A new interdisciplinary program in Engineering and Medicine at USC
The Viterbi School of Engineering has engaged in many external strategic partnerships. Within USC, there is an equally important need to promote training in interdisciplinary research that will embed doctoral-level engineers where they will apply their talent. In particular, many engineers will be active in healthcare settings.

Early immersion in healthcare delivery settings combined with training alongside medical students in collaboration will ensure that engineers develop the cultural awareness that will maximize their contribution in these settings. Trainees and graduates of our programs – even biomedical engineering – often rely on serendipity to link with colleagues and to develop professional relationships with medical doctors. Some have found their way into this arena to become champions of innovation through medical device invention, development and commercialization.

By connecting with the Keck School of Medicine, the Viterbi School of Engineering will develop a new process to co-train engineers with doctors and greatly increase the number of such champions graduating from USC. The Heath, Technology and Engineering Program (HTE@USC) will link labs and faculty across both schools. Through interdisciplinary collaboration focused on developing solutions to real medical problems during graduate school, this select group of Viterbi students will become leaders and entrepreneurs much sooner in their careers.

As members of small groups of like-minded doctors in training, engineering graduates of this program will play significant roles in continuous technology development attuned to patient needs. The relationships which are forged between engineering and medical students who share a passion for applied research focused on improving patient care through technological advancement will greatly amplify their combined output.

Yannis C. Yortsos, PhD
Z.A. Kaprielian Chair in Engineering
Chester Dolley Professor
I am delighted to introduce you to an innovative program at the University of Southern California that integrates training in both medicine and engineering. The program seeks to create new technologies and practices to advance patient care and promote health.

The Keck School of Medicine of USC and the USC Viterbi School of Engineering have created a collaborative program called the Health, Technology and Engineering Program or HTE@USC. A select group of medical students enrolled in this program will be more than just expert consumers of future technology: they will be innovators who create future technology.

Through HTE@USC, these outstanding students will start creating this technology during their medical school career. Their medical training will foster not only personal growth and learning, but also the development of new ideas and technologies that will immediately benefit patients.

I am particularly proud that through this program, the Keck School of Medicine also is contributing to the education of our engineering colleagues. I look forward to showing these students how physicians think, how we work with patients, and how to be effective partners in current and future projects. Project-focused collaboration will ensure that future physicians and engineers graduating from the HTE@USC program will be versed in the languages of both disciplines and emerge with an ability to work together to solve real medical problems rapidly.

In my own career, it took several years to master the engineering skills behind my successful work in ophthalmic laser technology. Collaboration was crucial. In addition to facilitating patents and publications related to the technology, early collaboration was the foundation for productive relationships and new projects that followed. Similarly, in the HTE@USC program, you will be learning and working in interdisciplinary teams starting from day one of your medical training, fast-tracking your career with fruitful collaboration from the beginning.

Exciting educational opportunities await you in our HTE@USC program and cutting-edge career paths will follow. I look forward to welcoming our new class of students into this exciting, challenging, and tremendously important program.

Carmen A. Puliafito, MD, MBA
May S. and John Hooval Dean’s Chair in Medicine
The USC Viterbi School of Engineering and the USC Keck School of Medicine are proud to announce a new joint interdisciplinary division. Health, Technology and Engineering (HTE@USC) will augment the training of select doctors and engineers through project-focused collaboration resulting in the most effective and efficient solutions to real-world healthcare problems. HTE@USC is part of a larger USC effort to promote rapid advances in healthcare through research and education. The education program will combine the essentials of medicine with advanced engineering and scientific technologies so that both engineering and medical graduates will have experience as innovators. Students will learn and use patient-centered design and research approaches required to address the healthcare needs of all patients, including those from traditionally underserved populations.

The research program will embed students as active members of interdisciplinary teams linking researchers at both the Keck and Viterbi Schools. This will happen through projects, symposia and other events designed to broker new ties within USC and with external partners. The range and depth of current research activities and the collegial network of partners will make it possible for HTE@USC students to apply their talent to address a wide range of medical issues. HTE@USC student project groups will be matched with research mentors exploring related areas where languages of engineering, science and medicine all contribute to highly creative and productive interdisciplinary environments.

