Vanderbilt

Department of
Biomedical Engineering
bio-inspired therapeutics and nanomedicine
Developing novel materials technologies to significantly impact the future of medicine is the common goal that unites the Advanced Therapeutics Laboratory, the Combinatorial Biomaterials and Biointerface Laboratory, and the Laboratory of Bionanotechnology and Nanomedicine.

cellular sensing and control
The Vanderbilt Institute for Integrative Biosystems Research and Education and the Merryman Mechanobiology Laboratory advance the scientific knowledge of cellular stimuli and their effects, and the instrumentation that makes such studies possible.

true cutting-edge engineering
With the Biomedical Modeling Laboratory, the Surgical Navigation Apparatus Research Laboratory takes ideas from the lab into the operating room.

the focus is on you
Envision an educational environment that personalizes instruction in a community-centered approach to create leaders in academia, industry, and medicine. We do.

more than meets the eye
The Vanderbilt University Institute of Imaging Science integrates advances in engineering, physics, chemistry, and computing to develop and apply new and enhanced imaging techniques that address problems and stimulate new research directions in biology and medicine.

light for life
Understanding the functions of the human body with the wave of a wand has been a fantasy of science fiction writers for decades. Optical technologies are closing in on this fantasy.

UNDERGRADUATE
The foundations of biomedical engineering are the same as those in other engineering disciplines: mathematics, physics, chemistry, and engineering principles. Biomedical engineering builds on these foundations to solve problems in biology and medicine over the widest range of scales—from the nanoscale and molecular levels to the whole body. Biomedical engineering provides a robust platform for employment in the medical device and instrumentation industries as well as careers in companies that specialize in the development and application of biologics, biomaterials, implants, and processes. Our graduates gain entry into nationally recognized graduate schools for continuing studies in biomedical engineering. Biomedical engineering is also a rigorous path for entry into, and an excellent preparation for strong performance in, graduate study in medicine for those students willing and able to excel in mathematics, physics, chemistry, biology, physiology, and engineering.

The Department of Biomedical Engineering is in the School of Engineering. In addition to the M.Eng., M.S., and Ph.D. degrees, the faculty supervises an ABET (Accreditation Board for Engineering and Technology) accredited B.E. degree program in biomedical engineering for undergraduate students. The department also participates in the M.D./Ph.D. program with the School of Medicine. Twenty-six faculty members with primary appointments elsewhere collaborate with the department. Many faculty members hold joint appointments with engineering and medical school departments.

Vanderbilt University’s Graduate School, in collaboration with the School of Engineering and School of Medicine, offers master of engineering, master of science, and doctor of philosophy degrees with a major in biomedical engineering. The goal of the Vanderbilt program is to provide advanced education and research training in quantitative organ and cellular biology, biomedical information and instrumentation systems, imaging, and the scientific principles underlying the origination of therapeutic devices and processes. It is specifically concerned with the interface between the engineering, physical, computing and mathematical sciences, and biology.

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Contact
Director of Undergraduate Studies: Adam Anderson
Email: adam.anderson@vanderbilt.edu
Phone: (615) 322-4874

Contact
Director of Graduate Studies: E. Duco Jansen
Email: duco.jansen@vanderbilt.edu
Phone: (615) 343-1911
Advances in medicine are largely dependent on understanding more fully the elegant, highly specific mechanisms that control biological and physical processes in nature. Whether it be development of an extracellular matrix, biomimetic material scaffold, synthesis of a nanoparticle that incorporates virus-like functionalities, or molecular engineering of diagnostic probes, bio-inspiration is a shared theme in this group of research labs. The Advanced Therapeutics Laboratory (ATL), the Combinatorial Biomaterials and Biointerface Laboratory (CBBL), and the Laboratory of Bionanotechnology and Nanomedicine (LBN) are united through the common goal to develop novel materials to significantly impact the future of medicine. LBN co-directors Todd Giorgio and Rick Haselton lead a team that develops and tests novel therapeutic and diagnostic devices based on the unique properties of nanomaterials. The major research areas in the CBBL, led by Hak-Joon Sung, focus on polymeric biomaterials-based chemical matrix engineering, cellular engineering, and tissue engineering. The ATL, directed by Craig Duval, creates stimuli-responsive, bio-inspired “smart” polymers for nano-carrier and hydrogel drug delivery applications and is highly integrated with both the CBBL and LBN. Each research focus involves a multifaceted approach that combines state-of-the-art biomaterials and engineering tools as well as chemical, biochemical, and biological methodologies.

