The Department of Mechanical Engineering & Materials Science

>> mems.wustl.edu
Students and faculty in the Department of Mechanical Engineering & Materials Science form a creative and close-knit community; we share a deep curiosity and interest in mechanics and materials and a strong desire to solve important problems.

Mechanical engineers and materials scientists will address the most pressing challenges of the 21st century: providing a plentiful supply of clean energy, ensuring high-quality, affordable health care, and maintaining the security of nations and communities. The principles of mechanics are embedded in each of these challenges, determining the behavior of man-made and natural systems as diverse as wind turbines, crawling cells and fighter jets. New materials — nanostructured, multifunctional, energy-harvesting, light, strong and environmentally friendly — will transform the way these systems are designed and made.

MEMS faculty and students, defined by their expertise in fundamental mechanical engineering and materials science, will exploit the interfaces between disciplines: where mechanics converges with biology, where materials science converges with nanotechnology and where aerospace engineering converges with the science of energy. These areas of convergence take advantage of WUSTL’s traditional strengths and culture of collaboration. At these interfaces, deep understanding, creativity and boldness will be rewarded by innovations with great impact in biotechnology, advanced materials and energy conversion.

More than 3,000 alumni represent MEMS in industry (from multinational corporations to fledgling startups), government (including NASA’s chief astronaut) and academia. More than 250 undergraduate students are currently pursuing degrees in our department. Many of these students also participate in undergraduate research, perform service with Engineers Without Borders, work on the Formula SAE race car or start their own companies, such as Andrew Brimer ’13, who started Sparo Labs.

We are very proud of the accomplishments of our MEMS alumni and students; they reflect both the value of a great education in mechanics and materials and the spirit of community that Washington University nurtures. I welcome your interest and encourage you to get in touch with us.

Philip Bayly, PhD
Department Chair and
Lilyan and E. Lisle Hughes Professor of Mechanical Engineering

Mechanical Engineering & Materials Science at Washington University
MEMS research is organized around four intersecting themes: biomechanics and biotechnology, advanced materials, energy and sustainability, and aerospace.

Some of the most difficult mechanical engineering problems involve biology and medicine. Biological materials are often more complicated than traditional engineering materials, and their responses to loading include growth and degeneration. MEMS biomechanics faculty work on developing devices for orthopedic or neurological surgery, and understanding tumor cell motility and the function of our heart and lungs. This line of research is enhanced by strong collaborations with faculty in other departments, such as biomedical engineering, biophysics and orthopedics.

Mechanical engineering faculty with aerospace interests include experts in computational fluid mechanics, rotorcraft and optimization theory. These faculty are making important advances in vehicle efficiency and wind energy, which rely on the same underlying principle of dynamics and fluid mechanics.

Research centers & labs

**Institute of Materials Science & Engineering (IMSE)**

The schools of Engineering & Applied Science and Arts & Sciences jointly established IMSE in 2012 to integrate and leverage the full potential of interdisciplinary materials research by bringing together more than 30 researchers from engineering, physics, chemistry, and earth and planetary sciences. While advances in materials science and engineering research depend on knowledge from traditional disciplines, a new integrated, dynamic and diverse approach through a convergence of disciplines provides the greatest opportunities for unprecedented discoveries — new knowledge that cannot be achieved by a single discipline or department.

IMSE also educates the next generation of materials scientists and engineers through a novel interdisciplinary doctoral program. imse.wustl.edu

New materials are critical to addressing the most pressing challenges of the 21st century in energy, sustainability, health care, security and information management. Our department has recently expanded its research on advanced materials. Materials science and engineering is an interdisciplinary field focusing on the development of new materials and nanostructures with desirable properties.

Materials science and engineering has fueled progress in traditional engineering disciplines, such as mechanical, electrical and biomedical engineering. Advances in materials are providing new solutions for some of the most significant challenges we face, such as developing new sources of energy and finding ways to use energy more efficiently while addressing environmental concerns. The design of new materials also is transforming medicine with engineered materials for regenerative medicine, drug delivery and improved healing.

