Graduate programs in

BIOLOGICAL SCIENCES

MARQUETTE UNIVERSITY

Be The Difference.

ABOUT MARQUETTE

Our programs. *Marquette offers 50 doctoral and master's degree and more than 30 graduate certificate programs, and a School of Dentistry and Law School. And we have a variety of specializations to help you tailor the curriculum to your needs — an opportunity not offered by all universities.*

Our students. *We enroll approximately 3,700 graduate and professional students from diverse cultural and educational backgrounds and 68 countries all over the world.*

Our faculty. *Marquette's almost 700 full-time faculty represent renowned scholars and industry experts. As a student, you'll also benefit from established collaborations within the local business and nonprofit communities, as well as other nationally renowned institutions within the region, including the Clinical and Translational Science Institute, Medical College of Wisconsin, Milwaukee School of Engineering, University of Wisconsin system, and others.*

Our research. *Graduate students can participate in important research alongside our renowned faculty members — making you a contributing member of our research team, not just a face in the crowd like at some other universities. Marquette's overall research award volume in fiscal year 2010 reached a record high, with faculty receiving more than $28 million. Federal award dollars increased by 81 percent, and the average award size rose by 45 percent.*

Our commitment. *Class sizes are small and are usually taught by regular faculty members who are conducting cuttingedge research. Your teaching will be informed by current research, and you will often have the opportunity to participate in research.*

Our network. *As a graduate of Marquette, you'll become part of our alumni family of 110,000 around the world — creating a professional network that spans from right next door to across the globe.*

Our values-based education. *As a Jesuit institution of higher education, Marquette continues a centuries-old tradition of academic excellence, development of the whole person and research that addresses societal needs.*

Why graduate studies in Biological Sciences at Marquette?

The biological sciences program is designed to develop the whole person with a superior graduate education tailored to the individual person. It is small enough to ensure personalized attention but large enough to have the resources and expertise to train individuals in the theoretical and experimental aspects of modern biology. The department is a university leader in obtaining funding for interdisciplinary and transformational research and receives more than $2 million annually for it.

Be prepared. We strive to train first-rate scientists capable of directing independent research. Our students are prepared for postdoctoral research and, ultimately, tenure-track faculty positions at prestigious research institutions and positions in industry and government.

Be engaged. Our graduate program offers a small student-faculty ratio, which means individualized attention and interaction among faculty and students. This permits flexible programming with unique learning opportunities customized to each student's interests and needs.

Be mentored. Our faculty are committed to excellence in teaching and research — so much so that several of them have been honored with the university's highest awards for teaching and research and are recognized nationally and internationally as scholars. You will experience that knowledge and leadership in your everyday interactions with them — in the classroom and outside of it.

Be informed. You will have exposure to a network of scholars from all over the world through the privately funded Distinguished Lecture Series, at which you will hear about the latest research and learn about developing techniques.

Be supported. Each year, we offer generous benefits in the form of research assistantships or teaching assistantships with tuition credits, a competitive stipend and health care benefits.

Biological sciences graduate programs:

Doctorate in biological sciences: biological sciences or neurosciences
Master of science in biological sciences

YOUR JOURNEY

Choose from two tracks: biological sciences and neurosciences. Biological sciences has nine specializations, and neurosciences is offered in collaboration with biomedical sciences in the College of Health Sciences. First-year students in both tracks do three laboratory rotations of seven weeks each to work with potential mentors and gain exposure to different research environments. Rotations include attending lab group meetings, literature research, bench work, and presentation of findings and/or research plans to lab members.

Employment of biological scientists is expected to increase 21 percent from 2008-18, much faster than the average of all occupations, according to the 2010-11 edition of the Bureau of Labor and Statistics' *Occupational Handbook*. Are you ready to fill that need?

"The Biological Sciences Department at Marquette is an interdisciplinary program that has allowed me to pursue the research that I am interested in. Collaborations with faculty, staff and students have given me invaluable insights into my research and future career path."