Craig Duval  
Assistant Professor of Biomedical Engineering

Prior to launching the ATL, I became intrigued by the fact that biologic molecules such as proteins and DNA present in a mammalian cell have exquisitely controlled and specific capabilities to turn on and off the basic processes in the cell, yet pharmaceutical scientists invest billions of dollars to develop synthetic, man-made molecules to mimic these same functionalities. Conceivably, better pharmaceuticals with higher specificity and fewer side-effects could be created if we could harness the naturally evolved functions of these biologics to control cell functions involved in progression of disease. However, current pharmaceutical technology suffers from the inability to overcome the barriers that inhibit delivery of biologic drugs (i.e. proteins and DNA). All the while, viral and bacterial bugs have evolved to efficiently deliver their own proteins, such as bacterial toxins, and viral DNA into cells. The overall theme of the ATL is to formulate bio-inspired, “smart” polymers into delivery vehicles capable of mimicking the naturally evolved systems' capacity for efficient intracellular delivery of therapeutic proteins and nucleic acids.
http://research.vuse.vanderbilt.edu/biomaterials/Duval/index.html

Hak-Joon Sung  
Assistant Professor of Biomedical Engineering

For years I’ve been fascinated by the idea of engineering living organisms and designing artificial organs using synthetic materials that manipulate fundamental biological mechanisms, such as embryogenesis, organogenesis, and regeneration. Movies like Jurassic Park and Robocoop inspired me to pursue a new path in science and engineering. Since then my research has helped to advance the field of biomedical engineering, in particular polymeric biomaterials for cell and tissue engineering and regenerative medicine.

Frederick Haselton  
Professor of Biomedical Engineering

Much of my personal motivation for working in biomedical engineering derives from my interest in dreaming up new technologies or devices to directly impact health and our understanding of the underlying cellular and molecular sciences. My laboratory has made contributions in many diverse areas from fluid mechanics of high frequency ventilation used with premature infants to optically activated gene expression for delivering targeted genetic therapies. Many of our current lab projects involve the application of unusual physical properties at the micro- and nanoscale to develop novel diagnostic tools. I am particularly excited about our progress toward developing nanoscale retinal imaging agents as a tool to predict the progression of ophthalmo-necrotic lesions in coronary arteries. Imagine the potential for a simple eye exam as a window on coronary disease. Equally exciting is our recent progress in developing a method to diagnose an infection from a single drop of blood using the “coffee ring” phenomenon. This technology promises to deliver modern medical diagnostic knowledge to a much greater fraction of the world’s population where it would directly enable life-saving decisions.

Todd Giorgio  
Professor and Chair of Biomedical Engineering

My childhood included covert use of chemistry kits for experiments not described in the instructions, and curiosity about living systems. Today, my research and teaching activities reflect the same interests. Much of biology operates under amazing control at a molecular level. Our group leverages new methods to create nanoscale materials for sensing and modifying the control of molecular events inside cells. Biomedical engineering principles are central to my work. My studies use quantitative experimental approaches and mathematical representations to understand the behaviors of complex living systems. I apply the resulting knowledge and biologically responsive nanostuctures to important challenges in human health as part of a larger initiative in nanomedicine. Vanderbilt is an ideal place for the interdisciplinary effort required by my studies and we have terrific collaborations including faculty in medicine, in the medical sciences, and among my colleagues in biomedical engineering. I’m currently part of an interdisciplinary team developing a nanostructure designed to overcome the drug resistance that contributes to poor clinical outcomes in cancer treatment. Craig Duval is creating new materials suitable for delivery of siRNA to inhibit drug resistance, and I’m applying a novel molecular “trigger” to ensure specific delivery to cancer cells. Clinical oncologist Ingrid Mayer and Lynn Matrisian, chair of Cancer Biology, are part of the team involved in the design and assessment of this work to ensure that our efforts will have impact in medical practice.