Research activities take place in multiple laboratories

- Biomechanics — the mechanics of cells, tissues and biomaterials. Research projects involve the mechanics of brain injury, cell motility, bones and tendons, embryonic development and imaging
- Computational Fluid Mechanics — the modeling and simulation of flow physics, flow control, air vehicles and fluid energy systems
- Design & Optimization — design theory and numerical methods for optimization
- Computational Mechanics & Rotorcraft Dynamics — finite state models of rotorcraft inflow and wake, aeroelasticity and numerical methods for fluid mechanic simulations
- Advanced Materials — structural, electronic, optical, photovoltaic and multifunctional materials. Specific research areas include bulk metallic glasses, atomic layer deposition and plasmonic nanostructures
Researchers to study heart failure

The National Institutes of Health (NIH) has awarded more than $2 million to a team of scientists from Washington University in St. Louis and InvivoSciences, a biotechnology startup with WUSTL roots, to construct artificial tissue models that will allow the rapid testing of new drugs for heart failure. According to the Centers for Disease Control, about 5.8 million people in the United States have heart failure, and many of them will die of their disease.

Drugs used to treat heart failure, such as ACE inhibitors or beta blockers, improve the symptoms and allow patients to live longer and feel better. They may even reverse pathological changes in the heart and allow patients to live longer. But these fibers also make it difficult to measure the properties without taking invasive measures. Bayly and colleagues plan to use magnetic resonance elastography (MRE), a noninvasive technique, to view and measure different properties of waves when they travel in different directions in the fibrous materials. Bayly also received a three-year, $395,000 grant from the NSF to measure the mechanical properties and processes that lead to motion in cilia and flagella.

Recent major research awards

- $490,000 from the NSF to develop imaging methods to characterize soft fibrous biomaterials
- $3 million from the NIH to study brain biomechanics
- $450,000 from the U.S. Army to fund collaborative research between engineering and anesthesiology on detection of disease biomarkers
- $200,000 from the U.S. Army Research Office for research titled "Paper Based Biomimetic SERS Substrates for Highly Sensitive and Selective Chemical Sensing"
- $180,000 from the U.S. Army Research Office for research titled "Nonlinear Aerelastic Analysis of Two- and Three-Dimensional Stall"
Faculty

MEMS tenured and tenure-track faculty are among the best educators and scholars in their fields, having received numerous prestigious awards and honors for their work. Faculty contribute to solving global challenges through cutting-edge research, and prepare the next generation of engineering leaders through state-of-the-art coursework and labs. In addition to their core research interests, faculty members work with colleagues across disciplines throughout the university, particularly with researchers in medicine and the physical sciences. Our students also benefit from instruction by Professors of the Practice, who bring decades of industry experience to the classroom.

Biomechanics

Faculty in this area study the mechanical properties of biological tissue and the effects of mechanical loading on biomedical systems. The properties of biological materials often depend on the magnitude, rate and direction of loading, so their behavior is often complicated. MEMS researchers are developing new techniques to identify and exploit the unique behavior of cells, blood vessels, bones and brain tissue to develop approaches to prevention and treatment of injury and disease.

Philip Bayly

The Lilyan and E. Lisle Hughes Professor of Mechanical Engineering and Department Chair

PhD, Duke University, 1993
MSc, Brown University, 1987
AB, Dartmouth College, 1986

Professor Bayly studies impact, vibration, wave motion and instability in mechanical and biomedical systems. He uses magnetic resonance imaging (MRI) to investigate the mechanics of brain injury and brain development. He also studies the nonlinear dynamic phenomena that underlie the oscillatory movements of cells and microorganisms.

