Biology and Biomedical Sciences

The Division of Biology & Biomedical Sciences at Washington University offers exceptional doctoral education at one of the nation's preeminent biomedical research centers. The Division includes 13 doctoral programs:

- Biochemistry, Biophysics and Structural Biology
- Biomedical Informatics and Data Science
- Cancer Biology
- Computational and Systems Biology
- Developmental, Regenerative and Stem Cell Biology
- Evolution, Ecology and Population Biology
- Human and Statistical Genetics
- Immunology
- Molecular Cell Biology
- Molecular Genetics and Genomics
- Molecular Microbiology and Microbial Pathogenesis
- Neurosciences
- Plant and Microbial Biosciences

A collaborative, interdisciplinary approach to research and education is a hallmark of Washington University and the Division. As a universitywide consortium, the Division transcends departmental lines and removes traditional boundaries of scientific fields. Faculty and graduate students regularly cross disciplines, devising novel questions and approaches that might otherwise go unexplored. The Division consists of approximately 690 PhD and MD PhD students, with more than 500 faculty members from 38 departments.

Washington University in St. Louis provides unique opportunities for translating basic science into practical application. In addition, the Division's associations with internationally prominent local institutions provide exciting opportunities: students in the biomedical sciences enrich their work with the clinical perspective of our outstanding medical school; students in plant, population, evolutionary and ecological sciences benefit from our close affiliation with the internationally renowned Missouri Botanical Garden (http://www.missouribotanicalgarden.org/) and the Danforth Plant Science Center (http://www.danforthcenter.org/).

To help prepare graduates for careers in academia, government, industry or another field of their choice, educational opportunities are offered for skills development and career exploration. The DBBS offers career-planning curriculum, and students can pursue noncredit elective credentials to build transferable professional skills in four areas that apply to a wide variety of scientific careers: leadership, entrepreneurship, science communication, and teaching. Through the Initiative for Maximizing Student Development Career Pathway Talks program, professionals from a variety of fields (e.g., biotech startups, patent law) provide presentations and Q&A sessions to students throughout the year. In addition — through partnerships with groups such as the Teaching Center, the Career Center, and student organizations such as ProSPER, InPrint, Sling Health, the BALSA Group, and the Young Scientist Program — students have additional opportunities to develop experiences relevant to their future career goals.

Additional Information

Further information, including full program descriptions, may be obtained in the following ways:

- **Mailing address:**
  Division of Biology & Biomedical Science
  Washington University in St. Louis
  660 S. Euclid Ave., CB 8226
  St. Louis, MO 63110

- **Physical location:**
  Bernard Becker Medical Library, Fourth Floor
  660 S. Euclid Ave.
  St. Louis, MO 63110

- **Email:** dbbsphdadmissions@wustl.edu
- **Website:** http://dbbs.wustl.edu

Degrees & Offerings

- PhD Degrees in Biology & Biomedical Sciences (http://bulletin.wustl.edu/medicine/degrees-offerings/dbbs-phd/)

Research

Biochemistry, Biophysics and Structural Biology (http://dbbs.wustl.edu/divprograms/biophysics/Pages/BBSB.aspx)

Areas of study:

- Enzymology and allostery
- Mechanisms of neural degeneration
- Molecular signaling
- Biochemistry of host-pathogen interactions
- Mechanisms of microbial immune evasion
- Protein-nucleic acid interactions
- Cell cycle regulation
- Computational biophysics
- Cellular transport and trafficking
- Nanotechnology and chemical biology
Visit our website for information about our Biochemistry, Biophysics and Structural Biology faculty (http://dbbs.wustl.edu/divprograms/biophysics/Pages/Faculty.aspx).

**Biomedical Informatics and Data Science (http://dbbs.wustl.edu/divprograms/BIDS/Pages/default.aspx)**

*Areas of study:*

- Applied Clinical Informatics (ACI): applying innovative measurement and informatics approaches to inform and improve clinical practice
- Consumer Health Informatics (CHI): investigating consumers' needs and integrating consumers' preferences into health information systems
- Clinical Research Informatics (CRI): managing information related to clinical trials as well as secondary use of clinical data
- Translational Bioinformatics (TBI): developing storage, analytic and interpretive methods to optimize the transformation of biomedical data
- Population Health Informatics (PopHI): integrating aspects of public health, clinical informatics and health care delivery