http://research.vuse.vanderbilt.edu/giorgiolab/index.html
Cardiac cells beat in synchrony to pump oxygen and nutrient-rich blood through your body to sustain life. The contraction is driven by calcium released during electrical stimulation. The internal powerhouse of cells, the mitochondria, provide the chemical energy required. The focus of my research is the delicate interplay between excitation, contraction, and bioenergetics that is distorted in cardiac disease, resulting often in deadly arrhythmias. In my laboratory, we perform measurements across multiple-length scales—from single-cell contractility to whole-heart excitability measurements—to understand the origin of these arrhythmias. Advanced bioinstrumentation and micro- and nanosensors, as well as microfluidics-based Lab-on-a-Chip devices, play key roles and allow us to explore physiology dynamically. The overall goal is the improved biophysical description of the heart to guide the identification of possible therapies for heart failure and ischemia. 

http://engineering.vanderbilt.edu/BiomedicalEngineering/FacultyStaff/FacultyListing/FranzBaudenbacher.aspx

Mechanobiology explores how mechanical forces affect cells in order to unravel the mysteries of disease formation and construct engineered tissues in the lab. My interest in mechanobiology grew first out of my passion for engineering mechanics. I was fascinated the first time I saw how pushing or pulling a cell changed the way the cell behaved. As a graduate student pursuing this research, I found the fascinating world of molecular biology with its endless questions. Combining these two areas, I built a lab that spends its days asking new questions about how we can push or pull cells and what these forces do to the biology of the cell. We are primarily motivated by two goals: to figure out how forces contribute to disease conditions and how cells can be manipulated to make new tissues in the lab when we apply forces to them. 

http://research.vuse.vanderbilt.edu/mechanobiology

At Vanderbilt, I am an experimental physicist, engineer, and physiologist. At home, I’m an electrician, carpenter, and plumber. I love to build gadgets and figure out how things work—lifelong vocations that overlap with the mission and vision of VIIBRE: to invent tools and develop skills required to understand biological systems across spatiotemporal scales, and to focus research using a multidisciplinary approach to microscale engineering and instrumentation for dynamic control and analysis of biological systems. At VIIBRE, we instrument and control single cells and small cell populations to probe the complexities of systems biology. My long-term challenge is to build a hybrid silicon/biological system that generates models and conducts experiments on itself to identify the underlying equations that describe metabolic and signaling dynamics of cellular systems. www.vanderbilt.edu/viibre
true cutting-edge engineering

The field of Technology Guided Therapy (TGT) combines a number of different medical disciplines including medical imaging, image registration, image segmentation, computational modeling, and surgical data collection and processing. The guidance process is where TGT moves from being an imaging or image processing field to a therapeutic process. Images are used as maps enabling surgeons not only to see where instruments are, but also where they are relative both to the lesion or site of surgical interest and to sensitive, healthy structures they want to avoid.

The Surgical Navigation Apparatus Research Laboratory (SNARL) develops systems for guiding the delivery of therapy. This may involve guiding surgery, some ablation device, implantation of a medical device or delivery of a chemical for therapy. The Biomedical Modeling Laboratory (BML) develops embedded systems that use computer models to assist pre-procedural planning, to enhance surgical guidance, to provide better understanding of tissue health, and to generate additional information relevant to therapeutic delivery. With the BML, SNARL takes ideas from the laboratory into the operating room.

Robert GalloWay
Professor of Biomedical Engineering
Professor of Neurosurgery
Professor of Surgery

"That’s not how I would do it," I blurted out in the midst of watching my first stereotactic neurosurgery case. Talk about arrogant! But I was appalled by how much the surgeon was working for the system, not the system working for the surgeon. There were tasks that are the purview of engineering not surgery: locating instruments in three-dimensional space, tracking their motion, and indexing through large data sets in the medical images. If I could create a device—now devices—to do that for surgeons then they could focus entirely on the surgery and provide experience, insight, and wisdom—things that are tough to capture in any device—toward the surgery. From our start in intracranial neurosurgery, we have developed guidance systems for ophthalmology, spinal surgery, cochlear implants, liver surgery, kidney surgery, and colorectal cancer staging. While this requires a great deal of focus, robust development, and mission-critical engineering, the payoff is huge. We can point to patients and say, “Our work saved their lives.” That’s pretty okay.

http://engineering.vanderbilt.edu/BiomedicalEngineering/Research/tgt_lab.aspx

Michael Miga
Associate Professor of Biomedical Engineering
Associate Professor of Radiology and Radiological Sciences
Associate Professor of Neurological Surgery