Guy Genin

Professor

PhD, Harvard University, 1996
SM, Harvard University, 1993
MS, Case Western Reserve University, 1992
BSE, Case Western Reserve University, 1990

Professor Genin studies interfaces and adhesion in nature, physiology and engineering. His current research focuses on interfaces between tissues at the attachment of tendon to bone, between cells in cardiac fibrosis and between subcellular components in plant defenses.

Joint faculty members

Richard Axelbaum, PhD
Professor, Energy, Environmental & Chemical Engineering

Elliot Elson, PhD
Professor, Biochemistry & Molecular Biophysics

Ken Kelton, PhD
Professor, Physics

Eric C. Leuthardt, MD
Associate Professor, Neurological Surgery

Matthew Silva, PhD, MD
Professor, Orthopedic Surgery

Simon Tang, PhD
Assistant Professor, Orthopedic Surgery

Stavros Thomopoulos, PhD
Associate Professor, Orthopedic Surgery

Other appointments

Harry Brandon, PhD
Professor of the Practice

Mary Malast, PhD
Instructor

Ruth Okamoto, PhD
Senior Research Associate

Fred Roos, PhD
Professor of the Practice

Shaun Sellers, PhD
Lecturer
Biomechanics

Three new faculty with research interests in biomechanics and mechanobiology have joined MEMS since 2012. These researchers are developing new theoretical and experimental approaches to illuminate the mechanics of tendons, blood vessels and cells.

Spencer Lake
Assistant Professor
PhD, University of Pennsylvania, 2009
BS, University of Utah, 2003

Professor Lake's research focuses on soft tissue biomechanics, with an emphasis on orthopaedic tissues, such as tendon and ligament. His research uses a multiscale experimental and computational approach to evaluate the in vivo loading environment, tissue properties and microstructural-structure-function relationships of tissues that function in complex physiological environments. Studies conducted by Lake's research group in the Musculoskeletal Soft Tissue Laboratory aim to enhance fundamental understanding of healthy tissue properties, elucidate changes that occur in (and mechanisms responsible for) injury/disease and provide guidelines for improved treatment/replacement strategies. While focused primarily on tendon and ligament of the upper extremity (i.e., shoulder and elbow), these studies also have broad applicability toward understanding properties and relationships of many different native and engineered soft tissues.

Amit Pathak
Assistant Professor
PhD, University of California, Santa Barbara, 2008
B.Tech/M.Tech, Indian Institute of Technology, Bombay, 2002

Professor Pathak's research interests include biomechanics, biomaterials, mechanobiology of the cell and interactions between cells and extracellular matrices. In particular, his research aims to understand how numerous parameters that define three-dimensional ECMs (e.g., stiffness, porosity and fibrous microstructure) all interactively affect cell motility through a variety of subcellular mechanisms. His lab tackles this multi-variable problem through a multidisciplinary approach that includes fabrication of new matrix platforms, development of advanced measurement tools in cell biology and construction of predictive computational models.

Jessica Wagenseil
Associate Professor
DS, Washington University, 2003
BS, University of California, San Diego, 1997

Professor Wagenseil studies cardiovascular mechanics, specifically focusing on cardiovascular development, extracellular matrix proteins and microstructurally based constitutive modeling. Her work is important for testing clinical interventions for elastin-related diseases and for designing better tools in cell biology and construction of advanced measurement tools in cell biology.

Ramesh Agarwal
The William Palm Professor of Engineering
PhD, Stanford University, 1975
MS, University of Minnesota, 1969
BS, Indian Institute of Technology, 1968

Professor Agarwal's current research interests are in fast- and rarefied-gas dynamics and hypersonic flows, biofluid dynamics, energy from wind and biomass, carbon capture and sequestration, and energy efficiency of buildings.

Energy & aerospace

Energy efficiency and aircraft performance both depend heavily on fluid mechanics, thermal effects and the interactions of fluids with elastic structures. MEMS faculty in these fields develop tools such as computational fluid mechanics codes and finite-state aerodynamic models to analyze these phenomena. They apply these methods to design efficient energy systems in buildings, improve the sustainability of transportation options and enhance the performance of rotorcraft and wind turbines.