Visit our website for information about our Biomedical Informatics and Data Science faculty (http://dbbs.wustl.edu/divprograms/BIDS/Pages/Faculty.aspx)

**Cancer Biology (http://dbbs.wustl.edu/divprograms/cancerbiology/Pages/default.aspx)**

*Areas of study:*

- Apoptosis and autophagy
- Tumor cell biology
- Chromosome stability and genome maintenance
- Cell motility and metastasis
- DNA repair, replication and recombination
- Transcriptional and translational regulation
- Metabolism
- Imaging technologies
- Receptor-ligand interactions
- Signal transduction molecules and pathways
- Biomarker studies
- Genomic mutation profiles and informatics
- Non-coding RNAs
- Tumor immunology and vaccines
- Tumor viruses
- Hematopoiesis
- Cancer disparities
- Small molecule and nanotechnology discoveries
- Tumor microenvironments
- Clinical trial research

Visit our website for information about our Cancer Biology Faculty (http://dbbs.wustl.edu/divprograms/cancerbiology/Pages/Faculty.aspx)

**Computational and Systems Biology (http://dbbs.wustl.edu/divprograms/compbio/Pages/default.aspx)**

*Areas of study:*

- Large-scale genetic network analysis and reconstruction
- Technology development for high-throughput collection of genetic and biochemical data
- Real-time, single-cell analyses of genetic regulatory circuits
- Specificity and evolution of DNA-protein interactions
- Algorithm development for comparison of DNA, RNA, and protein sequences
- Synthetic biology
- Metagenomics and microbiomes
- Epigenetics and epigenomics
- Functional genomic studies of population genetic variation
- Big-biodata integration and modeling

Visit our website for information about our Computational and Systems Biology faculty (http://dbbs.wustl.edu/divprograms/compbio/Pages/Faculty.aspx).

**Developmental, Regenerative and Stem Cell Biology (http://dbbs.wustl.edu/divprograms/devbio/Pages/default.aspx)**

*Areas of study:*

- Regenerative and stem cell biology
- Organogenesis
- Animal models of human developmental disorders
- Aging and longevity
- Neuronal development, differentiation and plasticity
- Genetic/developmental basis of cancer
- Growth factors and cell signaling during development
- Establishment of cell and tissue polarity
- Circadian rhythms
• Growth control and nutrition
• Hormonal regulation
• Gene regulatory networks/systems biology
• Epigenetic control of development

Visit our website for information about our Developmental, Regenerative and Stem Cell Biology faculty (http://dbbs.wustl.edu/divprograms/devbio/Pages/Faculty.aspx).

Evolution, Ecology and Population Biology (http://dbbs.wustl.edu/divprograms/eepb/Pages/default.aspx)

Areas of study:
• Levels and maintenance of genetic variation in natural plant and animal populations
• Variation at medically relevant genes and candidate loci
• Molecular evolution of genes
• Mechanisms of speciation and adaptation
• Factors that contribute to biodiversity across space and time
• Interaction of species and how such interactions affect biodiversity
• Restoration and conservation of species
• Biology of invasive species
• Role of species in the functioning of entire ecosystems
• Phylogenetic relationships among populations, species and higher taxa

Visit our website for information about our Evolution, Ecology and Population Biology faculty (http://dbbs.wustl.edu/divprograms/eepb/Pages/Faculty.aspx).

Human and Statistical Genetics (http://dbbs.wustl.edu/divprograms/hsg/Pages/default.aspx)

Areas of study:
• Detection of loci for simple and complex/quantitative traits in humans
• Association analyses for common and rare variants
• Development of novel statistical methods for gene discovery
• Mapping of simple and quantitative traits in model organisms
• Genomic approaches to gene expression, transcriptional regulation, and development
• Functional analysis of genes and variants for human disease

Visit our website for information about our Human and Statistical Genetics faculty (http://dbbs.wustl.edu/divprograms/hsg/Pages/Faculty.aspx).

Immunology (http://dbbs.wustl.edu/divprograms/immunology/Pages/default.aspx)

Areas of study:
• Tumor immunobiology
• Autoimmune diseases
• Host-pathogen interactions
• Immune system development
• Lymphocyte function
• Molecular immunology
• Cytokine function
• Lymphocyte differentiation
• Lymphocyte signaling
• Computational modeling of immune responses

Visit our website for information about our Immunology faculty (http://dbbs.wustl.edu/divprograms/immunology/Pages/Faculty.aspx).