**Terry Sanger, MD, PhD**

**Academic Director, HTE@USC**

*Overall program concept and design, curriculum development, cross-faculty networking, inter-institutional relations, research symposia planning, clinical and research mentor recruitment.*

I am very excited to be able to create this program at USC. I personally feel very strongly about the richness of the combination of Engineering and Medicine. My background includes an MD from the Harvard-MIT Health Sciences and Technology program, PhD from the MIT department of Electrical Engineering and Computer Science, postdoctoral research at the NASA Jet propulsion laboratory and MIT, and clinical fellowships at Los Angeles County Medical Center Department of Pediatrics, Boston Children’s Hospital Department of Child Neurology, and the Toronto Western Hospital Division of Movement Disorders. In my research, I use engineering methods every day in the study and treatment of children with movement disorders.

Medicine and Engineering have two very different and unique methods of reasoning. Medicine is based on close observation and pattern-matching, and doctors use the concept of differential diagnosis to guide decision-making with multiple possible plans of action. Engineering is based on finding detailed solutions to carefully-specified problems, and engineers use quantitative methods to help break problems down into components that can be solved efficiently and reliably.

When we bring together expertise in Engineering and Medicine, we unite two languages, two ways of thinking and two types of skills that, together, provide great force to improve healthcare and the lives of patients. I look forward to working with you and learning from the new ideas you will bring.
in Engineering and Medicine

The complexity of modern medicine makes it difficult for individual engineers, scientists or clinicians to move new technological or methodological advances all the way from concept to implementation and widespread application. The journey from bench to bedside is rarely straightforward and HTE@USC will teach the necessary steps and diverse expertise that are required along the way. Interdisciplinary collaboration is essential throughout the journey. The initial steps for each HTE@USC project group will include the identification of a problem that is both important and solvable. Solution-oriented designs will then be prototyped, refined and tested. Medical students and engineering students will work together to design pilot clinical trials to demonstrate comparative effectiveness. Good ideas can falter at any point in the winding journey from bench to bedside, and HTE@USC students will learn about both the successes and potential failures of medical technology development. Design teams will learn to anticipate and avoid future problems from the initial stages and iterations of design and prototyping.

As part of its education mission, HTE@USC offers a unique training program that provides hands-on, practical, real-world, case-based experience in medical technology and process improvement. The interdisciplinary approach of HTE@USC will inspire your creativity, enable your ingenuity and enhance the foresight you’ll need to spot and evaluate market demand. You will graduate as a valued member of a design team focused on healthcare innovation fully prepared to take on new challenges ahead.

George Tolomiczenko, PhD, MPH, MBA
Administrative Director, HTE@USC

Program and curriculum development, coordination of student and faculty recruitment, setting and monitoring program priorities and performance standards, marketing and communications, financial management and fundraising.

Experience as a clinician, researcher, teacher and administrator informs the multifaceted role I have with HTE@USC. After an undergraduate degree at Caltech, I earned a doctorate in clinical psychology at Boston University and a master’s in public health at Harvard. As both a scientist and clinician working at medical institutions, my focus shifted to public health and policy issues involving homelessness and mental illness. I am now returning to LA from to Toronto where I worked on technology-enabled approaches to healthcare management.

My work building research capacity was broadened in Canada to include directorships in technology-based regional economic development, medical research funding and non-profit organizations. I have always been devoted to creating and funding programs and partnerships enabling research, knowledge translation and chronic disease management. I have done this through energizing interactions with students, faculty, staff and clinical personnel in a variety of settings. I am thrilled to be part of HTE@USC’s leadership team redesigning medical and graduate engineering education to train front-line innovators. We’ll make sure that HTE@USC graduates will be leaders among interdisciplinary thinkers and inventors in healthcare.

You can reach me through HTE@USC.edu.
case-based instruction, project-focused learning
An innovative program that teaches collaboration

To prepare motivated engineering doctoral students to be successful innovators equipped with new technology and demonstrated methodological skills, we have created a program that involves close collaboration at all stages with students and faculty in the Keck School of Medicine. Our vision is that graduates of this new educational program will be experts in collaboration. Through interdisciplinary teamwork, graduates will be able to identify and solve the most important healthcare problems more rapidly and more effectively than has previously been possible.

