Professor Mike McShane has developed an injectable biomaterial for delivering drug therapies and sensor technology to targeted areas within the body that can lock its payload in place and control how it is released.
The Department of Biomedical Engineering at Texas A&M University is steeped in tradition. ABET accredited since 1977, this department has a history of educating generations of quality biomedical engineers, developing new technologies and advancing health care. As the field of biomedical engineering grows to meet the needs of a burgeoning population, this department and its people remain committed to our tradition of making a positive impact.

Towards that goal, we continue to expand our faculty. Assistant Professor Akhilesh Gaharwar has recently joined our ranks, and we’ve added Professor Michael Madigan, Professor Raimund Ober and Assistant Professor Daniel Alge. We’re also excited about the additions of Alan Brewer and John Hanks, two of our new professors of practice who are bringing a wealth of industry insight to the classroom. I know our students will benefit tremendously from these additions as well as from their continued interactions with all of our faculty members.

And speaking of our faculty members, they’re significantly advancing their respective fields in a number of new and exciting ways – some of which are featured in this very issue. For example, Associate Professor Brian Applegate is developing an innovative approach to imaging the inner ear. Associate Professor Roland Kaunas is involved with stem-cell research in space that could lead to new cancer therapies. Professor Vladislav Yakovlev is working to safeguard water systems with technology capable of detecting contaminants. Our cover story details the work of Professor Michael McShane who has developed an injectable biomaterial for delivering drug therapies and sensor technology to targeted areas in the body. I invite you to read about these stories and more in this edition of our department magazine.

Note from the Department Head

Gerard L. Coté
Department Head and Charles H. & Bettye Barclay Professor

And speaking of our faculty members, they’re significantly advancing their respective fields in a number of new and exciting ways – some of which are featured in this very issue. For example, Associate Professor Brian Applegate is developing an innovative approach to imaging the inner ear. Associate Professor Roland Kaunas is involved with stem-cell research in space that could lead to new cancer therapies. Professor Vladislav Yakovlev is working to safeguard water systems with technology capable of detecting contaminants. Our cover story details the work of Professor Michael McShane who has developed an injectable biomaterial for delivering drug therapies and sensor technology to targeted areas in the body. I invite you to read about these stories and more in this edition of our department magazine.
Understanding how hearing works has long been hampered by challenges associated with seeing inside the inner ear, but technology being developed by a team of researchers that includes a biomedical engineer from Texas A&M University is generating some of the most detailed images of the inner ear to date. The research is offering new insight into the mechanics of hearing that could lead to new therapies for hearing loss.

Employing a technique that generates high-resolution, three-dimensional images, Brian Applegate, associate professor in the Department of Biomedical Engineering at Texas A&M, and colleagues from Stanford University are mapping the tissues within the cochlea, the portion of the inner ear responsible for hearing. Their research, which appears in the Journal of Neurophysiology, could lead to breakthroughs in understanding of cochlear function, Applegate says.

Although the hearing process hinges on what takes place inside the cochlea, that important area of the inner ear has been traditionally difficult to study, Applegate says. Its small size and the fact that in humans its tissues are encapsulated – and therefore obscured – by dense bone create significant access issues. Researchers, he explains, can’t drill into the bone without risking damage to the tissues within or, at the very least, altering the mechanics of the delicate system. These factors, he says, have resulted in a general lack of information about how the cochlea amplifies sound and converts vibrations into nerve impulses. That dearth of functional and structural knowledge about the cochlea is a chief reason hearing loss diagnoses are typically based on circumstantial evidence as opposed to morphological proof, he adds.

New information about how the cochlea works, however, is emerging, thanks to the system developed by Applegate and his colleagues. Capable of rendering detailed images of tissues within an intact cochlea, the system employs a technique known as “optical coherence tomography,” or OCT. OCT is similar to ultrasound but generates images with much higher resolution. The images are produced from measurements of the inner ear’s structure and the incredibly small vibrations within the cochlea, Applegate says.

Though the technology has been primarily used in animal models to date, it’s already resulted in the first vibration measurements from the apex of an unopened mouse cochlea, allowing researchers to image the portion of the cochlea responsible for low frequencies. Since mammalian hearing is similar across species, the model allows the researchers to use the technology on a hearing system similar to the one in humans, Applegate notes.

“We’re working on making measurements of the movement within the cochlea that have never before been made.”

“We are the first to use this technique on mice in order to image the cochlea,” Applegate says. “We’re working on making measurements of the movement within the cochlea that have never before been made; we’re finding out new things about the mechanics of the inner ear that have not been known.”

Among the team’s findings is evidence suggesting different areas of the cochlea are responsible for different things, Applegate says. Specifically, gain (the amplification of sound) and
Technology capable of sampling water systems to find indicators of fecal matter contamination that are thousandths and even millionths of times smaller than those found by conventional methods is being developed by a team of researchers at Texas A&M University.

Working with a team of collaborators, Vladislav Yakovlev, professor in the Department of Biomedical Engineering, has developed an ultrasensitive detection method that can detect molecules associated with human and animal fecal matter in water systems. These extremely small indicators, he explains, have been traditionally difficult to detect but can signal greater levels of contamination, which can lead to illness and even death.

Encouraged by their results, Applegate and his team have developed a prototype device for use on humans. The device, a hand-held instrument, enables a researcher or physician to pass a probe through the ear canal and tympanic membrane in order to shine a laser through a thin membrane located on the cochlea where they can then image the inner ear tissues with the same technology.

"The point of our research is to better understand hearing, to learn more about the actual morphology of the inner ear as well as how it processes vibrations," Applegate says. "We also want to understand how different pathologies affect the ear. We want to know what happens when a person has progressive hearing loss due to loud sounds, traumatic injury or even genetic mutations. We want to see how these things change the soft tissue in the ear."

Towards that goal, the OCT technology employed by Applegate generates huge amounts of data about the cochlea. Thousands of measurements are taken from myriad points throughout the cochlea, resulting in gigabytes – and sometimes terabytes – of information that must be processed and interpreted in order to produce images. Applegate explains.

"All of this requires a fair amount of math to generate and interpret the results," Applegate says. "The signal is digitized and passed to something called a Field Programmable Gated Array (FPGA) where initial processing is done before sending it to the CPU. We collect two channels of data but end up only passing one to the CPU minutes," he says. "We will rely on this data-reducing equipment more and more as we move toward producing a volumetric image that enables us to see an entire sound wave move down the cochlea."

Data reduction, Applegate explains, is an important time-saving part of the process made possible by equipment produced by National Instruments, a global leader in providing test, measurement and embedded systems for engineers and scientists. With the aid of the equipment, the data generated from measurements within the cochlea is processed at a significantly faster rate, Applegate says.

"We can take a six-hour process and make it happen in a couple of
The team’s research is funded by the National Science Foundation and is featured in the journal “Proceedings of the National Academy of Sciences.” It details the development of technology that Yakovlev characterizes as affordable, highly sensitive, easy to implement and capable of delivering analysis of water samples in real time. That combination of benefits, he says, gives the system a leg up on other detection technologies, making it ideal for use not only in the United States but in developing countries, which often face water quality issues.

At home and abroad, animal and human waste can contaminate both recreational and source waters, carrying diseases such as polio, typhoid and cholera. This form of contamination can even result in environmental crises, such as devastation to the aquatic population and red-tide blooms, Yakovlev notes. These types of contamination events, Yakovlev explains, might be mitigated or even avoided if samples from water systems are more thoroughly analyzed so that they can provide a better picture of what is in the water. In other words, finding trace amounts of contaminants such as fecal matter in water systems can help sound the alarm for a serious contamination event because these trace amounts likely originate from a larger source in the water system, he notes.