Jennifer Bray
Biological sciences doctoral student and teaching assistant

Doctoral degree in biological sciences

Two tracks: biological sciences and neurosciences

Applicants (2011): 59
Admitted (2011): 15

Course work:

- Course selection is individually tailored to students' specific career goals and prior academic background, with classes selected from speciality graduate lecture courses and seminar courses that emphasize original literature.
  - — Biological sciences courses include cellular homeostasis, principles of eukaryotic genetics, structure and function of proteins, and microbial ecology.
  - — Neurosciences courses include cellular and molecular neuroscience, systems neuroscience, and behavior neuroendocrinology.
- First-year students are required to complete three seven-week laboratory rotations with selected faculty during which students are temporary members of the laboratories whose research is of interest to them. By the end of the second semester, students choose an adviser and form an advisory committee of five doctoral-degree research faculty members.
- Doctoral students must complete 24 credit hours, including 14 credits of lecture courses, five seminar courses (to be taken throughout the program) and five non-dissertation research credits.
- Average class size is five to 10 students, and students are expected to complete their course work in the first two years of the program.
- Students typically complete their degrees in five to six years.

Dissertation requirements:

- Students must pass a doctoral-qualifying exam, which is generally taken during their fourth semester. The exam involves a written proposal for a research project (in an area different from their dissertation research), which they defend in an oral presentation to their thesis committee. The exam tests students' scientific knowledge and ability for independent scientific thinking in the development and analysis of a research project.
- The research-intensive phase of the program begins at the end of the fourth semester at the beginning of the summer. The dissertation entails 12 credit hours of research, and at least one research paper must be submitted for publication to a peer-reviewed journal before the public defense of the thesis.

Other opportunities:

- Both tracks offer a collaborative research environment within the department and research community. The neurosciences track is supported by the Integrated Neuroscience Research Center, a consortium of multidisciplinary researchers committed to advancing neuroscience research and education.
- Beginning the second year, students annually present their in-process research work to faculty (biological sciences and biomedical sciences) as a mini-seminar.
- Students and faculty meet during weekly journal clubs for critical analysis of current scientific literature.
- Individual research groups have weekly laboratory meetings to exchange ideas and experimental results. Some groups combine to provide broader input.

For more program details, including requirements and course descriptions, see the *Graduate Bulletin* at marquette.edu/grad.

YOUR FACULTY MENTORS

For more information about the department's faculty members, awards and research, visit marquette.edu/biology/faculty.shtml and marquette.edu/biology/neuroscience.shtml.

Dr. Allison L. Abbott, assistant professor
MicroRNA genes in C. elegans development

Dr. James T. Anderson, associate professor
RNA-modifying enzymes

Dr. David A. Baker, associate professor
Neurobiology of addiction and schizophrenia

Dr. Murray Blackmore, assistant professor
Nervous system repair and regeneration

Dr. Edward M. Blumenthal, associate professor
Epithelial physiology and control of feeding/digestive behavior

Dr. James T. Buchanan, professor
Neurobiology of locomotion

Dr. SuJean Choi, assistant professor
Central mechanisms of energy regulation and feeding behavior

Dr. William E. Cullinan, dean of the College of Health Sciences, John P. Raynor, S.J., Professor of Biomedical Sciences and director of the Integrative Neuroscience Research Center
Stress neurobiology, neuroanatomy and neuroendocrinology

Dr. Stephen M. Downs, Wehr Distinguished Professor
Mammalian oocyte maturation and embryo development

Dr. Thomas J. Eddinger, professor
Smooth muscle function

Dr. Robert H. Fitts, professor and chair of biological sciences
Exercise physiology and skeletal/heart muscle biology

Dr. Paul J. Gasser, assistant professor
Cellular mechanisms of stress hormones

Dr. M. Behnam Ghasemzadeh, associate professor
Synaptic transmission and plasticity in drug abuse

Dr. Krassimira Hristova, assistant professor
Microbiology, microbial ecology

Dr. Kathleen M. Karrer, professor
DNA rearrangement/methylation and signal transduction

Dr. Doug Lobner, associate professor
Mechanisms of cell death in neurodegenerative diseases

Dr. James S. Maki, associate professor
Microbial ecology

Dr. John R. Mantsch, associate professor and chair of biomedical sciences. *Neuropsychopharmacology of stress and addiction*

Dr. Stephen H. Munroe, professor
Regulation of pre-mRNA splicing

Dr. Michelle Mynlieff, associate professor
Ion channels and neuronal function

Dr. K. Dale Noel, professor
Root nodule development and vernalization in higher plants

Dr. Robert W. Peoples, associate professor
Actions of alcohols on ligand-gated ion channels

Dr. Michael R. Schläppi, associate professor
Molecular biology of cold acclimation and flowering time regulation in plants

Dr. Martin St. Maurice, assistant professor
Structural biology and enzymology

Dr. Rosemary A. Stuart, professor
Mitochondrial biogenesis and function

Dr. Linda K. Vaughn, professor
Mechanisms of action of nitrous oxide in the brain

Dr. Robert A. Wheeler, assistant professor
Neural regulation of emotion, especially as it relates to addiction

Dr. Pinfen Yang, associate professor
Control of flagellar motility

> "Students will learn and be able to use the methods of scientific inquiry to solve problems and evaluate information."
>
> **Dr. Thomas J. Eddinger**
> Professor
> Marquette University

FACULTY RESEARCH

Our faculty have national and international society citations for research excellence, appointments to the NIH and NSF research review boards, memberships on editorial review boards for major scientific journals, and invitations to speak at prestigious conferences.