First and foremost, students in this program must become excellent engineers with the strong theoretical and practical background that characterizes educational programs at the Viterbi School of Engineering. Students therefore will be enrolled in and responsible for all the requirements of one of the regular PhD programs within any of the departments in Viterbi. In addition to these requirements, starting in the second year of their PhD program, students participating in the HTE@USC program will take additional classes side-by-side with medical students enrolled in the MD degree at the Keck School of Medicine. The purpose of these additional requirements is to expose students to the reality of clinical medicine; the methods, strengths, and weaknesses of physicians and the language and thought processes of doctors in the clinic and hospital. Most importantly, students will learn how to collaborate effectively with clinicians to solve health-related engineering problems by participating in project groups that are expected to solve real problems and lead to functioning tested prototypes or methods by the time of graduation.

Additional courses will be required for all HTE@USC students. “Topics in Health Technology and Engineering” will be taught by faculty from multiple USC schools and will cover ethics, regulatory requirements, intellectual property, methods of collaboration, rapid prototyping, basic clinical trial design, reimbursement, intellectual property, licensing, and commercialization. “Case Studies in Health, Technology and Engineering” is a seminar course that will discuss opportunities for innovation and lessons learned from successful and unsuccessful attempts to solve particular medical problems. Through this seminar, students will gain experience with the identification of important medical challenges and critical analysis of potential solutions. Group exercises within these two courses will be aimed at building effective design-team experience that will sustain participation in student group projects throughout their duration. Viterbi students will also join the Keck students for one year of the “Introduction to Clinical Medicine” course in which they will learn the same techniques of history-taking and physical examination as their medical peers.

The following summary lists the full requirements for becoming a graduate of the HTE@USC program in more detail.

Topics in HTE: A two-year lecture course that covers multiple topics affecting the successful development of collaborative projects. Topics will include techniques for collaboration and brainstorming, principles of design, ethics, regulatory controls on research and device development, intellectual property, creation of a business plan, strategies for approaching potential manufacturers, technology transfer, distribution, legal issues, licensing, and medical reimbursement. The course will be taught by faculty from several different schools at USC, including the Gould School of Law and the Marshall School of Business.
Case-based instruction, project-focused learning

YEAR 1
- Laboratory rotations: identify a PhD mentor and laboratory
- Viterbi Screening Examination

YEAR 2
- PhD Coursework and Research
- Groups: Introduction to Clinical Medicine
- Class: Topics in HTE
- Projects: needs/opportunities analysis
- Projects: design

YEAR 3
- PhD Research
- Case Studies in HTE
- Class: Topics in HTE
- Projects: initial prototype and dry testing
- Pre-clinical medicine block (4-6 weeks)

YEAR 4
- PhD Research
- Projects: design refinement and preliminary human subjects testing

YEAR 5
- Projects: design revision, ongoing human subjects testing, commercialization
Michael Khoo, PhD
HTE Academic Liaison
Viterbi School of Engineering

Dr. Khoo is an active researcher whose interests include the modeling of cardiorespiratory control during sleep, autonomic-metabolic interactions in obesity, and non-invasive physiological monitoring. As a Professor of Biomedical Engineering and Pediatrics and former Chair of the Biomedical Engineering Department, he has helped build the bridges that will allow HTE@USC to connect with the diverse engineering and science labs across a growing number of USC graduate programs. As a mentor and a leader of engineers embedded in a variety of settings, Dr. Khoo draws on his extensive experience to shape the curriculum from the engineering side. His continued involvement with the program will assure that the bridges linking labs and people between these disciplines will facilitate exciting new developments to improve health and healthcare services.
Case Studies in HTE: A one-year seminar course with in-depth analyses of specific healthcare problems and the factors that contribute to successful technological solutions. Under the close supervision of faculty from both Keck and Viterbi, students will discuss examples of successful and unsuccessful examples of technological devices for healthcare. Discussion will include elements from design and prototyping, through regulatory, research and development, technology transfer, manufacture, marketing, and reimbursement. Invited speakers from small and large corporations will discuss their personal experiences and the decisions that were made in their teams.

Introduction to Clinical Medicine: A one-year small group course that meets up to twice per week for 3 hours: once in a supervised clinical setting and once at the medical campus. Students will learn clinical history-taking and physical diagnosis, including the use of common medical instruments (stethoscope, ophthalmoscope, etc.) and the role of the differential diagnosis in guiding medical tests and decision-making.