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Mark Jakiela
The Lee Hunter Professor of Mechanical Design
BS, University of Michigan, 1983
MS, University of Michigan, 1984
PhD, University of Michigan, 1988

Professor Jakiela conducts research related to engineering design and design optimization. He has specialized in the application of evolutionary computation to problems in design and manufacturing. Together with associated researchers, he has developed systems that perform structural topology optimization, shape pattern nesting, Finite element mesh generation, antenna design and the optimal arrangement of piezoelectric actuators on aerodynamic surfaces. More recently, he has investigated computer-aided systems that allow engineering design and product development to be done by web-based user communities, as well as comprehensive cost models for remanufacturing processes. He has had collaborative research projects with many industry partners, including Ford, Nissan, Hitachi and Boeing.

David Peters
The McDonnell Douglas Professor of Engineering
PhD, Stanford University, 1974
BS, Washington University, 1970

Professor Peters's research projects in rotor wake modeling seek to correctly model the dynamic motions that profoundly influence vehicle dynamics of airplane propellers, helicopters and tilt rotors. His other research interests include aerelasticity modeling of helicopter rotors and wind turbines with unsteady aerodynamics and nonlinear structural deformations and response to stalling.
Materials & structures

Materials faculty focus on the development and creative application of new materials such as amorphous metals, nanoparticle composites and thin films. Structural mechanics faculty are concerned specifically with the properties and behavior of materials for structural applications, such as metals and aerospace composites.

Parag Banerjee
Assistant Professor
PhD, University of Maryland, College Park, 2011
MS, Washington State University, 2000
BE, Indian Institute of Technology, 1998

Professor Banerjee’s research interests focus on two aspects of materials science and engineering. First, he is interested in the synthesis of nanomaterials with tunable properties using principles of self-assembly and self-limited reactions. Second, and perhaps more importantly, he is interested in integrating these materials into “performance-enhancing” devices.

Kathy Flores
Professor and Associate Chair for Materials Science
PhD, Stanford University, 2000
MS, Stanford University, 1997
BS, Washington University, 1995

Professor Flores’s primary research interest is the mechanical behavior of structural materials, with particular emphasis on understanding structure-processing-property relationships in bulk metallic glasses and their composites. She leads research projects on topics ranging from investigations of the structural origins of plastic deformation in metallic glasses to the design of new glasses with desirable properties and the development of new manufacturing techniques suited to the unique processing capabilities of these alloys, in an effort to accelerate their incorporation in mainstream and high-performance applications.

Thomas Harmon
The Clifford W. Murphy Professor of Civil Engineering
PhD, Massachusetts Institute of Technology, 1973
AB, Washington University in St. Louis, 1966

Professor Harmon’s research interests include FRP materials, constitutive modeling of concrete materials with emphasis on failure and post-failure behavior, fatigue behavior of concrete pavements, lightweight concretes, high-strength and fiber-reinforced concretes, seismic retrofit of steel, concrete, and masonry structures; and earthquake resistance of new structures.

Kenneth Jerina
Professor of Engineering and Associate Department Chair for Materials Science
BS, St. Louis University, 1966
AB, Washington University in St. Louis, 1971
BSc, University of Illinois, 1969

Professor Jerina’s research interests are some of Professor Jerina’s research interests include plasticity and deformation of metals and alloys, constitutive models for engineering design methods for military and civil aircraft, constitutive models for maintenance of aging aircraft systems, DARPA and NASA sponsored by the Air Force, Navy, NSF, and explosively bonded superplastic alloys. He has been the principal investigator of several R&D programs sponsored by the Air Force, Navy, NSF, DARPA, and NASA.

