

# Dare to cross traditional boundaries

Computer science and mathematics

Biomedical engineering

Mechanical engineering

Chemical engineering

Polymer engineering

Polymer science

Chemistry

Biology

Physics

Geology



## Pioneering research

Are you rigorously trained? Intellectually flexible? Innovative and collaborative? Eager to build bridges between traditionally disparate disciplines? Then join the multiple explorations already under way in the Integrated Bioscience PhD program. **The brief summaries that follow provide only a glimpse of the highlights in four major areas of research in progress.**

## Computational biology and bioinformatics

Research in computational biology and bioinformatics addresses the questions raised by the success of the Human Genome Project, which opened a new chapter in modern biology. Faculty research teams – 13 investigators across seven departments – are blazing new trails in their search for answers. Among other research, they are considering large datasets that include sequence, structure, genomic, and proteomic expression data, analyses that require interdisciplinary expertise and collaboration, the engines that drive the Integrated Bioscience PhD program.

Teams exploring bioinformatics are developing tools for data visualization, analysis, and distributed data storage and retrieval. Working with colleagues at Cleveland Clinic, they are analyzing cell signaling and microarray data. Other researchers are working on the development of bioinformatics databases and tools. Teams exploring computational biology are developing remote sensing computing, such as biosensing garments and virtual systems for real-time remote surgery. Other teams are leading research in molecular and macromolecular modeling and simulation.

Still others are merging research in both areas to form a proteomics core to study the link between expression data interpretation and gene ontologies. Other new collaborations and opportunities abound.

## Financial aid options

- Teaching Assistantships
- Research Assistantships
- Summer assistantships
- Low-interest student loans

## Promising

The Integrated Bioscience Ph.D. program answers the needs of a 21<sup>st</sup> century that has been called the era of integrated science, engineering, and innovative technology. Fostering collaboration among independent thinkers, the program redefines advanced scientific study for a new millennium. Graduates of this program enter the work force as broadly trained specialists who are comfortable and competent crossing disciplines, a skill set in high demand in government, private industry, and academia and critical to addressing challenges in health care, the economy, and the environment.

The  
University  
of Akron

## For complete details

Visit <http://ib.uakron.edu> for complete details about the Integrated Bioscience Ph.D. program, including curriculum, requirements for admission, costs and financial aid.

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# Integrated Bioscience Ph.D.

The  
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# Adventure awaits at the intersection of the sciences

## Integrated Bioscience Ph.D.

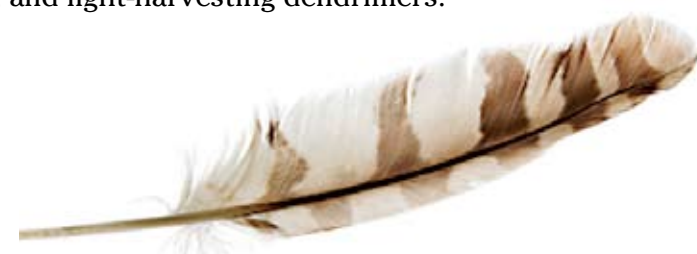
### Biomaterials

Three areas of active collaboration – involving 17 scientists from six departments – seek to unravel the mysteries of nature’s simple, yet elegant, designs. Among the materials in development are carbon nanotube adhesives inspired by geckos. Initial experiments already have uncovered unexpected effects of temperature and humidity on adhesion, a testimony to the value of collaboration at the center of the Integrated Bioscience PhD.

Inspired by spider silk, research teams are developing biomimetic fibers that mimic the high strength and extensibility of their biological model, combining expertise in electrospinning, the evolution of silk, and mechanical analysis of fibers.

Tooth enamel and bone are fascinating examples of how a combination of hard and soft matrices organized in hierarchical geometry can provide unique designs for manufacturing high-strength functional materials and coatings. Research here brings together expertise in polymer chemistry, computational modeling of biopolymers, colloidal and carbon nanotube assembly, and biomedical engineering. The result: novel synthetic routes to create hierarchical nanocomposites using silica, aligned carbon nanotubes, and polymer chemistry.

In addition to these three areas, research teams are developing synthetic muscles using block copolymers, protein stabilization in glassy sugars, biodegradable coatings, nano-ordered colored materials using techniques inspired by bird feathers, and light-harvesting dendrimers.



### A pioneering think tank

Be among the first in the country to participate in a Ph.D. program structured around broad-based, multidisciplinary collaboration involving more than nine hard sciences. The Integrated Bioscience Ph.D. program welcomes top students with undergraduate or graduate degrees in the natural sciences: Life sciences, engineering disciplines, applied mathematics, or computer science.

### Biomedical engineering

Three project areas in biomedical engineering capitalize on strong programs in engineering, polymers, and natural science. Exploration will expand exponentially over the next several years with the addition of three new endowed chairs in bio-related engineering.

Right now, faculty are developing hybrid BioMEMS (bio-micro-electro-mechanical-system) sensors that couple effective biosensing with advanced MEMS technology. One application under study addresses the urgent need of improved drug discovery tools.

Other teams are researching drug delivery vehicles for gene transfection via micro/nanospheres, nanofibers, dendrimers, and hydrogels. One example is delivery of powerful anti-microbial agents to biofilms via nebulization of encapsulated silver compounds.

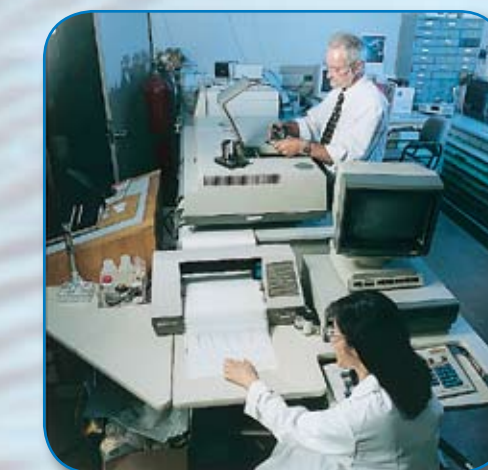
The third project area – social environment regulation of behavior – calls for the interdisciplinary study of complex behavioral phenomena in the post-genomics era. To that end, faculty are collaborating to map the effects of the early social environment on the organization and expression of the underlying neural systems. Collaborative research, a hallmark of the Integrated Bioscience PhD, is expanding analysis of social responses by enabling manipulation of social and chemical variables.



### Environmental bioscience

Get in on the ground level of solving complex environmental problems, the focus of bioscience research in the areas of bioremediation, biocontrol, natural resource management, and ecosystem function. Research here brings together ecologists, population biologists, mathematicians, engineers, chemists, geologists, and other scientists focused on the preservation of Planet Earth.

Climate change, biotic homogenization, introduction of invasive species, and alterations to nutrient cycles are ubiquitous examples of anthropogenic ecosystem change. Quantifying such changes, developing sustainable strategies to minimize future impact, and restoring formerly affected systems require an integrated perspective that encompasses biological, chemical, hydro-geological and engineering underpinnings and consequences.



**Scientists in these and other disciplines are waiting to involve you in these and other collaborative adventures of the Integrated Bioscience PhD program.**

### Unprecedented

Imagine the prestige of participating in a Ph.D. program that’s one of the first of its kind in the nation. Established in 2006, the doctoral program at The University of Akron immerses students in a collaborative environment where asking “Why?” “Why not?” and “What if?” predominate. A low professor-to-student ratio ensures attention from more than 60 faculty from 12 academic departments.