DIVISION OF DISCOVERY SCIENCE & TECHNOLOGY





National Institute of Biomedical Imaging and Bioengineering

National Institutes of Health

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National Institute of Biomedical Imaging and Bioengineering

Introduction

The mission of the National Institute of Biomedical Imaging and Bioengineering (NIBIB) is to improve human health by leading the development and accelerating the application of biomedical technologies. The Institute is committed to integrating the physical and engineering sciences with the life sciences to advance basic research and medical care.

The Division of Discovery Science and Technology is one of three divisions within the NIBIB's Office of Extramural Science Programs. Through grant, cooperative agreement, and contract mechanisms, the division promotes, fosters, and manages bioengineering research programs in the funding areas listed below.

Research Programs

- ***Biomaterials*** — Novel materials that can be used for a broad spectrum of biomedical applications such as implantable devices, drug and gene delivery, tissue engineering, imaging agents, theranostics, and biosensors. This includes functional or smart materials, as well as biomimetic and biosimilar materials. Areas of interest are modeling, design, simulation, synthesis, and characterization of materials, as well as the interaction of biomaterials with biological systems including biocompatibility, biomechanics, surface science (e.g. tools to assess host-implant interactions), and biofilm management.
  (David Rampulla david.rampulla@mail.nih.gov)
- ***Biosensors*** — Technologies for the detection and quantitation of clinically relevant analytes in complex matrices. Application areas include biomedical research, and clinical laboratory diagnostics, covering in vitro diagnostics, noninvasive monitoring, and implantable devices. Technologies also include novel signal transduction approaches, materials for molecular recognition, biocompatibility, signal processing, fabrication technologies, actuators, and power sources.
  (Seila Selimovic seila.selimovic@nih.gov)
- ***Connected Health*** — The development of enabling technologies that emphasize the integration of wireless technologies with human and biological interfaces. Includes the development of software and hardware for telehealth and mobile health studies. A;so includes methods for medical evaluation at one location and transmission of this information to another location for analysis of the disease status, methods to address affordability, usability and implementation issues in remote settings.
  (Tiffani Lash, baileyti@mail.nih.gov)
- ***Delivery Systems and Devices for Drugs and Biologics*** — The area of delivery systems and devices for drugs and biologics includes the delivery of nucleic acids, peptides, proteins, vaccines, genes, small molecules, and theranostics. Emphasis is on the engineering of new delivery vehicles that include novel biomaterials, liposomes, micelles, nanoparticles, dendrimers, etc. Delivery strategies may include targeted delivery, controlled release, and energy-assisted delivery modalities such as ultrasound, electroporation, electrophoresis, implantable pumps, and stimulators. The scope of work may include development of the delivery vehicle or device itself, and proof of concept testing through preliminary in vitro and in vivo studies.
  (David Rampulla, david.rampulla@nih.gov)
- ***Immunoengineering*** — Development and/or application of engineering principles, tools, methods, and technologies to manipulate and control the immune system to prevent, diagnose, or treat diseases. Tools may include biomaterials, engineered tissues, synthetic biology approaches, therapeutic delivery systems, probes, and devices for monitoring immune cell trafficking, mathematical models, and other methods.
  (Shadi Mamaghani, mamaghanis@mail.nih.gov)
- ***Mathematical Modeling, Simulation, and Analysis*** — Mathematical models and computational algorithms with potential clinical or biomedical applications, with a focus on multi-scale modeling. This area includes development of simulation technology for training and education in clinical practice and biomedical research, simulation algorithms for understanding and predicting health and disease, as well as mathematical, statistical, and signal processing methods for analysis of complex biomedical systems, clinical diagnosis, and patient monitoring.
  (Grace Peng, penggr@mail.nih.gov)
- ***Microfluidic Bioanalytical Systems*** — Design, development, and implementation of systems for the precise control and manipulation of biological fluids on a small, submillimeter scale. Technology development includes the areas of in-vitro micro-total analysis systems, arrays and biochips for detection of clinically relevant analytes in complex matrices.
  (Tiffani Lash, baileyti@mail.nih.gov)
- ***Point-of-Care Technologies*** — Technology development of rapid in-vitro diagnostic 5technolgies and monitoring platforms that provide real time medical evaluation and analysis of the disease status or condition at the time and place of patient care. Technology development include disposable lateral flow assays, nucleic acid testing platforms, glucose monitoring devices, among others.
  (Tiffani Lash, baileyti@mail.nih.gov)
- ***Rehabilitation Engineering and Implantable Medical Devices*** — Next generation engineering technology for implantable and assistive medical devices. Technologies include early stage development for implantable neuroprosthesis and neuroengineering systems, and next generation neural interfaces. Technologies for assistive medical devices include medical robotics for rehabilitation, surgery, preventative health and therapy; and next generation prosthetics and brain computer interface technology.
  (Michael Wolfson, michael.wolfson@nih.gov)
- ***Surgical Tools, Techniques, and Systems*** — New medical technologies to improve the outcomes of surgical interventions. Examples include relevant technologies for minimally invasive surgeries, medical simulators, and robotically assisted surgical systems.
  (Steven Krosnick, krosnics@mail.nih.gov)