Shankar Sastry
Professor of Engineering
PhD, University of Toronto, 1974
MEng, Indian Institute of Science, 1970
BEng, Indian Institute of Science, 1968
BS, Bangalore University, 1965

Professor Sastry has patents on advanced materials processing. Professor Sastry has more than 33 years of experience in the development of high-performance structural materials, rapidly solidified aluminum and titanium alloys, metal matrix composites, advanced solders, titanium aluminides, high-temperature intermetallics and advanced materials processing.

Srikanth Singamaneni
Assistant Professor
PhD, Georgia Institute of Technology, 2009
MS, Western Michigan University, 2004
BE, Nagarjuna University, 2002

Professor Singamaneni’s research interests include plasmonic engineering in nanomedicine (in vitro biosensing for point-of-care diagnostics, molecular bioimaging and nano-therapeutics), plasmonic (plasmonically enhanced photonic devices), surface enhanced Raman scattering (SERS)-based chemical sensors with particular emphasis on the design and fabrication of unconventional and highly efficient SERS substrates and SERS-based sensors for chemical and biological materials.

Membrane devices and materials

Professor Singamaneni and his research team work on the development of advanced materials and devices for energy harvesting, water purification, and biological applications. The team focuses on the design and fabrication of novel materials and devices that can convert energy from environmental sources, such as solar radiation, into electricity, and on the development of novel water purification technologies that can remove contaminants from water and produce safe, potable water.

For more information, visit mems.wustl.edu.
Undergraduate students

Bachelor of Science in Mechanical Engineering

Washington University offers a four-year curriculum leading to a baccalaureate degree, which is designed to prepare students for graduate school, medical school or industry. Minors are also available in aerospace engineering, energy engineering, mechatronics, robotics and nanotechnology.

All of our mechanical engineering students are educated about the mechanics of solids and fluids, thermodynamics and heat transfer, as well as the science of materials and the principles and techniques of mechanical engineering design. A mechanical engineering graduate can apply his or her expertise to a wide range of systems. Students studying mechanical engineering can take electives on topics ranging from energy conservation and environmental control to machine design, manufacturing and biomechanics.

Research & independent study

Undergraduates are encouraged to pursue research in a university lab during the school year or summer break. Many Washington University faculty have research openings for students; independent study credit is possible in many circumstances. Industry internships or co-op experiences are also valuable and highly recommended.

International experience

In addition to the study-abroad programs available through the School of Engineering & Applied Science and the College of Arts & Sciences, the MEMS department actively supports international experiences through Washington University’s Engineers Without Borders (EWB) chapter. MEMS students have recently led EWB projects in Ethiopia and Haiti.

Formula SAE
(Wash U Racing)

Each May, Wash U Racing takes part in the Formula Society of Automotive Engineers (SAE) competition at Michigan International Speedway. The premise behind the competition is that a fictitious manufacturing company has charged each team with designing a Formula-style race car. The competition evaluates all aspects of the prototype car, including on-track performance, marketability, manufacturability, engineering design and cost efficiency. To keep students safe and the competition fair, there are many regulations in place. The course itself is set up so that speeds rarely exceed 70 mph. Based on how points are metered out at the competition, the teams must come up with a strategy to help decide what characteristics to design for in the car. With differing strategies and design ideas, the cars end up varying wildly from team to team. This is an anomaly in motorsports and makes for exciting racing.

Formula SAE presents a great opportunity for students of all majors to apply what they’ve learned in the classroom.
Graduate students

The Department of Mechanical Engineering & Materials Science offers PhD, MS, BS and Master of Engineering degrees. Opportunities for advanced study and research are presently available in biomechanics, energy conversion and efficiency, advanced materials, nanotechnology and computational mechanics.

Faculty and students collaborate on interdisciplinary projects with partners in Biomedical Engineering, Energy, Environmental & Chemical Engineering, Chemistry, Physics, Biology and the School of Medicine. Students interested in these fields and registered in the department may take courses offered by these programs and may include faculty from these departments on thesis committees.