Pre-Clinical Medicine Block: Viterbi students will spend 4 or 6 weeks full-time in one of the regular medical pre-clinical course blocks, in order to learn in-depth the physiology and pathophysiology of a particular organ system, the terminology used by clinicians, and the depth of knowledge that physicians are expected to achieve. It is expected that most Viterbi students will choose to take this block in Neurology/Neuroscience or Cardiopulmonary medicine, but any core organ system may be selected.

Clinical Rotation: Viterbi students will join a medical team for one month during the 3rd or 4th year of their HTE@USC program. They will participate as observers in order to learn the detailed function of a medical or surgical inpatient service. It is expected that the choice of the particular service will depend on the interests of the student as well as the relevance of the particular service to the collaborative health technology project.

Allan Abbott, MD
HTE Academic Liaison
Keck School of Medicine

Dr. Abbott currently heads the Curriculum Office at Keck and was an architect of the redesign of the medical school curriculum intended to better integrate medical and basic science subjects. The redesigned curriculum also facilitates the integration of the hybrid curriculum for medical and graduate engineering students HTE@USC offers. Dr. Abbott is a family and sports medicine physician with interests in disease prevention and best practices in teaching medicine. His involvement with HTE@USC complements his focus on practice needs of individual physicians for structured continuing medical education. HTE@USC training will establish an early foundation for life-long learning for medical and engineering students aiming to innovate through interdisciplinary collaboration.
“Opportunity at the Intersection”
Excerpts from the President’s Special Address to the Health Sciences, August 25, 2010

C. L. Max Nikias, President, University of Southern California

The very laws of physics limit the growth of conventional electronics. But because of electronics, forces are gathering in such a way that this century is poised to be the Age of Medicine and Biology.

We can hope for breakthroughs in these areas—which will open up entire new sectors of the global economy. It is here that we will see the fastest-growing industries of this century. New technology can reshape medicine—with applications in drug delivery and patient care. We can see new therapeutic products unlike anything to date. And we can see new ideas move from the bench to the bedside—faster and more intelligently than ever.

So the leaders of the future will be universities that generate research and innovation in these areas, through cross-disciplinary approaches that generate intellectual friction and intellectual sparks; intellectual friction and sparks between medicine, and engineering, and biology, and chemistry, as well as pharmacy, and dentistry. Take any combination you like!

There are already many heroes and heroines in USC’s efforts to build disciplinary bridges. These are stars who have been willing to set aside traditional measures of academic prestige in order to be a part of teams that can make a difference.

HTE Project: The project will run throughout the time enrolled in the program. During the first year, HTE@USC students will identify a list of medical needs and opportunities and each will belong to a project group around a particular problem. All project groups will consist of two students from Keck and two students from Viterbi. During the summer between the first and second year of the program, project groups will start to develop plans for prototypes and assess challenges to manufacture, distribution, and clinical use. Appropriate laboratories at Keck and Viterbi will be identified. During the second to fourth years, project groups will continue to work together under close faculty supervision to develop and test prototypes or candidate methods, obtain preliminary clinical data, and work toward development of commercializable products, methods, or systems. We anticipate that the projects will form the core of the PhD students’ theses, and the medical students will be closely involved with testing, usability determination, and needs assessment throughout the second through fourth years of their training. Students will be closely mentored by faculty from both Keck and Viterbi, and as part of their projects they are likely to be involved in more than one laboratory. Projects are intended to solve real unmet healthcare needs, and groups are expected to file preliminary patents or submit descriptive manuscripts by the end of their training, with the intent that commercialization will be possible shortly thereafter. Our goal for the projects is to give students the experience and familiarity with the entire design process, from development of the initial concept through to technology transfer.

Upon graduation from HTE@USC, you will be uniquely prepared to create new devices and methods to improve the health of patients. You will also have begun lifelong relationships with a select group of medical students and faculty who will be your contacts and collaborators for future projects. Our graduates will look at healthcare with critical eyes, always thinking of ways to make processes and devices better. Most importantly, you will have the practical experience to know how to work with teams of experts to accomplish this, so that your career will have magnified impact on patients throughout the world who will benefit from the technologies and methods you develop.
A wearable pulse oximeter that provides continuous outpatient data on the status of children with congenital heart disease

2 A tablet-based hospital information system that allows instant communication between different teams of physicians caring for a patient

Software for bedside monitors that incorporates information on a patient’s diagnosis in order to provide reliable alerts of concerning cardiac or respiratory rhythms

4 A handheld electroencephalograph that can be used at the bedside to assess cortical function in the intensive care unit