However, detecting these trace amounts isn’t easy, especially in a timely manner, Yakovlev says. High costs, sample size limitations and lengthy analysis times, he notes, have prevented environmental researchers from employing highly sensitive techniques that can deliver real-time analysis – until now.

In addition, urobilin possesses another interesting property: it glows – or more accurately, it can be made to glow. When mixed with zinc ions, urobilin forms a phosphorescent compound, Yakovlev explains. This means if urobilin is present in a water sample – and zinc ions have been added – the sample will give off a greenish glow when examined under an ultraviolet light, he says. There’s just one catch. In some samples with low concentrations of urobilin, the glow, or phosphorescent emission, can be weak, making it difficult to analyze the sample. Researchers, Yakovlev says, must be able to thoroughly excite the sample (causing the reaction), observe the glow and then measure it in order to perform an accurate analysis.

Towards that goal, Yakovlev and his team have developed technology that allows them to thoroughly excite extremely small amounts of urobilin in large samples of water and then efficiently collect the resulting phosphorescent emission, regardless of how weak that emission might be. It’s done with the help of a device researchers refer to as an “integrated cavity.”

The integrated cavity used by the team of researchers is essentially a hollow, cylindrical container manufactured in Yakovlev’s laboratory. A water sample is placed inside the cylinder where it interacts with zinc ions, and a laser light is beamed into the object and onto the sample through a small hole, a process known as “integrated cavity.”

Graduate student Joel Bixler applies a laser to an integrated cavity prototype to excite the sample and trigger a phosphorescent emission.

It is estimated that pathogens in water each year cause more than two million deaths throughout the world.

Yakovlev explains. The light excites the urobilin compound present in the sample, causing it to emit a glow. The only way for the light to exit the cylinder, he notes, is through the hole that it initially entered. Not only does this ensure that all the light that enters the cylinder is used to excite the entire sample, it also enables researchers to efficiently collect the resulting phosphorescent emission so that it can be directed to a photo detector, such as a spectrometer, for analysis, Yakovlev says.

Employing the integrated cavity in their detection efforts, Yakovlev and his team have detected the presence of urobilin down to a nanomole per liter. A mole is a common unit of measurement in chemistry, and a nanomole is one billionth of that measurement. What’s more, the technology provides actual concentration levels of the contaminant, and it does so much quicker than other methods, he notes.

“We can demonstrate detection of ultralow concentrations of urobilin in solution,” Yakovlev says. “This is a huge improvement in terms of sensitivity, and our technique has tremendous potential for analysis of global drinking water supplies, particularly in developing nations and following natural disasters, where sophisticated laboratory equipment may not be available.”

Another key element of the technology, which can be produced for a few hundred dollars, is its ability to analyze large samples, Yakovlev notes.

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“ar around the world could benefit from the detection technology developed by Yakovlev and his team.
Meet Professor Vladislav Yakovlev

Vladislav Yakovlev is professor in the Department of Biomedical Engineering at Texas A&M University. Fellow of the Optical Society of America, and Fellow of the International Society for Optics and Photonics (SPIE). His research focuses on the development of new instrumentation for biomedical diagnostics and imaging.

Yakovlev, who joined Texas A&M in 2012, has made many significant contributions to the field of optical instrumentation for biomedical sensing and imaging. He has advanced the technology of ultrasmall solid-state lasers, and he was the first to adapt an optical pulse-shaping technique to improve the quality of multiphoton imaging. Yakovlev also has developed a simple approach for hyperspectral nonlinear Raman microspectroscopy, which is now widely used for biomedical microscopic imaging, and he has recently demonstrated its applicability for deep-tissue, chemically-specific imaging. In addition, he has engineered a novel material for substantially improved sensitivity of high-frequency ultrasound detection.

Yakovlev received his master’s degree in physics and Ph.D. in quantum electronics from Moscow State University. He says. Think smoke detector for a water faucet. Equally as important, he notes, the technology can be used for detection of other types of toxic compounds in both liquids and gases, lending itself to anti-terrorism applications, among other uses.

Yakovlev’s collaborators are Marlan O. Scully and Edward S. Fry, distinguished professors in the Department of Physics and Astronomy at Texas A&M; and graduate students Joel N. Baker, Michael Cone, Brett Hoke, John Mason and Ellie Figueroa.

As its stands, Yakovlev and his team are working to commercialize the technology for urobilin detection. Because it delivers nearly instantaneous results, it could serve as the basis for in-home detection systems that alert users if the water coming from their faucets is suddenly contaminated.

Meet Roland Kaunas.

Stem-cell research scheduled to take place aboard the International Space Station could lead to new cancer therapies, says a researcher from Texas A&M University’s Department of Biomedical Engineering who is part of a team preparing the cell culture for space travel.

The research, by Roland Kaunas, associate professor in the Department of Biomedical Engineering, will provide a new method to study the impact of tumor cells on stem-cell differentiation into bone.

Bone tumors, Kaunas explains, degenerate bone through their ability to inhibit bone stem cell function. However, stem cells behave differently in the absence of gravity. For example, stem cells can generate tissue-like structures that cannot be replicated on Earth, he notes. This key aspect will allow for the development of a system that enables researchers to identify potential molecular targets for drugs that inhibit the effects of tumor cells and hence, reverse the damage these tumors cause in bone, Kaunas says.

Kaunas’ research, which is being sponsored by NASA and the Center for the Advancement of Science in Space (CASIS), was one of two stem-cell investigations highlighted at the World Stem Cell Summit in San Diego.

NASA is interested in space-based cell research because it is seeking ways to combat the negative health effects astronauts face in microgravity, including bone loss and muscle atrophy, stated NASA representatives in a news release issued by NASA. Mitigation techniques are necessary to allow humans to push the boundaries of space exploration far into the solar system. This knowledge, the release reads, could help people on Earth, particularly the elderly, who are afflicted with similar conditions.

Meet Roland Kaunas. Scan this QR code with your smart device.

NASA selected CASIS to maximize use of the International Space Station’s U.S. National Laboratory through 2020. CASIS is dedicated to supporting and accelerating innovations and new discoveries that will enhance the health and wellbeing of people and our planet.

Meet Roland Kaunas. Scan this QR code with your smart device.

Stem-cell Research Aboard International Space Station Could Lead to New Cancer Therapies

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An injectable material developed by Professor Michael McShane is helping bring targeted drug delivery and embedded sensor technology a step closer to reality.

A new injectable material designed to deliver drug therapies and sensor technology to targeted areas within the human body is being developed by a Texas A&M University biomedical engineer who says the system can lock its payload in place and control how it is released.

The research, led by Michael McShane, professor in the Department of Biomedical Engineering who specializes in biomaterials, and graduate student Jason Roberts, appears in “Journal of Materials Chemistry B.” It details the development of a carrier system embedded with microscopic capsules that act as tiny reservoirs for medicines or even sensors that would alert a person in critical instances, such as when blood-sugar levels change.

The technology, McShane notes, affords researchers a high degree of control over what is delivered to the body, where and when it is delivered and how much of it is delivered. That degree of flexibility, he says, could make the system an extremely useful tool when it comes to targeted drug delivery.

As opposed to having patients simply swallow a pill, health care professionals have long envisioned delivering specific quantities of medicines to targeted areas of the body, thereby increasing the treatment’s effectiveness while reducing side effects. In order to achieve this, a “vehicle” of sorts is needed to safely and accurately deliver the medicine to the desired location within the body.