Graduate degrees offered

- PhD in Mechanical Engineering
- PhD in Aerospace Engineering
- Master of Science in Mechanical Engineering
- Master of Science in Aerospace Engineering
- Master of Science in Materials Science
- Master of Engineering in Mechanical Engineering
- Master of Engineering & Master of Business Administration

“I decided to pursue my PhD at Washington University because of my undergraduate research experience with Professor David Peters. I learned that big problems can be solved by splitting them into smaller pieces. Seeing a problem being solved gave me confidence that someday I could solve big problems by my own.”

Sean Hong
MEMS PhD student

Student news

Wash U Racing reaches goals at Michigan competition

Nine minutes before the end of the day’s events at the Formula SAE Michigan Collegiate Design Series, the differential on the 2013 Wash U Racing car came apart during a test run.

The team had to remove and dismantle the part, diagnose the problem, fix and reinstall it, all within an hour, or risk losing points. Although the 22-member team faced this and a few other obstacles, it placed 15th overall out of 120 teams that entered the competition, held in May 2013 at the Michigan International Speedway. It also placed 19th overall for the car’s fuel economy.

“We accomplished what we set out to do at the beginning of last year, which was to finish the grueling 24-kilometer endurance run, which only about 40 teams were able to do,” says Surjan Singh, president of Wash U Racing and a senior majoring in mechanical engineering.

Formula SAE (Society of Automobile Engineers) is designed to challenge teams of university undergraduate and graduate students to conceive, design, fabricate and compete with small, Formula-style competition vehicles. Teams generally spend up to a year designing, building, testing and preparing their vehicles.

Engineering a solution and a future

Following nine months of research, paperwork and conference calls, Engineers Without Borders certified the project, and the WUSTL chapter made a five-year commitment to the Mekelle Blind School, located in the southern tip of the Saharan Desert in Ethiopia, which was in dire need of water for drinking and agriculture.

Five WUSTL students went to Ethiopia for the first time for an initial assessment of the school and its surrounding community. What they found was frightening. The school didn’t have the capacity to last for more than a couple of days without water from the city’s system, which sometimes shuts down for a week at a time during the region’s dry season.

Although the school had a functioning water tower with two 5,000-liter tanks, it was sagging and in desperate need of repair. So when the group returned, they fixed the tower and then installed a new pump for an existing well.

Doctoral student awarded Imaging Sciences Pathway Fellowship

Kate Wilson, a doctoral student in the Department of Mechanical Engineering & Materials Science, was selected to receive an Imaging Sciences Pathway Fellowship award.

The objective of the Imaging Sciences Pathway is to educate “renaissance scientists” whose knowledge of the physical sciences, engineering and biology will allow them to explore new frontiers within the various and ever-expanding research domains of imaging sciences.

The Imaging Sciences Pathway has been awarded an NIH grant that, together with support from Washington University in St. Louis, allows the program to offer several fellowships per year to graduate students in the Pathway.
Mechanical Engineering alumni

“My engineering education has governed all of the things that I deal with on a day-to-day basis. It provided the background and the way of thinking that I use daily at work. Being on the Formula SAE race car team in particular has really given me a lot of experience that I call on for design.”

Brian Aggrey, SpaceX, Class of 2013

Col. Robert L. Behnken
Chief of NASA Astronaut Office

In this role, Robert Behnken is responsible for managing Astronaut Office resources, operations and safety programs. During this innovative time, he will also help develop astronaut flight crew operation concepts and crew assignments for future spaceflight missions.

“Bob is a highly dedicated professional who understands the challenges that this office holds,” said NASA Director of Flight Crew Operations Janet Kavandi. “He has an excellent reputation both inside and outside the Astronaut Office.”

Behnken has taken two missions to the International Space Station for NASA.

Deanne Bell
TV Host, Discovery Channel, PBS, DIY Network, National Geographic Channel and ESPN

Deanne Bell credits Washington University with nurturing the diverse talents and traits that led to a career of hosting science-based television shows.