• ***Synthetic Biology for Technology Development*** — Synthetic biology, the design and wholesale construction of new biological parts and systems and the re-design of existing, natural biological systems for tailored purposes, has applications in biomaterials, drug and gene delivery systems and devices, mathematical modeling, simulation and analysis, medical implants, sensors, and tissue engineering. This program may include, for example, the use of synthetic biology approaches for the development of signal-sensing biomaterials; genetic switches for the control of gene delivery; synthetically engineered viruses and bacteriophages as therapies; synthetic circuits for gene therapy; synthetic control of biosensors through environmentally responsive promoters; and synthetic control systems for the production of biomaterials.
(David Rampulla, david.rampulla@nih.gov)

• ***Tissue Chips*** — The development of in vitro tools for assessing the function of engineered tissues; high-throughput assays and instruments to reduce cost, time, and complexity of tissue engineering; and novel bioreactor techniques for growing tissues and organs on a large scale, for drug development and study of normal physiology and pathophysiology.
(Seila Selimovic, seila.selimovic@nih.gov)

• ***Tissue Engineering and Regenerative Medicine*** — Enabling technologies to develop functional cell, tissue, and organ substitutes to repair, replace, or enhance biological function either in vivo or in vitro. This multidisciplinary field draws upon and integrates advances in biomaterials, cell and developmental biology, physiology, in vitro "tissue-on-a-chip" systems development, imaging, computational modeling, bioreactor design, biomechanics, and novel engineering methods.
(Rosemarie Hunziker, hunzikerr@mail.nih.gov)

Funding Opportunities

See: http://www.nibib.nih.gov/funding

Collaboration

An important aspect of the Institute's mission is encouraging collaborations among the institutes and centers at NIH, other federal agencies, and the private sector.

• ***American Institute for Medical and Biological Engineering (AIMBE)*** — Collaboration to develop validation and qualification guidelines for new in vitro tools and models for the pre-clinical drug discovery process. http://www.nibib.nih.gov/news-events/meetings-events/sixth-aimbenih-workshop-validation-and-qualification-new-vitro-tools-and

• ***Armed Forces Institute for Regenerative Medicine (AFIRM)*** — The U.S. Army Medical Research and Material Command (USAMRMC), Office of Naval Research (ONR), and the NIH have established AFIRM, which is dedicated to the repair and regeneration of battlefield injuries through the use of tissue engineering and regenerative medicine. Therapies developed by the AFIRM will also serve trauma and burn patients in the public at large. This trans-agency effort includes academic and industry scientists, biotechnology companies, hospitals, the U.S. Army Institute of Surgical Research, and the NIBIB as the NIH lead.
http://www.afirm.mil/

• ***Interagency Modeling and Analysis Group (IMAG)***— IMAG brings together program officers across federal agencies to communicate, disseminate, and plan collaborative activities and joint initiatives related to computational and analytical modeling and analysis of biomedical, biological, and behavioral systems http://www.imagwiki.nibib.nih.gov. IMAG hosts the NIH Population Modeling SIG and the Multi-scale Modeling (MSM) Consortium. http://www.imagwiki.org/mediawiki

• ***Multi-Agency Tissue Engineering Sciences (MATES) Working Group*** — The MATES Working Group facilitates communication about tissue engineering and regenerative medicine activities across NIH institutes and other federal agencies by conducting monthly meetings. The working group also cosponsors funding opportunities, scientific meetings, and workshops; facilitates the development of standards; and monitors new technology development in the field.

• ***National Nanotechnology Initiative (NNI)*** — The NNI is a multi-governmental agency program aimed at accelerating the discovery, development, and deployment of nanometer-scale science, engineering, and technology. The Nanoscale Science, Engineering, and Technology Subcommittee (NSET) is an interagency body operating under the National Science and Technology Council (NSTC) that coordinates the planning, budgeting, program implementation, and review of NNI activities.
http://www.nano.gov/

• ***NIBIB Point-of-Care Technologies Research Network (POCTRN)*** — This network of centers was created to drive the development of appropriate point-of-care diagnostic technologies through collaborative efforts that simultaneously merge scientific and technological capabilities with clinical need.
http://www.nibib.nih.gov/Research/POCTRN

• ***Neuroprosthesis Group (NPG)*** — NPG brings together program officers across NIH and other agencies to communicate, disseminate, and plan collaborative activities related to neuroprosthesis and neuroengineering.

NIBIB Contacts

You may contact Rishi Mathura, NIBIB Scientific Program Specialist at rishi.mathura@nih.gov, or the Program Directors listed previously about funding opportunities or the application process. We welcome the opportunity to speak with potential applicants about the institute's programs. Areas of scientific coverage for each member of the program staff are shown in the Research Programs section of this fact sheet and are available on the NIBIB website at http://www.nibib.nih.gov/Research/Program Areas.