Movies like The Black Hole, Tron, War Games and Platoon inspired me to do two things while growing up: get into computers and join the U.S. Army. The former turned me into an engineer; the latter turned me into a biomedical engineer. In my senior year, I took a leave of absence to serve with the army during the Persian Gulf War. Returning from war, I really wanted to do something to help people so I signed up to study biomedical engineering in graduate school and never looked back. Computers and the world of simulation had made indelible impressions; thus, my laboratory focuses on generating sophisticated computer models and embedding them within technology such that they direct surgical therapy and aid in the diagnosis of disease. While actor Matthew Broderick may have simulated global thermonuclear war in War Games, we simulate how organs shift during surgical procedures to provide better guidance during delivery of therapy—I like my career choice better.

http://bmlweb.vuse.vanderbilt.edu
the focus is on you

Vanderbilt students have big, generous hearts and one of the most satisfying things for me is to help our students apply their engineering skills to the service of others. After all, to be an engineer is to commit oneself to a life of service—service in solving problems and making the world a better place.

Imagine your career 10 years from now. Perhaps you will be reporting your research findings at a conference in Germany, collaborating with engineers in India, marketing your new biomaterials products in China, or sharing a new surgical technique with colleagues in Japan. If you study abroad, as we encourage you to do, not only will your international career activities bring back terrific memories of your studies abroad, they will draw on the cultural competency you gained. We’ve worked hard to bring you many options to study engineering abroad during one of your regular semesters as an undergraduate.

My colleagues in Vanderbilt’s Global Education Office and I look forward to getting you started on one of the most meaningful and memorable aspects of your education.

www.vanderbilt.edu/geo

Cynthia PASCHAL
Associate Dean of the School of Engineering
Associate Professor of Biomedical Engineering
Associate Professor of Radiology and Radiological Sciences

Thomas HARRIS
Oris Henry Ingram Distinguished Professor of Engineering, Emeritus
Professor of Biomedical Engineering, Emeritus
Professor of Chemical Engineering, Emeritus
Professor of Medicine, Emeritus
John Gore
Hertha Ramsey Cress University Professor of Radiology and Radiological Sciences, Biomedical Engineering, and Physics
Professor of Radiology and Radiological Sciences
Professor of Biomedical Engineering
Professor of Physics
Professor of Molecular Physiology and Biophysics
Director, VUIIS

As a graduate student in the United Kingdom in the 1970s, I worked with some of the earliest ultrasound imaging systems and had the good fortune to attend a conference titled "Medical Images: Formation, Perception, and Measurement." It was then that I understood imaging science could be a coherent discipline within medicine. There were powerful new modalities such as MRI and PET on the horizon and this field would depend heavily on engineers, physicists, and chemists to exploit new technologies to provide information to clinicians and biologists. The Institute of Imaging Science is a unique embodiment of how multidisciplinary efforts working together can impact medicine in major fashion as new imaging techniques are applied to some of our most important problems and questions: How does the brain work? What kind of cancer treatment should be used? What is the cause of diabetes? www.vuiis.vanderbilt.edu

Adam Anderson
Associate Professor of Biomedical Engineering
Director of Undergraduate Studies
Associate Professor of Radiology and Radiological Sciences

Most of our basic understanding of brain structure and function comes from microscopic analysis of brain tissue specimens and invasive studies of the brain in action. However, recent innovations in magnetic resonance imaging (MRI) provide a new window on brain structure and function, allowing non-invasive measurements in both children and adults. For example, our lab has used functional MRI to map neuronal activity in children with learning disabilities to identify specific regions that limit math skills. In other studies, we have mapped activity related to hallucinations and cognitive problems in schizophrenia. Our recent research focuses on improving MRI measurements of brain connectivity. We have developed new methods to relate imaging data to fiber properties and we are using these to understand changes in the brain associated with developmental disabilities and psychiatric diseases. www.vuiis.vanderbilt.edu

Mark DOE
Associate Professor of Biomedical Engineering
Associate Professor of Radiology and Radiological Sciences
Director, Center for Small Animal Imaging