Landing her first job in the media-rich city of Los Angeles kick-started Bell’s career. While working in L.A. as a Boeing aerospace systems designer, she auditioned for a science-focused TV show. Although the producer rejected her, the producers’ encouragement at a one-on-one session led to callbacks and ultimately put Bell on the air.

“Deanne Bell’s unique ability to present complex topics in an engaging and accessible way is a model for science communication”

Andrew Brimer
Co-Founder, Sparo Labs

Andrew Brimer was part of a student-led team that founded Sparo Labs, which experienced an award-winning project to develop a low-cost spirometer, a device that measures lung function.

The team spent about a year and a half developing the product and a prototype that conveys the historical issues of high cost and difficulty of use. Most spirometers cost between $20 to $1,000, making them unaffordable for patients as well as hospitals and clinics in the developing world. However, the device the student team designed could be sold for under $100. The low cost could give asthma patients in the U.S. as well as health-care providers in developing countries access to this powerful technology, which was specially designed for accuracy and durability despite its low price.

Michael K. Gibbons
Vice President, F/A-18 & EA-18 Programs, The Boeing Co.

Michael Gibbons started his career at McDonnell Aircraft (now The Boeing Co.) as a structural analyst working on the F/A-18 Program. In his 30 years with Boeing, Gibbons has enjoyed working a wide variety of assignments, including the F/A-18 F-15, AV-8B, A-12, JSF, and multiple classified programs.

Gibbons believes that his experience at Boeing has given him the opportunity to apply the theories of engineering he learned at Washington University.

“Every class I took at Wash U., I still use. I still do everything on airplanes, in buildings, you name it,” he says. “I’m applying something from almost every class I took at Wash U. I still solve textbook engineering problems and equations like when I was in college, but now I get to extend the knowledge to real-world applications and get paid for it.”

Cristina Garcia Duffy
Rotary Wing Aerodynamics Specialist, UK Aerodynamics Centre and AgustaWestland

After earning a doctorate in aerospace engineering with a concentration in rotorcraft, Cristina Garcia Duffy started her career at AgustaWestland, a helicopter manufacturer based in the United Kingdom. While at the company, Garcia Duffy has held different positions within the R&T department, from technical research in aerodynamics to managing programs within the R&T, leading the company’s University Research Centers and taking the co-lead on a Skunk Works-type program, Project Zero, which brought a number of innovative technologies together within one test vehicle and was designed, developed and tested in flight within six months. Now at the UK Aerodynamics Centre, Garcia Duffy is supporting the development of aerospace strategies to aid the government in the launch of future research programs, and advises the government and industry bodies on proposals of work for funding.

Sandra Sowah
Engineer, Structural Integrity Associates Inc.

Sandra Sowah works for Structural Integrity Associates Inc., a specialty engineering consulting firm in the San Francisco Bay area. She is a member of the firm’s Vibration and Instrumentation Group and specializes in analyzing piping vibrations and fluid mechanics phenomena for components in both boiling water reactors and pressurized water reactors.

“Most specialty engineering firms like Structural Integrity have fundamental engineering knowledge gained from college in complex and high-tech applications for engineering components, so you have to be on your game,” she says. “I’m applying something from almost every class I took at Wash U. I still solve textbook engineering problems and equations like when I was in college, but now I get to extend the knowledge to real-world applications and get paid for it.”
Facilities

The MEMS department is committed to providing undergraduate students with hands-on exposure to state-of-the-art instruments and measurement techniques. We maintain undergraduate labs for fluid mechanics, thermal sciences, materials science, vibrations and design. The school provides an excellent, supervised student machine shop and project space for student groups such as Engineers Without Borders and Wash U Racing.

