



Rice University's Institute of Biosciences and Bioengineering (IBB)

IBB fosters cross-disciplinary research and education programs encompassing the biological, chemical, and engineering disciplines. *IBB is at the heart of Rice life sciences and builds programs that put faculty and students at the center of innovative research.* Today, 108 faculty members representing all of Rice's science and engineering departments are affiliated with the Institute. These researchers work across departmental boundaries in areas where movement from basic science discovery to practical application occurs with amazing speed: protein-based blood substitutes, non-rejectable replacement materials for bone or organ transplants, synthetic cell fabrication, engineered tissues, heart and cancer diagnostic tools and treatments, nutritional formulations, and targeted drug delivery systems. In addition to its strong research focus, IBB offers a summer academy program for high school students, research opportunities for undergraduate students, as well as training and professional development programs for graduate students and postdoctoral fellows. With its relocation to the university's new BioScience Research Collaborative, specifically designed to foster collaborations with other institutions in the Texas Medical Center, IBB is at the forefront of discoveries that hold extraordinary promise for practical applications to human health. More details on IBB may be found at its website: <http://ibb.rice.edu>

Selected Research Endeavors of the IBB Researchers

“Beating hospital superbugs at their own game”- With fewer and fewer new antibiotics coming through the pipeline it is time to re-think how we fight these nasty bacteria from reacting to them, to anticipating their moves, and getting ahead of them. Dr. Yousif Shamoo's research engages Rice with the Texas Medical Center to develop the tools and insights needed for us to anticipate and combat these scourges of modern medicine.

“Lab-on-chip” - Dr. John McDevitt's lab is breaking new ground in creating medical microdevices that detect a variety of health problems, including cardiac disease, oral cancer, ovarian cancer, prostate cancer, severe trauma injuries and drugs of abuse. The winner of numerous awards and author of more than 150 patents and patent applications, Dr. McDevitt co-founded an Austin, Texas company in 2004 based on his CD4 microchip, which provides simple, rapid and affordable methods for counting white blood cells in HIV/AIDS patients. Dr. McDevitt's bio-nano-chip and other devices like it are truly revolutionary because they achieve the same results as bulky diagnostic machines in medical facilities, while being portable, noninvasive and affordable. If early detection is the cornerstone of prevention and treatment, then Dr. McDevitt's chip can potentially save more lives, more safely and at a fraction of the cost.

“Regenerative Medicine” - Developments in regenerative medicine are making it possible for patients to live without debilitating heart disease; for athletes to re-grow cartilage in an injured knee; for injured soldiers to recover and return to normal life; for children with congenital heart defects to receive a heart or valve patch that will grow as they do; and for researchers to finally understand the initiation and progression of various diseases in organs and other connective tissues. With a keen eye toward non-embryonic stem cells and their abilities to restore the body, regenerative medicine applies tissue engineering strategies—together with other biological, engineering, and computational techniques—towards the replacement or repair of biological tissues. Multiple IBB researchers and TMC physicians are joining forces in this effort.



Outstanding Faculty Return on Investments

“IBB Faculty Seed Grants” - These grants are enormously important to our faculty members because they help them to explore risky new areas of research, collecting the preliminary data necessary to publish their work or to win increasingly competitive awards from federal agencies. Past awards were applied to projects which hold tremendous promise for human health including the early detection, imaging, and nontoxic treatment of prostate cancer and more effective, less invasive therapies for heart patients of all ages. Some of the achievements that such grants have helped spark among previous winners include:

- Four previous faculty awardees (Drs. Michael Diehl, Michael Kohn, Jane Grande-Allen, and Dimitri Lapotko) used the data they collected under seed grants to win over four million dollars in grants from the National Institutes of Health (NIH).
- As a result of seed money they received, Drs. Junghae Suh, Jonathan Silberg, and Laura Segatori won prestigious CAREER awards from the National Science Foundation.
- Drs. Robert Raphael and Tom Killian were able to use their early results to launch a Houston biotechnology company called n3D BioSciences which revolutionizes cell culturing techniques.

IBB Education and K-12 Outreach

“Rice Undergraduate Research Initiative” Rice students are among the most creative and hardworking in the nation. As federal spending on research decreases the first cutbacks are frequently research opportunities for undergraduates. Conducting truly independent research under the mentorship of a Rice faculty member at the cutting edge of science and technology is among the most rewarding and influential experiences an undergraduate can have. This program establishes fellowships to support research driven by student passions and empowers them to conduct truly independent research fueled by their imaginations and not from pre-existing faculty projects. Who knows what an Owl can discover if given an opportunity to fly?

“Girls BioScience Initiative” This Initiative is an intensive preparatory program designed to immerse economically disadvantaged female high school rising sophomores from the Houston Independent School District in some of the most cutting-edge areas of biomedical research, provide them with a solid foundation for college study and create lasting mentoring relationships over the course of their high school career. This program aims to impact the pipeline of underrepresented minority women in Science, Technology, Engineering, and Mathematics (STEM) disciplines by successfully transitioning them from high school to baccalaureate programs. The ultimate goal is to provide viable role models, STEM career goals, and familiarity with the complex higher education process to foster significant development & participation of Hispanic & African American women in STEM fields.

“Leaders of Tomorrow Initiative” – Rice University’s graduate students are some of the world’s brightest and most talented minds. IBB’s prestigious professional and research-oriented programs are highly selective and give graduate students a significant edge. With programs such as the Howard Hughes Medical Institute’s Med Into Grad Program which partners Rice University with the University of Texas M.D. Anderson Medical Center, this program allows bioengineers and biophysicists to translate their skills into improving cancer diagnostics and therapeutics. Additionally, the Systems and Synthetic Biology Program trains students in both experimental and theoretical approaches to solve both fundamental and applied programs in the biosciences, biotechnology and medicine. Funding these top IBB graduate education programs will ensure their sustainability and impact by continuing the pipeline of well-trained scientific leaders for the future.