Biochemistry and genetics — The research areas of this diverse group include regulation of RNA processing; epigenetic regulation of gene expression; structural and functional analysis of enzymes; and cellular metabolism and mitochondrial function.

Cell and developmental biology — This highly interactive group uses diverse approaches, including genetics, molecular biology, bioinformatics and imaging, to investigate cellular and developmental processes in a wide variety of model organisms.

Drug addiction and mental disorders — Drugs of abuse such as cocaine produce long-lasting changes in cellular and synaptic properties in the brain. Mental disorders such as schizophrenia may involve similar neuronal changes. Labs are focusing on these neuroplastic changes to understand the basis of addiction and mental disorders and find therapeutic interventions.

Microbiology and ecology — The group focuses primarily on how microbes function as organisms, cope with diverse habitats, and have tremendous effects on their immediate environment and the entire global biosphere. Molecular, biochemical and physiological approaches are emphasized. Research topics include symbiosis and different aspects of environmental microbiology.

Neurobiology of stress — The body's stress response is a natural coping mechanism to change, but chronic stress is associated with mental disorders, and stress increases susceptibility to drug addiction. Several labs are investigating stress mechanisms at molecular, cellular and circuit levels and the role of stress in psychiatric disorders and drug addiction.

Physiology — The primary focus of this group is on muscle, nerve and epithelial physiology with formal course work in these disciplines emphasizing molecular, cellular and system physiology. Research emphasis includes neurotransmitter actions, locomotion, smooth/skeletal and heart muscle function epithelial transport.

Regulation of feeding behavior — Understanding the mechanisms of hunger and energy regulation may provide insights into eating disorders and ultimately aid in the search for effective therapies. The studies in these labs focus on the hypothalamus and the reward systems in rodents and on the mechanisms of feeding mutations in Drosophila.

Structure and function of ion channels — Ion channels underlie electrical signaling of nerve cells. Patch-clamp techniques allow investigation of the structure and function of ion channels to understand the mechanisms of their gating and modulation by alcohol and other drugs. Labs using these techniques are studying the NMDA receptor, GABA receptor and Ca channels.

For more information about the department's faculty members, awards and research, visit **marquette.edu/biology/faculty.shtml and marquette.edu/biology/neuroscience.shtml.**

YOUR RESOURCES

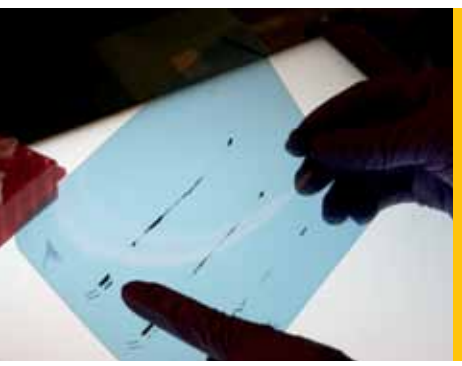
As a graduate student in biological sciences, you'll have access to:

- a bioimaging center with a confocal and fluorescent microscopes.
- an X-ray diffractometer for macromolecular crystallography.
- growth chambers, ultracentrifuges, FPLC, gel documentation systems, and phosphoimager and scintillation counters on a shared basis.
- local collaborations with the Medical College of Wisconsin, Milwaukee School of Engineering, University of Wisconsin–Madison and University of Wisconsin–Milwaukee.
- tuition scholarships if participating in summer work in Woods Hole, Mass.; at Cold Spring Harbor Laboratory in Cold Spring Harbor, N.Y.; or at a similar laboratory devoted to the study of biological sciences.
- travel funds when presenting data at conferences and national meetings.
- the Raynor Memorial Libraries, which hold about 1,200 electronically catalogued print journal subscriptions in biological and health sciences, including many of the most highly cited journals.

Our graduate programs also provide excellent resources beyond the classrooms. Thanks to our location in downtown Milwaukee and community-connected faculty, you'll enjoy an urban setting with access to a vibrant arts scene, professional sports, restaurants and nightlife.