**A better vehicle**

McShane’s team, which also includes graduate student Dustin Ritter, is building that vehicle using a modified Jell-O-like substance known as a hydrogel. A hydrogel is a polymer mesh material that is typically biocompatible, meaning it allows cells within the body to conduct normal physiological processes without triggering an immune response from the host. Because of this, hydrogels are widely used in tissue engineering research, and they can be found in a number of other applications, most commonly as the material from which contact lenses are made.

Although hydrogels aren’t new, the ones employed in McShane’s carrier system aren’t typical; they’ve been enhanced. Specifically, they are embedded with tiny capsules that are significantly smaller than the width of a human hair. Each of these microcapsules serve as a reservoir or depot for the material doctors and researchers want to deliver, such as a drug.

Measuring a few microns in diameter, these porous microparticles are made from clusters of calcium carbonate nanoparticles that have been deliberately formed around a specific material to trap it inside, McShane notes. Once the desired material is trapped within the microsphere, multiple layers of polymers are wrapped around the particles, he explains. This allows for precise and customizable control over how the microcapsule will release its contents when it interacts with its surrounding environment, McShane explains.

**Biosensors, too**

The system, McShane says, is not limited to drug delivery. In fact, it has shown promising results with biosensors. In these types of applications, he explains, the microcapsules carry a payload, such as a protein, that is responsive to something in the body that doctors want to measure. This measurable material is allowed to pass into the hydrogel and into the capsules where it triggers some type of optical change, he says. For example, McShane has been able to trigger a color change in the material (observable with a reader device) when pH and oxygen levels change or when blood-sugar levels fluctuate. It’s work that could translate into safer and more effective ways for people, such as those suffering from diabetes, to monitor their conditions.

“Through chemistry, we can design these microcapsules so that when we put inside of them stays inside of them or what we put inside of them is released when we want it to be released – all at once or gradually,” he says.

**From liquid to gel**

The microcapsules also play another critical role in the system – helping to transform the hydrogel from a liquid to a gel once it is inside the body. McShane notes. In order to be easily administered, McShane’s carrier system starts as a liquid with tiny solid suspended particles. This allows it to be injected into the desired location, transporting the microcapsules and their contents. By manipulating the chemical reactions that take place between the microcapsules and the hydrogel – such as calcium release as the particles dissolve – McShane and his team can control how quickly their system turns into a gel.

That’s important because the hydrogel helps lock in place the microcapsules at the correct location while also acting as a buffer between them and the body’s internal environment. Without the gelation of the carrier system, the microcapsules could be absorbed into the lymph system, broken down by the body and removed before they could release their contents, or they could migrate away from the targeted location, McShane explains.

“Basically, our material starts as a liquid with a bunch of microspheres suspended in it, and we can inject it,” he says. “It will then gel wherever we inject it, taking the shape of the mold in which it is placed. This mold could be something we design to give it a certain shape, or it could just be a void in tissue that we’re trying to fill with the material.

“It’s the combination of controlling the gelation, and then controlling how the microcapsules function that makes this a unique and viable system for a variety of applications.”

An injectable material developed by Professor Michael McShane is helping bring targeted drug delivery and embedded sensor technology a step closer to reality.
What differentiates biomedical engineering education at Texas A&M?

The 42-year program in biomedical engineering at Texas A&M has been ABET accredited since 1977 and, although long standing, is ahead of the curve in terms of providing both quality education as well as recruiting excellent and diverse undergraduate and graduate students. One thing that sets the Texas A&M program apart is that it not only places those students in leading universities, medical and graduate schools, and government laboratories, but it also produces students who are consistently sought by biomedical engineering companies. The faculty not only provides quality education but also is engaged in excellent, leading-edge fundamental research. However, one area that truly differentiates biomedical engineering faculty members at Texas A&M is their superb translational research that includes working with industry, forming medical device companies, and designing medical devices that truly impact clinical medicine.

What does the future of the biomedical engineering field look like, given it is one of the fastest growing engineering disciplines?

The biomedical engineering field has been America’s fastest-growing field for the past decade. According to the latest report from the Bureau of Labor Statistics, the job outlook for biomedical engineers and physicians is brighter than the overall projected growth for all occupations, including other engineering professions. Specifically, employment of biomedical engineers is expected to grow by 62 percent from 2010 to 2020. Demand will be strong because an aging population will likely need more medical care and because of increased public awareness of biomedical engineering advances and their benefits. Health technologies, in general, were recognized by the National Academy of Engineering as one of the areas of greatest achievement in the 20th century, and this is likely to continue into the 21st century. There has been a substantial increase in the number of biomedical engineering departments nationwide, and students have found it to be a very popular major that has continually drawn diverse students into engineering, including up to 50 percent females in many departments across the country.

Describe your area of expertise.

My research focuses on the development of macroscale to nanoscale systems using lasers, optics and electronics for in-vivo and in-vitro sensing, such as development of a glucose-monitoring system for determining blood sugar levels in patients with diabetes, optically monitoring perfusion and oxygenation for tissue transplants and wearable technologies, and the development of point-of-care and cell phone-based devices to remotely detect cardiac biomarkers, blood toxins, skin cancer and malaria. My focus has not only been in fundamental research as the co-author of more than 250 publications, proceedings and abstracts but also in translational research as co-holder of several U.S. patents and co-founder of three medical device companies.

In my new role as the director for the Center for Remote Healthcare Technology, I believe that as wearable fitness devices and medical technologies in the home become more sophisticated we can not only enable healthy living but truly shift the landscape in the field of medicine from disease management to disease prevention. The center serves as a focal point to identify and overcome the unmet patient and health care provider needs through development of breakthrough health care devices, technologies and information systems. 
Criscione Named Assistant Dean for Graduate Programs

Dr. M. Katherine Banks, vice chancellor and dean of engineering, has appointed Dr. John C. Criscione assistant dean for graduate programs at Texas A&M University’s Dwight Look College of Engineering.

Criscione joins the Texas A&M faculty in 2001 as assistant professor and is currently an associate professor in the Department of Biomedical Engineering. He earned a bachelor's degree in applied physics from Purdue University, a Ph.D. in biomedical engineering, and an M.D. from the Johns Hopkins University.

Criscione’s research focuses on how mechanics — the study of force and motion in matter — applies to the biology of the heart and how to utilize such knowledge to obtain better clinical outcomes. Toward this end, state-of-the-art modeling tools are essential for representing the mechanical behavior of biological tissues, and Criscione has made fundamental contributions to the nonlinear field theories of mechanics. In order to translate research discoveries into therapies for heart failure, Criscione is an active inventor and entrepreneur. As a founder and CEO of CorInnova, an early-stage medical device company, he has firsthand knowledge of the medical device industry — experience that he uses to guide his research and teaching in the research, development, design and regulation of medical technologies.

He is an advisory board member of FDA Medical Device Industry Coalition and a charter fellow of the Michael E. DeBakey Institute of Comparative Cardiovascular Science and Biomedical Devices at Texas A&M.

In 2012, Criscione was selected to take part in the National Academy of Engineering’s fourth Frontiers of Engineering Education symposium, which included 72 of the nation’s most innovative, young engineering educators. He also received the 2009 Bryan Rotary Club/Research Valley Commercialization Rising Star Award for his work in accelerating the commercialization of Texas A&M heart technologies.