Magnetic resonance images can visualize the inside of our bodies, but what really interests me is what is not apparent to even the well-trained eye. I can see the inside of your brain, but can I also measure the progression of a disease? I can see your bones, but can I tell if they are at risk of fracture? I can see your muscle is injured, but can I tell if it's healing? The magnetic resonance signals from your body convey an abundance of information about tissue micro-anatomy, physiology, and function, but figuring out what it all means is a challenge! www.vuiis.vanderbilt.edu
Biomedical engineering allows me to combine my strengths in technology development with my love for medicine. Whether I am looking for a method to screen for skin cancer without taking a biopsy or devising a way to tell surgeons where tumor ends and normal begins so they can remove the cancer completely in a single surgery, I use light to solve such problems. I build instruments that can detect cancers early using properties of light that behave differently in normal compared to cancerous tissues. These instruments are like Star Trek’s “tricorder,” a handheld device that can scan a suspicious area with light and indicate whether it is cancer. These are just examples of some of my ongoing projects as part of the biomedical optics laboratories.

www.bme.vanderbilt.edu/bmeoptics
At some point, everybody wonders how rainbows happen. I was no different, and my curiosity about light only grew from there. I wanted to know how light worked, how it interacted with its environment, and what it can tell us about ourselves. In eighth grade while other kids were making volcano models, I was using polarized light to look at structural stresses in model bridges. As an undergraduate in physics at Washington State University, I spent a summer in Professor Mark Kuzyk’s optics lab and was fortunate to spend one year studying abroad in Wales. There, I developed an appreciation for philanthropy and helping those who are less fortunate. As graduation neared, I began looking at grad schools that could combine my interest in physics with the opportunity to help people.

I found a biomedical engineering lab at the University of Wisconsin doing just that—using light to improve human health. Light-tissue interactions can provide a wealth of information on the function of the human body, including metabolism, oxygenation, and structure. This information can be used to determine if a cancer is developing, what treatment would best suit a particular tumor, and whether a tumor is responding to therapy.

I completed my Ph.D. at Duke University in 2007, and after a short stint as a post-doc I landed my dream job at Vanderbilt University. My research focuses on harnessing the power of light to improve the care of cancer patients. Vanderbilt is an ideal place to study light and cancer because of its strong optics and imaging cores, and collaborators in the world-class Vanderbilt-Ingram Cancer Center. Light continues to reveal new secrets every day, and I am proud to be a part of this research and make a positive impact on human health.

http://research.vuse.vanderbilt.edu/skalalab

Melissa SKALA
Assistant Professor of Biomedical Engineering

light for life
Undergraduate
Admission to the undergraduate program is managed by the Office of Undergraduate Admissions. Prospective students are encouraged to investigate the university by visiting the campus. Admissions staff are available to answer questions, arrange campus tours, provide additional information about degree programs, and link visitors with appropriate campus offices and members of the university community.

Contact
Office of Undergraduate Admissions
Vanderbilt University
2305 West End Avenue
Nashville, TN 37203-1727
Phone: (615) 322-2561 or (800) 288-0432
Website: admissions.vanderbilt.edu

Dates to Remember
August
Application packets available from Undergraduate Admissions
October 1
Earliest deadline to submit the College Scholarship Service (CSS)/Financial Aid PROFILE to processors
November 1
Application deadline for Early Decision I
December 15
Early Decision I Notification
January 1
Earliest deadline to submit the Free Application for Federal Student Aid (FAFSA) to processors
February 5
CSS PROFILE and FAFSA due to addresses as indicated
April 1
Regular Decision notification
May 1
Postmark deadline for matriculation deposit

Graduate
To apply for admission to the graduate program in biomedical engineering, you must first meet the general requirements for admission by the Vanderbilt University Graduate School. Application for admission may be made electronically through the Graduate School website at www.vanderbilt.edu/gradschool.

The Graduate School Catalog may be viewed at www.vanderbilt.edu/catalogs. The Graduate School Catalog may be viewed at www.vanderbilt.edu/gradschool.

Dates to Remember
October 22
Last date for applicants to take the computer-based general GRE
November 19
Last date for international applicants to take the Test of English as a Foreign Language (TOEFL)
April 1
Regular Decision notification
May 1
Application deadline for Early Decision I
June 15
Regular Decision notification

Undergraduate
Vanderbilt is committed to enrolling talented, motivated students from diverse backgrounds. More than 60 percent of Vanderbilt students receive some type of aid. The university offers a full range of merit-based scholarships, need-based financial assistance, and financing/payment options to families of all income levels. More information can be found at www.vanderbilt.edu/financialaid.