5 Paperwork and workflow for more rapid triage and processing of patients in the emergency room

6 A wheelchair that facilitates safe transfers to and from the bed.
real-world knowledge
that changes the real world

INTERDISCIPLINARY MENTORING
On entry into HTE@USC, students will be assigned a primary mentor from the faculty at the Viterbi School of Engineering and a secondary mentor from the faculty at the Keck School of Medicine. These mentors will be in addition to the student’s departmental advisor(s) and dissertation advisor. Mentors will work closely with students to ensure that they are meeting the requirements of the program and to provide additional help where necessary. Mentors will also provide guidance on the selection of design projects and other aspects of collaborative research. After the design teams have been formed and specific projects have been proposed, students will work in laboratories at Viterbi and Keck. The laboratory directors are Division of HTE@USC faculty members who will provide specific domain knowledge related to the student’s research project.

It is expected that students who have identified a laboratory at Viterbi for their PhD studies or who are funded on a research assistantship will participate in collaborative projects that are relevant to their laboratory. Early in the design process, the dissertation advisor or principal investigator from their laboratory will be involved in forming a plan of investigation and collaboration with laboratories and faculty at Keck.

Following graduation from the HTE@USC program, mentors will remain important resources for guidance and advice.

GRADUATES WILL BE LEADERS
We anticipate several potential career paths for graduates of this program:

- A faculty member in an academic engineering department interested in health applications who remains alert for potential innovations and knows how to contact the right people in the medical field to start the development process
- An engineer in a health-related technology company that actively identifies and develops new technology for healthcare
- A leader of an industrial research and medical design group
- A founder or partner in a health-technology startup company who can develop an appropriate technology development plan and assess the medical impact, feasibility, and utility of new technology

After completing the HTE@USC program, all graduates will have direct experience with the full process of device or method development in medical technology. Most importantly, they will have formed bonds with a group of like-minded medical students and engineers who will be their mentors, colleagues, and contacts for the rest of their lives. HTE@USC will eliminate barriers to collaborative projects and provide a clear path so that graduates know whom to contact, how to discuss their projects, how to work together, and how to plan from the beginning for a successful outcome.

Successful HTE@USC graduates will be provided with a certificate of completion of the requirements of the program. More important than the certificate, however, will be their experience with hands-on project development and the tangible results of the project, including patent applications and initial steps toward technology transfer.
Students will apply to the HTE@USC program during the fall of their first year in a PhD program at the Viterbi School of Engineering. Successful applicants to the program will have demonstrated interest in health applications of engineering, and preferably will have completed some undergraduate coursework in biology, chemistry, and physiology.

The application process will include two essays: (1) How do my goals after completion of graduate school involve a combination of medicine and engineering, and (2) Describe a device or method you would like to develop, state why it is important and what potential impact it could have, give a brief description of an initial implementation, and state at least three major problems that must be overcome in the design and development process.

Following interviews conducted by Medical and HTE faculty, applicants will be notified of potential entrance into HTE@USC during the early spring of their first year at Viterbi. It will then be the applicant’s responsibility to identify a dissertation advisor and obtain permission from the advisor to participate in HTE@USC. Because of the additional time requirements of HTE@USC, it is expected that advisors will be most interested in supporting students through this component of their training if the student will be able to facilitate a collaborative project that is of direct relevance to ongoing projects in their laboratory.

It is also the applicant’s responsibility to work with their departmental advisor to create a cohesive plan of study and research that includes the HTE@USC program. In some cases, the additional HTE@USC coursework will fulfill the requirements for an academic minor in their Viterbi department. For further information, interested applicants should email HTE@USC.edu or contact the HTE@USC office by phone.

### SUMMARY OF THE ENGINEERING PROGRAM

Students will enter the HTE@USC program starting in August following their first year of the PhD program. They must have fulfilled all the first-year course requirements for the PhD. If they are supported by a research assistantship, they must obtain permission from their advisor to participate in HTE@USC.