Marquette University

- Access to networking, career counseling, and job searching counselors and seminars through our free Career Services Center
- More than 20 academic centers and institutes that foster research in end-of-life care, ethics, neuroscience, rehabilitation engineering, transnational justice, water quality, sports law and others
- Access to more than 1.7 million volumes of books and bound journals, 22,000 journals and other serials in digital format, laptops for checkout, and extensive special collections (Raynor Memorial Libraries are open evenings and weekends)
- Access to a secure high-speed wireless network (54Mbps) for laptops and other devices
- Remote computer access to campus-only resources through our VPN
- Student Health Service, Counseling Center and Campus Ministry
- Sports recreation and fitness facilities
- Big East Conference sports, including men's basketball, which has 27 NCAA appearances, 14 Sweet Sixteen appearances, three Final Four appearances and one NCAA championship (1977) and plays in front of 18,000 fans at the Bradley Center



The department offers a master's degree, and students can choose from five research groups: cell and developmental biology; genetics and molecular biology; microbiology; plant biology; and physiology. Course selection is individually tailored to students' specific career goals and prior academic background. For more information, visit marquette.edu/biology.

Milwaukee

- The Milwaukee metropolitan area has approximately 1.7 million people, ranking among the top cities in the United States by population
- Home to nine Fortune 500 company headquarters, including Harley-Davidson, Johnson Controls, Northwestern Mutual and Rockwell Automation
- Milwaukee offers many art and cultural opportunities, including a repertory theatre, a symphony orchestra, two opera companies, a ballet company, diverse art galleries, a public museum, the Milwaukee County Zoo and the Milwaukee Art Museum
- Professional sports include baseball (Brewers), basketball (Bucks), hockey (Admirals), soccer (Wave) and skating exhibitions at the Pettit National Ice Center (an Olympic training facility)
- Known as the city of festivals, Milwaukee has abundant celebrations throughout the year honoring the city's diverse heritage, including Summerfest — the world's largest outdoor music festival
- More than 10 miles of lakefront, 1,500 restaurants and 15,000 acres of parks

"The education at Marquette is taught by people who know the material at a practical level. It is great to learn from someone who isn't just teaching from a book but instead teaches from experience."

Jordan Blacktop
Neurosciences doctoral student

YOUR INVESTMENT

Typically, all biological sciences graduate students are fully funded by research and teaching assistantships. The value of that funding for the 2011-12 academic year is:

For full-time students:

Nine credits per semester at $945 per credit = $8,505 per semester*

Doctoral students must complete 24 credit hours and 12 hours of dissertation work.

Master's students must complete 24 credit hours and six hours of dissertation work.

*Figures provided are based on average credit hours taken per semester and exclude service fees and/or continuous enrollment/continuation course fees. Per-credit cost valid until May 2012.

YOUR OPPORTUNITIES

Our students are prepared for postdoctoral research and, ultimately, tenure-track faculty positions at prestigious research institutions and positions in industry and government.

You can find Marquette students doing postdoctoral work at:

- Boise State University
- California Institute of Technology
- Dana-Farber Cancer Institute
- Duke University
- Michigan State University
- Northwestern Medical College
- Scripps Research Institute in La Jolla, California
- University of California, San Francisco
- University of Texas
- Universtiy of Wisconsin, Madison
- Washington University School of Medicine

in faculty positions at:

- Dominican University
- Indiana University
- Lewis University
- Marquette University
- Milwaukee School of Engineering
- University of Massachusetts

and doing research at:

- Abbott Laboratories
- Blood Center of Wisconsin
- Jackson Laboratories
- Preservation Solutions in Elkhorn, WI
- Wisconsin Crime Lab

YOUR FIRST STEP

We invite you to apply.

Application requirement checklist:

- ☐ Online application at marquette.edu/grad/apply (must be submitted online before all other admission materials)
- ☐ Application fee
- ☐ Official transcripts from all current and previous colleges/universities except Marquette
- ☐ Three letters of recommendation
- ☐ A statement of purpose outlining future scientific and career goals, mentioning specific research laboratories or courses of study, as appropriate
- ☐ GRE scores (general test only)
- ☐ (International applicants only) TOEFL score or other acceptable proof of English proficiency
- ☐ If necessary, submit any additional hard-copy materials in one envelope to:

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  P.O. Box 1881
  Milwaukee, WI 53201-1881



We invite you to speak with a representative of the college.

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