Contact
Engineering Graduate Programs
ATTN: Biomedical Engineering
Vanderbilt University
411 Kirkland Hall
Nashville, TN 37240 U.S.A.
Phone: (615) 343-2727
Website: www.vanderbilt.edu/gradschool

Dates to Remember
January 1
Application deadline including all supporting credentials
January 15
Admission offers made
April 1
Deadline for applicants to respond to offers of admission
April 15
Last date for applicants to take the paper-based general GRE

Graduate
Students wishing to be considered for financial awards administered by the Graduate School should check the appropriate box under “Financial Information” on page 2 of the online application and make certain that a complete application is received by January 15. Prospective applicants are urged to apply for fellowships or grants from national, international, industrial, or foundation sources. More information can be found at www.vanderbilt.edu/gradschool.

Graduate students in the Department of Biomedical Engineering seeking the Ph.D. degree receive a competitive stipend, tuition waiver, health insurance and reimbursement for some incidental fees. This financial aid can be in the form of a Teaching Assistantship or a Research Assistantship.

• Graduate Teaching Assistantships
Financial aid for the academic year to students who assist in supervised teaching of undergraduates

• Graduate Research Assistantships
Financial aid for the calendar year to students carrying out thesis or dissertation research with support from a research grant

Expanded Aid Program
Beginning in the fall of 2009, need-based financial aid packages for all undergraduate students no longer include need-based loans. This latest initiative does not involve the use of income bands or “cut-offs” to pre-determine levels of eligibility and applies to all undergraduate students with demonstrated financial need who are U.S. citizens or eligible non-citizens. The end result is that, in addition to a realistic academic year earnings expectation, all need-based aid packages now include scholarships and/or grants (gift assistance) in place of need-based loans that would have previously been offered to meet demonstrated need.

Teaching or Research Assistantships may be supplemented by a scholarship or fellowship through a competitive process supported by exceptional applicant qualifications. In order to be considered for these service-free awards, an applicant’s file must be complete by January 15. The honor fellowships listed below are in addition to a Teaching or Research Assistantship.

• Harold Stirling Vanderbilt (HSV) Graduate Scholarships
$6,000/year for up to five years

• University Graduate Fellowships (UGF)
$10,000/year for up to five years

• Provost’s Graduate Fellowships (PGF)
$10,000/year for up to five years

• School of Engineering Fellowships (IBm)
$4,000/year for up to four years plus an award of $1,000 for professional development

• Thomas R. Harris Fellowship (TRH)
$4,000/year for one year, honoring the founding chair of the Vanderbilt Department of Biomedical Engineering

Prospective applicants are urged to apply for fellowships or grants from national, international, industrial, or foundation sources.
1. MRI pulse sequence
   - proton relaxation and diffusion
   - MRI of tissue and skeletal muscle
   - compartmental modeling of water
   - Characterization of neural
   - Biomedical Engineering

2. Surgery
   - spectroscopy for diagnosis
   - Biomedical Engineering

3. Bioenergetics and arrhythmogenesis
   - cardiac force-excitation-coupling
   - microfluidic-based cellular instrumentation
   - microrheology and cell-cell adhesion
   - biomagnetic field
   - High resolution imaging
   - Bioengineering

4. Tensor imaging (DTI)
   - functional MRI and diffusion
   - Magnetic resonance imaging (MRI)
   - Biomedical Engineering

5. Clinical practice
   - systems for combined imaging
   - biosensors; theranostic
   - imaging
   - medical devices, medical
   - Technology-guided therapy,
   - Professor of Biomedical

6. Drug delivery and gene delivery applications
   - phage display for discovery of peptides for
   - biology
   - Biomedical Engineering

7. Drug delivery; regenerative medicine; RAFT
   - polymerization; stimuli
   - response to stimuli, delivery of biomacromolecular drugs; development of in vivo vascular contrast agents
   - Biomedical Engineering

8. Detection
dynamics; use of fluorescence and Raman
toce detection of cancer and precancer
   - Applications of optical
techniques for diagnosis of:
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Professor of Biomedical

9. Engineering
   - endocytosis
   - mechanics; biorheology;
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

10. Engineer
detection
   - Development of new
   - imaging; optical spectroscopy
   - and nanotechnology for
cancer diagnosis and therapy
   - Associate Professor of Biomedical
   - Engineering

