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About WPI's Life Sciences and Biomedical Engineering

Across the life sciences at WPI, faculty and graduate students are working to advance the understanding of living organisms and to translate discoveries into new therapies, devices, and products that will help prevent and cure disease, address environmental challenges, improve the effectiveness of health care, and elevate the human condition.

Among the major research focus areas in the life sciences at WPI today:

- Regenerative Biosciences and Engineering, Stem Cell Biology
- Tissue Mechanics, Mechanobiology, Biomaterials
- Bioinformatics and Computational Biology
- Biophysics
- Plant Systems and Biofuels
- Genetics and Pathogenesis
- Biological Imaging and Sensing
- Smartphone and Networked Medical Applications
- Nanoscience and Technology, Molecular Sensors, and Microfluidics

The work at WPI's Life Sciences and Bioengineering Center (LSBC) is a nexus of partnerships and collaborations with academia and industry.

Faculty and students routinely collaborate with colleagues at institutions across the country and the world, including an innovative program developed by WPI and nearby University of Massachusetts Medical School (UMMS) to sponsor translational research projects that leverage the strengths of both institutions. WPI and UMMS also offer a joint graduate program in biomedical engineering and medical physics.

The LSBC is also home to Massachusetts Biomedical Initiatives (MBI), one of the country's leading incubators for life sciences companies. MBI has launched dozens of companies in Central Massachusetts and continues its mission today by helping entrepreneurs commercialize promising technologies, including some spun off from WPI labs.

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Biomedical Engineering

WPI is making important advances in biomedical engineering—a melding of engineering, biology and medical science—aimed at extending lives, re-enabling the disabled, and vastly improving our quality of life.

Biology and Biotechnology

The work of the Biology and Biotechnology Department at WPI goes beyond the theoretical. Students, faculty, and industry collaborate in research and discovery to solve problems that affect us all. Their goals: to help treat and cure common, dread diseases, like Alzheimer's and cancer; heal wounds faster; create a greener world through science; and use computer science techniques to solve flesh-and-blood problems.

- Pamela Weathers, professor of biology and biotechnology, has been working for more than 10 years to produce a more effective and economical treatment for malaria, using a plant that produces a compound that is the only remaining effective treatment for the disease. Malaria is a mosquito-borne parasitic infection that afflicted nearly 220 million people in 2010, according to the CDC.

In her research, Weathers is exploring a way to turn the whole *Artemisia annua* plant into a malaria therapy, bypassing the need for the costly process of extracting artemisinin from the plant, purifying it and packaging it with other materials as a pharmaceutical. A new study by WPI and the University of Massachusetts has shown that the powdered dried leaves from the Artemisia annua plant may be a far more effective antimalarial treatment than purified artemisinin, delivering 40 times more artemisinin to the blood and reducing the level of parasite infection more completely in mice.

Chemistry and Biochemistry

The Biochemistry faculty works in the Life Sciences and Bioengineering Center, the $50 million, 125,000-square-foot research facility. In this state-of-the-art laboratory and office building, individual lab spaces and shared facilities are allocated by research focus area, rather than department, encouraging interdisciplinary and interdepartmental collaboration.

The Chemistry Department performs cutting-edge research that can help improve lives and address concerns that face humanity, working in interdisciplinary teams that combine the best of each discipline to innovate and create, while gaining hands-on experience.

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- José Argüello, professor of chemistry and biochemistry, recently concluded a four-year term on a National Institutes of Health (NIH) study section, participating in the review and evaluation of research proposals aimed at understanding the nature of biological phenomena and applying that knowledge to enhance human health. Argüello was a member of the NIH Macromolecular Structure and Function study section, joining a panel of leading scientists from around the United States who are experts in how metals such as copper, iron, and zinc, which are essential to life, participate in biological processes.

Argüello studied the structure and function of proteins that transport heavy metals across cell membranes. Metals such as copper, zinc, cobalt, and iron are micronutrients that perform several fundamental functions. For example, when they are incorporated into cellular proteins, the metal molecules assist in maintaining structure and confer catalytic activity to proteins. They also participate in the transport of oxygen in the blood, the synthesis of sugars in plants, and the transcription of DNA. Metals also contribute to both the virulence of pathogenic microorganisms and the ability of a cell to resist infection by those organisms. Because of the importance of these basic biological functions, a better understanding of the mechanisms of heavy metal transport has implications for the treatment of a host of diseases, for human and animal nutrition, and for the bioremediation of heavy metal pollution.

Biomanufacturing Education and Training Center

Launched in April 2011, the Biomanufacturing Education and Training Center (BETC) is a 10,000-square-foot, pilot-scale, fully functional biomanufacturing facility with stainless steel and single use technologies. It provides a hands-on environment for training and education of workers in the biomanufacturing field who produce medicines using engineered living cells.

WPI founded the center with support from the Massachusetts Life Sciences Center to help meet the growing demand for skilled biomanufacturing workers and accelerate innovation in life sciences in central Massachusetts. The BETC was created in concert with WPI faculty and industry experts whose experience influenced the use of space, the selection of lab equipment, and the design and delivery of the curriculum.

The center also increasingly serves as a lifeline for displaced workers looking for job retraining. To date, 22 companies have participated in BETC programs, including Biogen Idec, Genzyme, Shire, Abiomed, and ImmunoGgen. In January 2015, WPI announced a new collaboration with AdvantaPure, a manufacturing firm based in Pennsylvania, that extends the center's capabilities to help companies that supply equipment and solutions to biomanufacturers.