Realizing the need for new research laboratories and specialized facilities that would support the school’s intellectual vision and plans, Chancellor Mark S. Wrighton committed the site at the northeast corner of WUSTL’s Danforth Campus for the School of Engineering & Applied Science. In 2007, the school developed a master plan for a new engineering complex that would complement and connect to the existing Uncas A. Whitaker Hall for Biomedical Engineering. The proposed approximately 700,000-square-foot complex will provide modern research and instructional facilities equipped with state-of-the-art technology needed to enable collaboration across disciplines.

$150M
Invested since 2001 in engineering space

LEED: The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ is a third-party certification program and the nationally accepted benchmark for the design, construction and operation of high-performance green buildings.

Select companies where our alumni work:

- Accenture
- Anheuser-Busch InBev
- Bain & Co. Inc.
- bioMerieux
- Boeing Co.
- Capital One
- Chrysler
- Cummins Inc.
- Deloitte LLP
- Egon Zehnder International
- Energy Solutions
- EPIC Systems Inc.
- Environmental Systems Design Inc.
- ESRP Inc.
- ExxonMobil Corp.
- Intelligated
- Johns Hopkins University Applied Physics Lab
- Kiewit (Energy Group)
- L’Oreal USA Inc.
- McMaster-Carr
- Murphy Co.
- Naval Sea Systems Command
- Nordyne Inc.
- OFI Testing Equipment Inc.
- PowerPlan
- Qinetiq North America
- Operations LLC
- Raytheon Co.
- RockTenn
- Rolls Royce
- Sider + Byers Associates
- Target Corp.
- Tesla Motors Inc.
- U.S. Air Force
- U.S. Army
- U.S. Patent and Trademark Office
- Vringo Inc.
- WorleyParsons Group Inc.
- Space Exploration Technologies Corp.

$64,333
Reported starting salary for a 2013 WUSTL Mechanical Engineering Bachelor of Science graduate

$63,900
National average

* National Association of Colleges and Employers
Henry A. and Elvira H. Jubel Hall

Henry A. and Elvira H. Jubel Hall, the new home of the Department of Mechanical Engineering & Materials Science, will be located near the intersection of Brookings Drive and Hoyt Drive. As the newest building in the Engineering complex at the northeast corner of campus, it will contain classrooms, laboratories, faculty offices and gathering and study areas.

The new space will allow the department to expand its faculty by up to 80 percent and provide the infrastructure to double its already robust research program. The new building will allow MEMS to enhance its research enterprise while maintaining a spirit of collaboration and commitment to undergraduate education. In addition, it will help meet the growing demands of a top-tier program in mechanical engineering, the school’s second-largest major.

“The three generations of the Jubel family have now earned or are earning degrees from Washington University, and I’m sure Henry Jubel would be honored by this gift,” says Mark S. Wrighton, chancellor of Washington University. “Jubel Hall will be an excellent example of the foundation’s mission to support young people seeking to improve their lives through higher education.”

The Jubel Family

When Henry A. Jubel came to the United States from Germany in the 1920s as a young boy, he likely never imagined that he would start what has become a multimillion-dollar international manufacturing company.

The aluminum die-casting company he founded in 1961, Spartan Aluminum Products (known today as Spartan Light Metal Products) in Sparta, Ill., has flourished and is now run by his son, Don Jubel, who is honoring his late parents with a gift from the Henry A. Jubel Foundation toward construction of the Henry A. and Elvira H. Jubel Hall. It’s a fitting tribute to a man who earned a bachelor’s degree in mechanical engineering from Washington University in 1940 with the help of a scholarship and wages from cutting grass, translating books from German to English and from his mother, who cleaned homes.

After graduating from Washington University, Henry Jubel took a position in 1941 with the Civil Service Ordnance Department, from which he received the highest civilian award and a cash bonus of $1,000 for inventing a modification of a grenade launcher that fit onto the bayonet attachment of the M-1 rifle. After World War II, he went to work for Sterling Aluminum Products as a production engineer. Later, changes at Sterling led Jubel to purchase Sterling’s aluminum die-cut machines to establish Spartan Aluminum Products.