Efforts by helping our researchers identify promising technologies and pursue their commercialization, which ultimately, contributes to economic development for the State of Texas. Dr. Criscione has a broad background as a successful faculty member and experience in developing and commercializing biomedical devices. Banks said, “His service in this capacity for TEES will enhance our commercialization efforts by helping our researchers identify promising technologies and pursue their commercialization, which ultimately, contributes to economic development for the State of Texas.”

Maitland’s research focuses on novel treatments of cardiovascular disease with a focus on strokes. Maitland’s research projects include endovascular interventional devices, microcoaxial, optical therapeutic devices and basic device-body interactions/physics including computational and experimental techniques.

Maitland is the group leader of the Biomedical Device Laboratory, which develops a number of interventional devices, including those based on shape memory polymers (SMPs). SMPs have attracted increased attention from the scientific community for numerous applications, ranging from aerospace applications to the biomedical industry.

Earlier this year, Maitland was honored as a “TEES Faculty Fellow” for contributions to teaching, research and service. The designation recognizes established faculty members with a history of continuous performance. TEES is an engineering research agency of the State of Texas and a member of The Texas A&M University System. Texas A&M engineering faculty members hold joint appointments as TEES researchers.

Coté Named Director of Center for Remote Healthcare Technology

Gerard L. Coté, professor and head of the Department of Biomedical Engineering at Texas A&M University, has been named director of the Texas A&M Engineering Experiment Station’s Center for Remote Healthcare Technology (CRHT), announced M. Katherine Banks, vice chancellor and dean of Texas A&M Engineering.

CRHT, which was established in 2013, has a vision of enabling healthy living by shifting the landscape from disease management to disease prevention. The center’s mission is to identify and overcome the unmet patient and health care provider needs through development of breakthrough health care devices, technologies and information systems.

Towards this goal, the center serves as a focal point to facilitate significant advances in the remote health care field through next-generation wireless & remote medical information systems, translational research in biomedical devices, and development of innovative algorithms and test and measurement systems.

Researchers at the center are not only developing innovative prototype and information systems but also engaging state and federal and regulatory agencies, the medical community, and the medical device industry in an effort to further the design, development, testing and deployment of those systems.

Coté, who joined Texas A&M in 1991, is holder of the Charles H. and Bettice Rayburn Professorship in Engineering. In addition, he holds the rank of Fellow in the Institute of Electrical and Electronics Engineers, the International Society for Optics and Photonics, the Biomedical Engineering Society, and the American Institute for Medical and Biological Engineering.

Coté’s primary research interests include the use of optics for medical diagnostics and biomedical sensing. Within the Department of Biomedical Engineering, he directs the Optical Biosensing Laboratory, which focuses on the design, development, theoretical modeling and analysis of optical sensors for biomedical measurements. He is also director of three Houston-based medical device companies, BioTex, Inc., Vinalase, Inc., and Base Pair Biotechnologies.

A recipient of numerous awards throughout his career for teaching and research, Coté’s honors include receiving the Mary Jane Kugel Achievement Award from the Juvenile Diabetes Research Foundation International, the Association of Former Students (AFS) Faculty Distinguished Achievement Award in Teaching, and the AFS Distinguished Achievement Award for Research.

Coté completed his undergraduate degree in electrical engineering from Rochester Institute of Technology and earned his master’s degree and Ph.D. in biomedical engineering from the University of Connecticut.

Alge and Madigan Join Biomedical Engineering Faculty

Daniel Alge, a biomedical engineer specializing in biomaterials and tissue engineering, and Michael L. Madigan, a biomedical engineer specializing in biomechanics, have joined the faculty of the Department of Biomedical Engineering at Texas A&M University at the rank of assistant professor and professor, respectively.

Prior to working as a postdoctoral associate in the laboratory of Professor Kristi Anseth at the University of Colorado, Alge earned his Ph.D. from Purdue University where he worked with Professor Tim-Min Chen Chu.

Alge's research interests span chemistry, biology and materials science, with the overarching theme of developing enabling biomaterials for fundamental and translational applications in tissue engineering. His scientific achievements include 19 peer-reviewed research papers, more than 25 conference presentations, and two U.S. patent applications. He is also a dedicated teacher and mentor, and recently co-authored a book chapter on polymer chemistries for tissue engineering.

Madigan, who prior to joining Texas A&M served as associate professor and Kevin P. Granata Faculty Fellow at Virginia Polytechnic Institute and State University, researches injury prevention through the study of the dynamics and motor control of human movement. Specifically, he is focusing on balance and falls as well as low back pain and injury due to their high prevalence and impact on society.

Madigan completed his B.S. and M.S. degrees in bioengineering from Texas A&M University. After working with a Small Business Innovation Research (SBIR) company for two years, he returned to academia and completed his Ph.D. in biomedical engineering from Virginia Commonwealth University.
Cosgriff-Hernandez, Yakovlev Named College of Engineering Faculty Fellows

Elizabeth Cosgriff-Hernandez and Vladislav Yakovlev, faculty members in the Department of Biomedical Engineering at Texas A&M University, have been named recipients of the 2013-2014 Dwight Look College of Engineering Faculty Fellow Awards.

Cosgriff-Hernandez was named a Charles H. Barclay Jr. ’23 Fellow, and Yakovlev was named a Eugene Webb Fellow. The announcement was made by M. Katherine Banks, vice chancellor and dean of engineering.

Cosgriff-Hernandez is associate professor in the department. She joined Texas A&M in 2007. Her laboratory specializes in the development of hybrid material systems that combine the advantages of synthetic and natural polymers such as collagen to advance tissue engineering design. Cosgriff-Hernandez completed her undergraduate degree and earned her Ph.D. at Case Western Reserve University.

Yakovlev is professor in the department and holds fellow designations with the Optical Society of America, the American Institute for Medical and Biological Engineering, and the International Society for Optics and Photonics. He joined Texas A&M in 2012. His research focuses on nanoscopic optical imaging of molecular and cellular structures, single-molecule spectroscopy and manipulation; protein spectroscopy and structural dynamics; bioanalytical applications of optical technology and spectroscopy, and deep-tissue imaging and sensing. Yakovlev completed his undergraduate degree and earned his Ph.D. at Moscow State University.

McShane, Yakovlev Elected to AIMBE College of Fellows

Two professors in the Department of Biomedical Engineering at Texas A&M University have been elected to the American Institute for Medical and Biological Engineering (AIMBE) College of Fellows.

Michael J. McShane and Vladislav V. Yakovlev each have been elected to the College of Fellows for their outstanding contributions to research and education. As Fellows, they represent the top two percent of the medical and biological engineering community.

The College of Fellows comprises 1,500 individuals who are recognized as outstanding bioengineers in academia, industry and government and have distingushed themselves through their contributions to research, industrial practice and/or education. Fundamental to their achievements is the common goal of embracing innovation to improve the health care and the safety of society.

McShane and Yakovlev were formally inducted during AIMBE’s Annual Meeting in March.

McShane joined the Department of Biomedical Engineering in 2006. His research and educational activities cover many areas of biomedical engineering, including biomaterials, molecular biology, biomedical optics, biotransport, bioinstrumentation, signal processing and medical device design. His laboratory develops and tests sensor systems using microscale and nanoscale fabrication approaches of self-assembly and photolithography as well as develops strategies for deploying these in vitro and in vivo.