11. Engineering
   - applications
   - imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

12. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

13. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
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   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

14. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

15. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
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   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

16. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

17. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

18. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
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19. Engineering
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   - Engineering and Chemical
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36. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

37. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

38. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

39. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

40. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

41. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

42. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

43. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

44. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

45. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

46. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

47. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

48. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

49. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical

50. Engineering
   - imaging; optical spectroscopy
   - Development of optical
   - Imaging of lung physiology;
   - MR angiography, MR and CT
   - Cardiovascular fluid
   - Engineering and Chemical
   - Professor of Biomedical
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Professor of Electrical Engineering and Computer Engineering

Edward Chekhmenev
Assistant Professor of Radiology and Radiological Sciences

Andre Churchwell
Associate Professor of Medicine (Cardiology)

Bruce Damon
Associate Professor of Radiology and Radiological Sciences

Benoit Dawant
Professor of Electrical Engineering

Andre Diedrich
Research Associate Professor of Medicine (Clinical Pharmacology)

Zhaohua Ding
Assistant Professor of Radiology and Radiological Sciences

Dan France
Research Associate Professor of Anesthesiology

Paul Harris
Research Associate Professor of Biomedical Informatics

Alan Herline
Associate Professor of Surgery (Colon and Rectal)

S. Duke Herrell
Associate Professor of Surgery (Laparoscopy/Endoscopy)

Stacy Klein-Gardner
Associate Professor of the Practice of Teaching & Learning

Robert Labadie
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Bennett Landman
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Charles Manning
Assistant Professor of Radiology and Radiological Sciences

Victoria Morgan
Assistant Professor of Radiology and Radiological Sciences

Jeffry Nyman
Research Assistant Professor of Orthopedics

Leon Partain
Professor of Radiology and Radiological Sciences

Wellingon Pham
Assistant Professor of Radiology and Radiological Sciences

David Piston
Professor of Molecular Physiology and Biophysics

Chad Quarles
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Anna Rao
Associate Professor of Psychology

Baxter Rogers
Research Assistant Professor of Radiology and Radiological Sciences

Ben Saville
Assistant Professor of Biostatistics

Seth Smith
Assistant Professor of Radiology and Radiological Sciences

Thomas Yankelev
Associate Professor of Radiology and Radiological Sciences

Vanderbilt

Cornelius Vanderbilt had a vision of a place that would “contribute to strengthening the ties that should exist between all sections of our common country” when he gave a million dollars to create a university in 1873. Today, that vision has been realized in Vanderbilt, an internationally recognized research university in Nashville, Tenn., with strong partnerships among its 10 schools, neighboring institutions, and the community.

Vanderbilt offers undergraduate programs in the liberal arts and sciences, engineering, music, education and human development, as well as a full range of graduate and professional degrees. The combination of cutting-edge research, liberal arts education, nationally recognized schools of law, business, and divinity, the nation’s top-ranked graduate school of education, and a distinguished medical center creates an invigorating atmosphere where students tailor their education to meet their goals and researchers collaborate to address the complex questions affecting our health, culture, and society.

An independent, privately supported university, Vanderbilt is the largest private employer in Middle Tennessee and the second largest private employer based in the state.

Nashville

Vanderbilt’s hometown of Nashville is a vibrant, engaging city known proudly as “Music City, U.S.A.” The university’s students, faculty, staff, and visitors frequently cite Nashville as one of the perks of Vanderbilt, with its 330-acre campus located a little more than a mile from downtown.

From serving as home to the nation’s largest Kurdish population to being named America’s friendliest city for three years in a row, Nashville is a metropolitan place that exudes all of the charm and hospitality one expects from a Southern capital.

The city was settled in 1779 and permanently became state capital in 1843. The city proper is 533 square miles with a population of nearly 570,000. Major industries include tourism, printing and publishing, technology manufacturing, music production, higher education, finance, insurance, automobile production, and health care management. Nashville has been named one of the 15 best U.S. cities for work and family by Fortune magazine, was named as the No. 1 most popular U.S. city for corporate relocations by Expansion Management magazine, and was named by Forbes magazine as one of the 25 cities most likely to have the country’s highest job growth over the coming five years.

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