Molecular Cell Biology (http://dbbs.wustl.edu/divprograms/cellbio/Pages/default.aspx)

Areas of study:
• Apoptosis
• Cancer cell biology
• Chromosome biology and genome maintenance
• Cytoskeleton assembly, cell motility and chemotaxis
• DNA repair, replication, and recombination
• Extracellular matrix and tissue mechanics
• Mechanisms of enzyme catalysis and inhibition
• Mechanisms of transcription and tissue-specific transcription regulation
• Membrane excitability
• Metabolism
• New imaging technologies for cells and whole animals
• Organelle biogenesis
• Prion diseases and neural degeneration
• Protein trafficking
• Receptor-ligand interactions in regulation of cell growth and cell phenotype
• Regulation of gene expression and translational control
• Signal transduction molecules and pathways
• Vascular biology and coagulation

Visit our website for information about our Molecular Cell Biology faculty (http://dbbs.wustl.edu/divprograms/cellbio/Pages/Faculty.aspx).
Molecular Genetics and Genomics (http://dbbs.wustl.edu/divprograms/genetics/Pages/default.aspx)

Areas of study:
- Genetic basis of human disease
- Epigenetics
- Animal models of human disease
- Cancer genetics
- Model organism genetics
- Computational genomics and epigenomics
- Regulation of transcription and translation
- Population genetics
- Developmental genetics
- Gene therapy
- Gene regulatory networks/systems biology
- Genetic basis of microbial development and pathogenesis
- Functional genomics
- Sequence analysis and gene-structure prediction

Visit our website for information about our Molecular Genetics and Genomics faculty (http://dbbs.wustl.edu/divprograms/genetics/Pages/Faculty.aspx).

Molecular Microbiology and Microbial Pathogenesis (http://dbbs.wustl.edu/divprograms/micro/Pages/default.aspx)

Areas of study:
- Microbial physiology
- Molecular genetics
- Genomics
- Structural biology
- Environmental microbiology
- Microbial bioenergy
- Bacteriology
- Mycology
- Parasitology
- Virology
- Host defense, allergy and inflammation
- Cell biology of host-pathogen interactions
- Imaging technologies for cells and whole animals
- Immune responses to pathogens

Visit our website for information about our Molecular Microbiology and Microbial Pathogenesis faculty (http://dbbs.wustl.edu/divprograms/micro/Pages/Faculty.aspx).

Neurosciences (http://dbbs.wustl.edu/divprograms/neuro/Pages/default.aspx)

Areas of study:
- Neurobiology
- Neurology
- Functional imaging
- Behavior
- Cognition
- Computational neuroscience
- Electrophysiology
- Sensory systems
- Motor systems
- Neuroglia
- Neuronal development
- Learning
- Memory
- Language
- Synaptic plasticity
- Mind
- Consciousness
- Neurodegeneration
- Diseases of the nervous system
- Neuronal injury
- Clinical neuroscience
- Motor control
- Biological rhythms
- Connectivity mapping

Visit our website for information about our Neurosciences faculty (http://dbbs.wustl.edu/divprograms/neuro/Pages/Faculty.aspx).

Plant and Microbial Biosciences (http://dbbs.wustl.edu/divprograms/PlantMicroBioSci/Pages/default.aspx)

Areas of study:
- Molecular mechanisms governing responses of microbes and plants to their environment
- Assembly and regulation of membrane-associated complexes
- Cytoskeleton organization and its role in morphology and cell division
- Structural biology and biochemistry
- Molecular mechanisms underlying cell and organelle size
- Plant-microbe interactions
- Metabolic engineering of natural products, biomaterials, and biofuels
• Microbial ecology and evolution
• Biogeochemical cycles and earth history
• Systems biology
• Astrobiology

Visit our website for information about our Plant and Microbial Biosciences faculty (http://dbbs.wustl.edu/divprograms/PlantMicroBioSci/Pages/Faculty.aspx).

Faculty

For a list of divisions and their areas of study, including more information about program faculty members, please refer to the Research (p. 1) section of this page.

Courses

For a full listing of courses offered through the Division of Biology and Biomedical Sciences, please visit the university’s online course listings (https://courses.wustl.edu/CourseInfo.aspx?sch=L&dept=L41&crslvl=5:9).