Yakovlev joined Texas A&M in 2012. His research focuses on the development of new instrumentation for biomedical diagnostics and imaging. Yakovlev’s primary research interests include nanoscopic optical imaging of molecular and cellular structures, single-molecule spectroscopy and manipulation, protein spectroscopy and structural dynamics; bioanalytical applications of optical technology and spectroscopy, and deep-tissue imaging and sensing.

McShane and Yakovlev are both interested in materials science, chemical engineering, and held joint appointments in the departments of chemistry and biological engineering. The book, Gaharwar says, is a standard reference for researchers and tissue engineers with an interest in nanomaterials, laboratories investigating biomaterials, and academics interested in materials science, chemical engineering, biomedical engineering and biological sciences. It explores the fabrication of a variety of nanomaterials and the use of these materials across a range of tissue engineering applications, he adds.

The book focuses on the fabrication of nanomaterials for tissue engineering applications and includes chapters on the use of nanoparticles for imaging nanoscale biocomposites, nanoscale biotransport, and nanoscale drug delivery systems. The book, Gaharwar says, is a standard reference for researchers and tissue engineers with an interest in materials science, chemical engineering, and biomedical engineering.

Piskho Inducted into University of Missouri Chemical Engineering Academy of Distinguished Alumni

Michael V. Piskho, the Stewart & Stevenson Professor II in the Department of Biomedical Engineering and director of the National Center for Therapeutics Manufacturing (NCTM) at Texas A&M University, has been inducted into the University of Missouri Chemical Engineering Academy of Distinguished Alumni.

“Piskho joined the Department of Biomedical Engineering in January 2012. Most recently, Piskho served as Charles D. Holland ’53 Professor and Department Head of Chemical Engineering at Texas A&M University. In that role, he led a department of 27 tenured and tenure-track faculty, 1,000 students, $13 million per year in research expenditures and $20 million in endowments.

Before joining the Texas A&M faculty, he was distinguished professor and held joint appointments in the departments of chemistry and materials science and engineering at Penn State University.

In addition to his academic experience, Piskho has been involved in the creation of two start-up companies in the area of diagnostic systems, has co-authored more than 100 peer-reviewed publications and proceedings and is co-inventor of more than 22 issued U.S. patents. In 2008, he received the American Institute of Chemical Engineers (AIChE) Food, Pharmaceuticals and Bioengineering Plenary Lecture Award for his presentation “Nanoparticles for Drug Delivery and Biochemical Sensing,” detailing his research in nanoparticles and drug delivery systems for chemotherapy and the development of nanosensors for mapping oxidative stress in cells.

He also serves as director of the NCTM, which is jointly operated by the National Institute of Standards and Technology and the Texas A&M Engineering Experiment Station. This first-in-class biopharmaceutical workforce development and GMP manufacturing facility provides an interactive learning environment for trainees, students, researchers and industrial partners.

Piskho received his B.S. and M.S. in chemical engineering from the University of Missouri, Columbia and Ph.D. in chemical engineering from the University of Texas at Austin, and postdoctoral training at the Massachusetts Institute of Technology. His research interests include microfabricated biosensors, microfabrication of implantable biomaterials and "smart" drug delivery systems.
Grunlan Elected Secretary of Polymeric Materials: Science and Engineering

Melissa Grunlan, associate professor in the Department of Biomedical Engineering at Texas A&M University, has been elected secretary of Polymeric Materials: Science and Engineering (PMSE), a division of the American Chemical Society. Grunlan, who completed her undergraduate career and earned her master’s degree at North Dakota State University, earned her Ph.D. at the University of Southern California, Los Angeles in 2004. She joined the biomedical engineering faculty at Texas A&M in 2005 after a postdoctoral appointment in the Department of Chemistry.

Her laboratory focuses on developing new polymeric biomaterials for medical devices and regenerative therapeutics. She has produced coatings, hydrogels, elastomers and porous foams from “hybrid” systems based on combining inorganic and organic polymers. Her group also includes development of self-cleaning membranes for implanted biosensors, dot-resistant coatings for blood-contacting devices and scaffolds for bone repair and for the regeneration of osteochondral interfaces.

Previously, Grunlan served PMSE as “member-at-large.” In addition, she was selected to speak at the PMSE Young Investigator Symposium at the Fall 2012 national meeting in Philadelphia where she co-organized a PMSE symposium on polymeric biomaterials.

Yakovlev Named SPIE Fellow

Vladislav Yakovlev, professor in the Department of Biomedical Engineering at Texas A&M University, has been promoted to the rank of fellow in the International Society for Optics and Photonics (SPIE) for his achievements in optical instrumentation for biomedical imaging.

The annual recognition of Fellows provides an opportunity for SPIE to acknowledge members and to SPIE. More than 1,000 SPIE members have become Fellows since the society’s inception in 1955.

Yakovlev, who joined Texas A&M in 2012, has made many significant contributions to the field of optical instrumentation for biomedical sensing and imaging. He has advanced the technology of ultraviolet solid-state lasers, making it an indispensable tool for multiphoton microscopy, imaging and sensing. In addition, he was the first to adapt an optical pulse-shaping technique to improve the quality of multiphoton imaging. Yakovlev also developed a simple approach for hyperspectral nonlinear Raman microscopy, which is now widely used for biomedical microscopic imaging, and Adams, he has extensively demonstrated the utility of deep-tissue, chemically-specific imaging. Yakovlev’s most recent contribution to the field of biomedical engineering is related to the discovery of a novel material for substantially improved sensitivity of high-frequency ultrasound detection.

Throughout his career, Yakovlev’s research projects have garnered many awards and honors, and he has been issued five patents. Yakovlev has published more than 100 papers in peer-reviewed journals, given 30 invited public presentations and more than 100 presentations at different conferences. He has also edited a book on the biochemical applications of nonlinear optical spectroscopy and contributed to several books and textbooks. In addition, he has served as a program committee member and symposium organizer for several international conferences in the field of optics.

Yakovlev is a lifetime member of SPIE and has served as a program committee member of two international SPIE conferences. He regularly participates as a speaker at SPIE conferences and also has been an invited speaker. He has supervised his research in the Journal of Biomedical Optics and Optical Engineering and serves as a reviewer for both publications. He also has served as a special section guest editor for the Journal of Biomedical Optics.

Yakovlev received his master’s degree in physics and Ph.D. in quantum electronics from Moscow State University.

SPIE is a not-for-profit organization founded in 1955 to advance light-based technologies. The society serves more than 235,000 constituents from approximately 155 countries, offering conferences, continuing education, books, journals and a digital library in support of interdisciplinary information exchange. He has served as a program committee member and symposium organizer for several international conferences in the field of optics.

K. Maitland Named IEEE Senior Member

Kristen Maitland, associate professor in the Department of Biomedical Engineering at Texas A&M, has been promoted to senior member of the Institute of Electrical and Electronics Engineers (IEEE). As a senior member, Maitland joins a select eight percent of IEEE’s 419,900 total members. Her elevation to senior grade is based upon extensive experience, and reflects professional maturity and sustained achievements of significance.

Maitland’s research focuses on the design, construction and testing of multi-modal, multi-scale, multi-dimensional and high-speed optical imaging systems for preclinical and clinical, in vivo and in situ imaging. She joined the Department of Biomedical Engineering at TAMU in 2008 after completing her undergraduate studies and masters degree at California Polytechnic State University and earning her Ph.D. at the University of Texas at Austin. She is recipient of the National Science Foundation (NSF) CAREER Award and the Texas A&M Women’s Progress Award as well as a Texas A&M Engineering Experiment Station Select Young Faculty member.