**Course Requirements (year is relative to entry into HTE@USC):**

Required coursework, qualifying examinations, and thesis for the PhD degree in a department at the Viterbi School of Engineering. Courses particularly relevant to HTE@USC will be identified with the guidance of your mentor(s).

| Introduction to Clinical Medicine (special section with engineers, year 1) |
| Topics in HTE (years 1 and 2) |
| Case Studies in HTE (year 2) |
| Pre-clinical medicine block (6 weeks during year 2) |
| Health Technology project (years 1-4, including summer after year 1) |
| Clinical rotation (year 3 or 4) |

Because of the timing of coursework at Keck, including the 4-6 week preclinical medicine block, it may not be possible to take other courses at Viterbi during one or two semesters of the program. Therefore it is expected that participation in the HTE@USC program will prolong the PhD program of study by approximately one year.
Students admitted to the HTE@USC program will have access to a wide variety of research centers where expertise, facilities and other resources will enable them to design, build and test solutions. By plugging into and supporting the strong and successful collaborations that already exist or which have recently been formed between the Viterbi School of Engineering and the Keck School of Medicine, students will be able to tackle the real-world problems they identify and prioritize in clinical settings.

The selection of research centers below is a small sample of those that could potentially include HTE project groups. For HTE students, the focus will be on problem-specific projects to complete while mentored by leading faculty experts and working in concert with other USC resources aiming to bring ideas to market (including the Stevens Institute for Innovation (http://stevens.usc.edu/) and the Alfred E. Mann Institute for Biomedical Engineering (http://ami.usc.edu/)).

Beginning as an integrative program across two USC schools, HTE@USC will provide the skills and abilities so that our students will be able to form the best and most successful team of clinicians, engineers, and scientists for a particular job. With training to facilitate and accelerate collaboration, HTE@USC students and graduates will learn by example from their mentors and lead by example beginning at USC and continuing through productive careers.

USC-affiliated centers which have been enabled through interdisciplinary approaches include:

- **Bioelectronic Research Lab** >> http://bmes-erc.usc.edu/brl/
- **Center for Applied Molecular Medicine** >> http://camm.usc.edu/
- **Center for Autism Research in Engineering** >> http://care.usc.edu/
- **Biomimetic MicroElectronic Systems Engineering Research Center** >> http://bmes-erc.usc.edu/
- **Center for Vision Science and Technology** >> http://cvst.usc.edu/
- **Biomedical Imaging Research Lab** >> http://neuroimage.usc.edu/
- **Center for Body Computing** >> http://www.usccardiology.org/bodycomputing/index.html
- **Center for Neural Engineering** >> http://www.neural-prosthesis.com/index-7.html
- **Clinical and Translational Science Institute** >> http://www.labctsi.org/
- **Institute for Creative Technologies** >> http://ict.usc.edu/
- **Medical Device Development Facility** >> http://mddf.usc.edu/
- **Brain-Body Dynamics Lab** >> http://bbdl.usc.edu/
- **Pulsed Power Research Group** >> http://pulsedpower.usc.edu/
- **Signal Analysis and Interpretation Laboratory** >> http://sail.usc.edu/
- **Center for Robotics and Embedded Systems** >> http://cres.usc.edu/Home/
- **Zilkha Neurogenetic Institute** >> http://www.usc.edu/schools/medicine/research/institutes/zni/
Some HTE@USC research mentors

Ellis Meng, PhD  
Biomimetic Microelectronic Systems (BMES) and Biomedical Microsystems (BML)

Yigal Arens, PhD  
Intelligent Systems Division, Information Science Institute

Pat Levitt, PhD  
Zilkha Neurogenetic Institute

Francisco Valero-Cuevas, PhD  
Division of Biokinesiology and Physical Therapy

Gerald E. Loeb, MD  
Medical Device Development Facility

Laurent Itti, PhD  
iLab USC

David B. Agus, MD  
USC Westside Prostate Cancer Center

Shrikanth (Shri) S. Narayanan, PhD  
Signal Analysis and Interpretation Laboratory

Shinyi Wu, PhD  
Roybal Center for Health Policy Simulation

Noah Malmstadt, PhD  
Laboratory for biomimetic phase interfaces

Leslie A. Saxon, MD  
Center for Body Computing

Norberto M. Grzywacz, PhD  
USC Center for Vision Science and Technology

Maja J Matarić, PhD  
Center for Robotics and Embedded Systems

Albert (Skip) Rizzo, PhD  
Institute for Creative Technologies

Theodore W. Berger, PhD  
Biomimetic Microelectronic Systems (BMES), Biomedical Simulations Resource (BMSR), and Center for Neural Engineering (CNE) labs

Mark S. Humayun, MD, PhD  
Bioelectric Research Lab