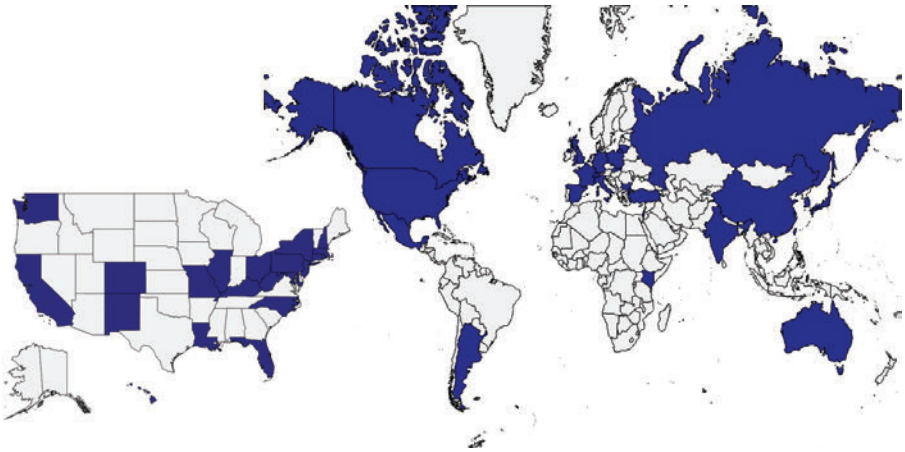


Overview of the graduate program schedule.

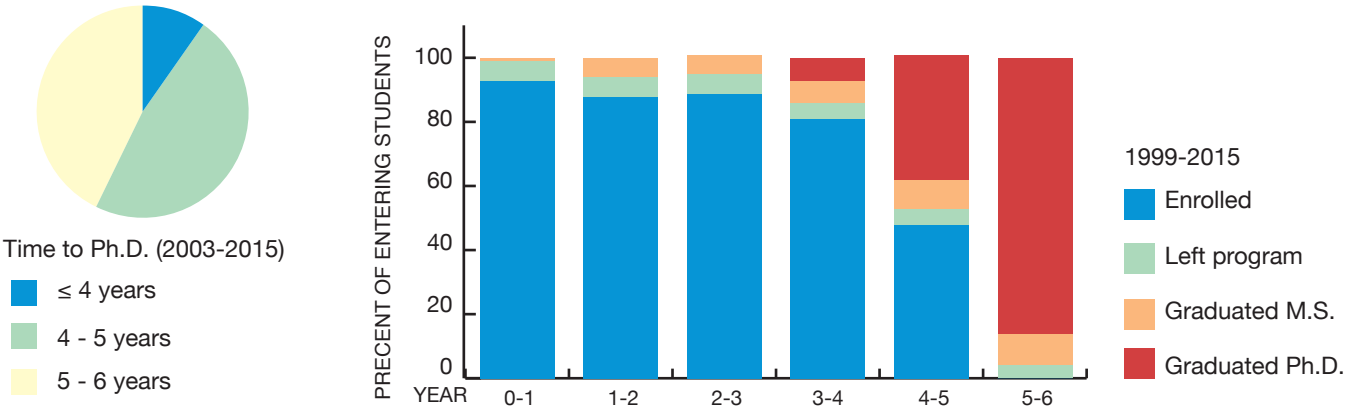
Watson School applicants & admissions



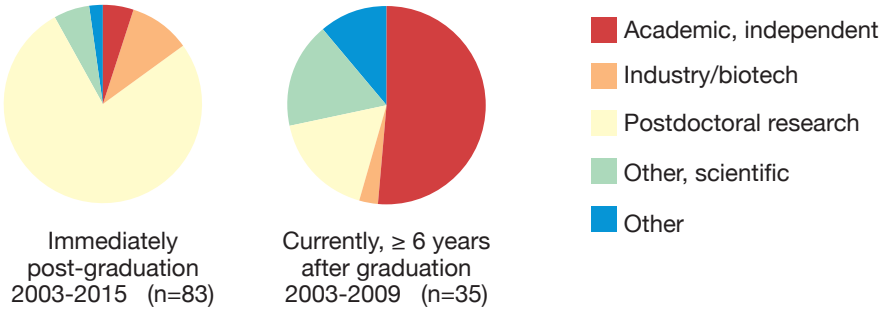
Geographic origins of Watson School students



Watson School student progress & time to degree



Career paths of Watson School Ph.D. graduates



The Watson School's Mission

Since 1890, Cold Spring Harbor Laboratory has been a global leader in research and education. The international scientific community at CSHL provides a unique and stimulating atmosphere for doctoral research—an environment where students, postdoctoral fellows, and faculty work side-by-side. The Watson School of Biological Sciences was founded on the belief that with well thought-out mechanisms, enthusiastic involvement of faculty, and highly motivated students, an innovative curriculum could be provided that would allow students to earn a doctoral degree in a shorter time than in traditional programs without compromising the quality of their training. The curriculum is designed to train students to become scholars and independent thinkers.

Our mission is to:

- Prepare the best and the brightest students to face the ever-changing cutting edge of biological and biomedical research with the necessary skills to become leaders in science and society.
- Enable students to complete their PhD in approximately four years from matriculation, while maintaining the highest standards of excellence.
- Impart a broad, multi-disciplinary, representation of the biological sciences.
- Teach students how to think independently and critically, focusing on the principles of scientific reasoning and logic.
- Educate ethical biologists who can communicate effectively with all audiences.
- Emphasize that learning is a lifelong process that goes hand-in-hand with outstanding research.
- Facilitate the pursuit of significant, independent thesis research.

To accomplish these goals the following unique features drive the program:

- Separate course work and laboratory rotations into separate phases in the first year of training.
- Extensive student mentoring through a "two-tier" mentoring program.
- Financial support from the program, which serves to uncouple the funding source from graduate education.
- A student body with diverse ethnicities, nationalities, and educational backgrounds.
- A unique environment, which includes a world-class scientific Meetings and Courses program, providing the opportunity to meet and learn from leaders in science.