IEEE is the world’s largest professional association dedicated to advancing technological innovation and excellence for the benefit of humanity. It is designed to serve professionals in all aspects of the electrical, electronic and computing fields and related areas of science and technology that underlie modern civilization.

Ober Joins Biomedical Engineering Faculty

Raimund Ober, a biomedical engineer specializing in microscopy techniques, has joined the faculty of the Department of Biomedical Engineering at Texas A&M University at the rank of professor.

Prior to joining Texas A&M, Ober served as professor at the University of Texas at Dallas. He also is an adjunct professor at the UT Southwestern Medical Center at Dallas and a member of its graduate program in biomedical engineering.

His research interests relate to the development and application of engineering principles to problems in molecular/cellular biology, cancer therapeutics and immunology. Of particular interest is the development of new microscopy techniques and, more specifically, single molecule microscopy approaches. His theoretical and experimental investigations of the classical resolution problem showed that there is no resolution limit in a microscope, but that distances well below those estimated by Rayleigh’s criterion can be resolved.

He has pioneered the development of a new microscopy modality, multilevel plane microscopy, to enable the study of fast cellular transport processes in three-dimensions. Using microscopy and other techniques, his research group and collaborators investigate the dynamics and transport of targets in cells and interactions with their target proteins in a cellular context; for example, engineered antibodies that target tumor cells.

Pishko Honored as Regents Fellow by Texas A&M System Board of Regents

Michael V. Pishko, professor in the Department of Biomedical Engineering at Texas A&M University, has been honored with the designation of Regents Fellow by the Texas A&M University System Board of Regents.

Pishko, holder of the Stewart & Stevenson Professorship II of Biomedical Engineering and director of the National Center for Therapeutics Manufacturing, joins a select group of agency professionals who were formally honored last January in Galveston, Texas.

“The Regents Awards allow us to show our outstanding faculty and researchers that we value their contribution to the A&M System,” said Board Chairman Phil Adams. “It is their commitment to excellence that makes the A&M System one of America’s very best.”

“Our staff, faculty and researchers are the backbone of the A&M System. This is an excellent opportunity for us to recognize the significant contributions these individuals make each day not only in the A&M System, but all over the world,” said A&M System Chancellor John Sharp.

The Board established the Regents Professor Award program in 1996 and Regents Fellow Award program in 1998 to recognize employees who have made exemplary contributions to their university or agency and to the citizens of Texas. To date, 103 agency professionals have received the Regents Fellow Service Award.

The A&M System is one of the largest systems of higher education in the nation, with a budget of $13.8 billion. Through a statewide network of 11 universities, seven state agencies, two service units and a comprehensive health science center, the A&M System educates more than 125,000 students, conducts over $1.85 billion in research and outreach programs each year. Internationally funded research expenditures exceed $780 million and help drive the state’s economy.
Just like that, Dustin Ritter knew he was where he was supposed to be.

Some 8,500 miles from home and working in the neonatal intensive care unit of the largest hospital in the African nation of Rwanda, the biomedical engineering graduate student from Texas A&M University was struck with an acute sense of purpose after hearing a doctor’s story.

Ritter, who was participating in his department’s first study abroad program in Rwanda, had been assigned to the hospital to help repair medical devices as part of the program’s curriculum. It was his first day on the job, and he was eager to get started. Joined by his wife, Sarah, also a graduate student in the program, Dustin surveyed his new environment, wondering if the couple could truly make a difference in the month they would be working in the hospital.

Having a vigorous interest in global health initiatives, the couple had made the trip to serve as teaching assistants in the program while gaining a more tangible perspective on the health care obstacles facing developing countries such as Rwanda.

That perspective was instantly brought into keen focus for the Ritters when a doctor from Human Resources for Health (HRH) who was working in the unit happened to notice the young couple and, striking up a conversation, learned they were biomedical engineers on hand to help repair the unit’s medical equipment. He was overjoyed. His next few sentences told the reason why.
rescues. Those obstacles, as the Ritters learned, can quickly translate into tragedy. It’s a harsh reality of the region that’s difficult to accept, and it underscores an urgent need for the assistance.

Dustin and Sarah, along with 11 of their fellow engineering students are providing through an intensive two-month study abroad program aimed at improving health care in Rwanda.

The program is sponsored by Texas A&M’s Department of Biomedical Engineering and Engineering World Health (EWH), a nonprofit organization dedicated to improving the quality of health care in hospitals serving resource-poor communities of the developing world. Known as the EWH Texas A&M Summer Institute, the new program brings engineering students to Rwanda for a two-month period so that they can work with local hospital staff to repair the damaged medical equipment they encountered. Sometimes the tasks were as simple as replacing a blown fuse. Other times, students found themselves deciphering schematics, replacing circuit boards and reinstalling software for equipment such as anesthesia machines, oxygen plants and x-ray devices.

“My confidence grew after working on my first piece of equipment,” recalled Ibukunoluwa Oni, a biomedical engineering student from Texas A&M. “We repaired a wide variety of equipment. Sometimes we only had to solidify a loose connection, but we also worked on more complex devices like infant incubators that needed their heating elements replaced.”

In addition to repairing devices, the students often times took on the role of teacher, devoting time to train local hospital staff in the proper use of their newly functioning medical equipment – a measure, the students explained, intended to decrease user errors and ensure the devices remain accurate and functional.

“IT was a neat experience to push some of the [local] personnel towards the medical equipment we were working on and show them what they should be doing with it,” said Mason Coté, an undergraduate biomedical engineering major from Texas A&M. “

In total, the 13 students repaired 112 pieces of equipment, valued at $225,000, across six hospitals throughout Rwanda, said Kristen Maitland, program coordinator and associate professor in Texas A&M’s Department of Biomedical Engineering.

Beyond the obvious and immediate benefits provided to Rwanda’s health care facilities and its patients, the department’s study abroad program provides potential long-term solutions by tasking its students, upon returning to their universities, to draw on their experiences in order to design new medical devices capable of meeting the specific needs of a developing country.

“The design aspect of the program is an essential element,” Gerard Coté said. “It provides the students that were actually in country with an experiential opportunity to work with local staff, doctors, and nurses, toward engineering low-cost, high-quality, solutions to their challenging clinical issues.”

Students in the program submit official design proposals for medical devices, Coté said, that can be further explored by the department’s senior-level design teams and the “Aggik-Challenge” program, a college-level initiative through which undergraduate engineering students form multidisciplinary teams and tackle design projects related to engineering challenges throughout the world.

With the information provided by the Rwanda study abroad experience, senior design students as well as Aggik-Challenge participants have the opportunity to develop prototypes of medical devices that can be taken back to Rwanda for testing by future study abroad classes, Maitland says.

“The result, Dustin Ritter says, will be a more effectively designed device that’s suited for the conditions of the region. “You have to be in touch with the actual user of the device,” Dustin said. “If you designed something for a developing country, you lose all of the U.S. and then tried to give it to a developing country where there is intermittent water and electricity, it won’t work. You have to have design for what you have available to you, what is locally available.

“You shouldn’t design a device that needs an obscure battery or a really obscure custom part. Design for what that region has and what it can easily obtain. You also have to consider the environment. For example, if you design a device for use in a place that has very high temperatures and humidity and no air conditioning, you’re going to have to seal everything up or design something that is not susceptible to rust. Aspiring, young engineers might not even be thinking about these constraints without experiencing the region firsthand, like we did through the program.”

Given the initial success of the program, department and EWH officials are hoping to expand it next year, enabling nearly twice as many students to participate and work in 12 hospitals throughout Rwanda. It’s a win-win situation for the students, who receive invaluable, hands-on experience applying their knowledge to real-world engineering problems, and for Rwanda, as it continues a dramatic advancement in health care reform.
Since experiencing a devastating genocide in 1994 that killed nearly one million people, Rwanda has committed to rebuilding, particularly in the area of health care. Statistics from the World Health Organization show Rwanda’s life expectancy has doubled, and the country has registered significant decreases in deaths caused by HIV, tuberculosis and malaria. Citing the creation of several components, everyone working together – and we’ve now seen that first hand.

"Sometimes it can be depressing, but I also feel like there are things that can be done, I still want to be involved, I still want to try and do more. I want to try and help by taking some of these concepts developed by our students, other students in other programs and others who aren’t in any programs – and find a way to manufacture them and get them on there to those people who need them," Dustin said. "It takes so much need, but you can’t do it by yourself," Dustin said. "It takes several components, everyone working together – and we’ve now seen that first hand.

"With global health, you can make such a tangible difference. There is so much need, but you can’t do it by yourself," Dustin said. "It takes several components, everyone working together – and we’ve now seen that first hand.

An MRI-guided laser system that allows surgeons to perform brain surgery on tumors and epileptic lesions in the brain is expected to become widely available to patients in need now that the technology has been acquired from Visualase Inc. by the global medical device company Medtronic, Inc., says a biomedical engineering professor from Texas A&M University who co-founded the company responsible for the technology.

The technology, says Gerard Coté, professor in the university’s Department of Biomedical Engineering and director of the Center for Remote Healthcare Technology, enables surgeons to pinpoint and destroy brain tumors and lesions with extreme precision and is a much less-invasive alternative to conventional surgery.

The advantage of this approach over other approaches for brain surgery, Coté explains, is that it can be performed while the patient is awake, requires no radiation and no skull flap (the large opening in traditional craniotomies), and is often performed in otherwise inoperable areas of the brain.

Traditional brain surgery, he explains, is usually a daylong operation that involves removing part of the skull, cutting through healthy brain matter and physically removing the problematic tissue. That procedure, he adds, can be followed by a weeklong hospital stay and prolonged recovery period.

The technology developed by former Texas A&M students Ashok Gowda and the late Roger McNichols, conversely, can be completed in about four hours, and most patients can return home the following day, Coté says.

Known as “Visualase,” the technology is already used in more than 45 hospitals, nationwide, including 15 pediatric hospitals. Before the surgical procedure, computer software first helps identify the targeted tissue so that it may be treated and the surrounding healthy tissue can be avoided, Coté explains.

During the procedure, a small entry point is made in the skull that allows a laser applicator (about the size of a pencil lead) to be inserted into the tissue. The patient is placed in the MRI, and a physician receives and reviews images to verify proper positioning of the laser applicator in the skull. The clinician then uses a laser to heat and destroy the problematic tissue while imaging the tissue being damaged in real time to ensure destruction of the problematic tissue and to avoid damaging healthy tissue. The laser applicator is then removed, and the scalp is closed with one stitch, Coté notes.

Medtronic’s acquisition of Visualase, Inc. (the privately held company co-founded by Coté and his colleagues Gowda, McNichols, and Sohi Rastegar, former Texas A&M Professor) means Medtronic will add the MRI-guided laser ablation system to its portfolio of therapies for treating neurological conditions and will integrate the technology into its broader neuroscience offerings.

“My colleagues and I are very excited about this acquisition and I truly believe it will provide more global access to this innovative technology that will ultimately help many more patients undergoing brain surgery for neurological conditions,” Coté said.

The all-cash transaction of up to $105 million includes an initial payment of $70 million plus additional payments of up to $35 million that are contingent upon the achievement of specific milestones, reads a release issued by Medtronic.
Akl Wins College's Outstanding Graduate Student Award

Tony Akl, a Ph.D. candidate in the Department of Biomedical Engineering at Texas A&M University, has been honored by the university’s Dwight Look College of Engineering as a recipient of the Outstanding Graduate Student Award.

The award recognizes master’s and doctoral students who have demonstrated excellence above and beyond the usual levels of achievement. Awardees must be in good academic standing with a minimum cumulative and degree GPA of at least 3.75.

Akl has maintained a 4.0 GPA while also working as a graduate research assistant at the Optical BioSensing Laboratory, under the supervision of Professor and Department Head Gerard Coté. Akl has published six original refereed journal articles with two more in review. In addition, he has one article in preparation and has authored 21 conference proceedings and presentations at national and international meetings.

Akl was previously recognized by the Office of Graduate and Professional Studies at Texas A&M with the George W. Kuene Endowed Graduate Award for excellence in academics, research and service. Throughout his time at Texas A&M he has been active in K-12 outreach. Akl serves as design chair for the student chapter of Engineering World Health (EWH) and mentors three undergraduate student sensor design teams working on EWH projects.

Browning Honored with Acta Student Award

Mary Beth Browning, a Ph.D. candidate in the Department of Biomedical Engineering at Texas A&M University, has been named recipient of the Acta Student Award for her contribution to the manuscript, “Multilayer Vascular Grafts Based on Collagen-mimetic Proteins.”

As part of the award, which is presented by the Acta journal “Acta Biomaterialia,” Browning received a $2,000 cash prize and was formally recognized at the annual Materials Science and Technology in Montreal.

“Not only did your paper demonstrate exceptional value to the biomaterials community, but your personal credentials and recommendations were also exemplary,” wrote William R. Wagner, editor-in-chief of Acta Biomaterialia, in a congratulatory letter to Browning.

Browning, who completed her dissertation under Associate Professor Elizabeth Cosgroff-Hernandez, is a National Science Foundation Graduate Research Fellow and PEO Endowed Scholar. As part of her research, she is creating a synthetic, small-diameter vascular graft for bypass and peripheral arterial replacement surgeries.

Browning is the first author of four published papers and has contributed to several more. In addition, she has co-written a book chapter in the “Handbook of Biomedical Technology.” Browning is active in Science Technology Engineering Mathematics outreach and has served as vice president of the Society for Biomaterials student chapter.

Editor’s note: Browning is conducting postdoctoral research with Regents and Distinguished Professor Magnus Host at the Institute of Biosciences and Technology in Houston, part of the Texas A&M Health Science Center.
Zhao Notches Top Honors at ISPE Poster Competition

Jing Zhou, a graduate student in the Department of Biomedical Engineering at Texas A&M University, has received top honors at the International Society of Pharmaceutical Engineering (ISPE), South Central Chapter research poster competition, hosted by the National Center for Therapeutics Manufacturing.

Her poster, “Thermo-Responsive Layer-by-Layer Assemblies for Nanoparticle-Based Drug Delivery,” details an alternative approach to the delivery of therapeutics with reduced toxic effects. As a winner, she advanced to ISPE’s national poster competition at the organization’s annual meeting in Washington, D.C.

Zhou is pursuing her master’s degree under the supervision of Michael Pishko, professor in the Department of Biomedical Engineering, and Jodie Lutkenhaus, assistant professor in the Department of Chemical Engineering.

Founded in 1980, ISPE is committed to the advancement of the educational and technical efficiency of pharmaceutical professionals through forums for the exchange of ideas and practical experience. With more than 22,000 members in 90 countries throughout the world, ISPE continues to work to keep industry personnel informed of the latest technological and regulatory trends that are occurring in the marketplace.

Editor’s note: Zhou is interning with Kalon Biotherapeutics.

Nail, Whitely Awarded LSAMP Fellowships

Two graduate students in the Department of Biomedical Engineering at Texas A&M University have been awarded fellowships by the Texas A&M University System Louis Stokes Alliance for Minority Participation (TAMUS LSAMP).

Lindsay Nail and Michael Whitely each have been named recipients of the Bridge to the Doctorate Fellowship, which entitles them to receive financial assistance for the first two years of their studies. The annual amount of each fellowship includes a $30,000 stipend and a $9,000 allowance for tuition and fees, research supplies, educational travel, health insurance and other fees.

Nail is advised by Associate Professor Melissa Grunlan, and Whitely is advised by Associate Professor Elizabeth Cosgriff-Hernandez. Specifically, Nail is researching shape memory polymers in an effort to heal bone defects, and Whitely’s research focuses on generating high-porosity bone grafts and porous microspheres for the controlled delivery of growth factors.

As recipient of the fellowship, which is funded by the National Science Foundation, Nail and Whitely have been identified as having the potential to significantly impact their respective academic and research fields. In addition, they have been recognized as potential leaders and role models who will inspire and help mold the academic and career paths of their undergraduate and graduate student peers.

In addition to pursuing their respective degrees, the two graduate students, as part of the program, are required to attend the NSF Joint Annual Meeting each summer during the course of their fellowships where they will have the opportunity to meet and form relationships with graduate and undergraduate LSAMP students and faculty across the Texas A&M University System.

TAMUS LSAMP is a partnership composed of Texas A&M University, Texas A&M University-Corpus Christi, and Prairie View AM University, committed to increasing the number of underrepresented students participating in the science, technology, engineering and mathematics (STEM) fields. The program offers a research program for promising undergraduate students in STEM fields and the Bridge to the Doctorate program for incoming master’s degree students interested in pursuing doctoral degrees in STEM fields and, ultimately, entering the ranks of the faculty.

In pursuit of their respective degrees, Nail and Whitely have received fellowships from other LSAMP programs around the country as well as with the academic and research leaders among the NSF LSAMP Principal Investigators and Project Directors. They also must attend and present research at the annual TAMUS LSAMP symposium where they will have the opportunity to meet and form relationships with graduate and undergraduate LSAMP students and faculty across the Texas A&M University System.

Jabbour Awarded George W. Kunze Prize

Joey Jabbour, a graduate student in the Department of Biomedical Engineering at Texas A&M University, has been named recipient of the 2014 George W. Kunze Prize.

Jabbour was selected for the award based on her superior academic achievement and her publications in a refereed journal of national or international stature. As an honoree of the Kunze Prize, Jabbour also has demonstrated good citizenship through contributions to the university and community.

Jabbour, who is advised by Associate Professor Kristen Maitland, received a $1,000 cash award and was formally recognized at the Graduate Student Council Banquet.

During her time as a graduate student at Texas A&M, Jabbour has designed, built and tested an in vivo confocal microscope to provide high-resolution images of tissue in the oral cavity to detect cancer in its earliest stages. Her research involves the development and characterization of the instrument and preclinical and clinical testing of the device. To date, she has six peer-reviewed publications.

"Joey is highly productive and creative in her approach to problem solving, and she is passionate about research and teaching," Maitland said.

George W. Kunze was long-time dean of the Graduate College at Texas A&M. At the time of his retirement, university faculty and friends generously contributed an endowment in honor of Kunze to provide an annual $1,000 award for a doctoral student nearing completion of the degree program. The Kunze Prize is sponsored by the Office of Graduate Studies.

Davis Awarded Whitaker Fellowship

Caleb Davis, a graduate student in the Department of Biomedical Engineering at Texas A&M University, has been named recipient of the Whitaker International Fellowship.

As a fellowship recipient, Davis will have the opportunity to study at Queen Mary University of London and at Imperial College for nine months in the labs of Professors Steve Greenwald and James Moore, beginning this fall.

While there, Davis, who is advised by Assistant Professor of Mechanical Engineering Michael Moreno, will work on the mechanical testing of arteries and fitting constitutive mathematical models to that data that include the multilayered arterial wall structure. This will provide a powerful tool for future studies to investigate the effects of arterial structure and function on vascular disease, he notes.

"Caleb is an exceptional student," Moreno said. "His work is always precise, accurate and professionally presented. I believe his knowledge, personality, strong verbal and analytical skills, intrinsic desire to learn and commitment to excellence, serve as evidence that his potential as a scientist has no bounds."

The Whitaker International Program sends emerging leaders in U.S. biomedical engineering (or bioengineering) overseas to undertake a self-designed project that will enhance their careers within the field. The goal of the program is to assist the development of professional leaders who are not only superb scientists but who also will advance the profession through an international outlook. Along with supporting grant projects in an academic setting, the Whitaker International Program encourages grantees to engage in policy work and propose projects in an industry setting.

The Whitaker International Fellows and Scholars Program was created by the Institute of International Education with a grant from the Whitaker Foundation. Its mission is to promote international collaboration in the growing field of biomedical engineering. Whitaker International Fellows and Scholars who have already received a Ph.D. Whitaker International Scholars are biomedical engineers who have already received a Ph.D. within two years of application.

The Whitaker International Program

The Whitaker International Program 2014 George W. Kunze Prize

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Aguilar, Cavazos and Martinez Named NACME Scholars

Three undergraduate students from the Department of Biomedical Engineering at Texas A&M University are among a select group of 15 students from the Dwight Look College of Engineering who each have been named recipient of the National Action Council for Minorities in Engineering (NACME) scholarship.

Samantha Aguilar, David Cavazos and Corrine Martinez each received the NACME scholarship, which includes a $3,000 award that is renewable as long as the students maintain a 3.0 GPA. In addition, as NACME scholarship recipients, these students are expected to participate in a college-related student leadership program such as the Engineering Ambassador Program and the Explore Engineering summer camps.

NACME aims to increase the proportion of African American, American Indian and Latino graduates in science, technology, engineering and math (STEM) education and careers. NACME’s vision is to help shape the United States engineering workforce, much like the Dwight Look College of Engineering at Texas A&M University. Therefore, the scholarships are the result of a five-year grant awarded to the college of engineering, by NACME, to help support talented underrepresented students studying engineering.

Bergerson Named Recipient of Philanthropic Educational Organization Scholar Award

Christie Bergerson, a graduate student in the Department of Biomedical Engineering at Texas A&M University, has been named recipient of the Philanthropic Educational Organization (P.E.O.) Scholar Award.

The award, which was established in 1991, provides educational support for women who are pursuing a doctoral-level degree at an accredited college or university. As a recipient of the highly competitive merit-based award, Bergerson received $15,000.

Bergerson, who is a graduate research assistant for Assistant Professor of Mechanical Engineering Michael Moreno, is working on the development of a device that encourages osteoregeneration of long bones, using guided tissue-regeneration techniques and tunable biomechanical microenvironments that influence stem-cell differentiation.

During her graduate career, Bergerson has co-authored a book chapter for the Handbook of Medical Devices; a review article on mechanical factors in cardiac growth, development, disease and therapeutic intervention; and a research article on the development of constitutive models for biodegradable polymers. She recently presented her dissertation work at Student Research Week and won first place for her podium presentation in the medical category. Her work was subsequently presented at the American Society of Mechanical Engineers 2013 Summer Bioengineering Conference.

Prior to joining Moreno’s Biomechanical Environments Lab, Bergerson earned her Bachelor of Science in biomedical engineering from Texas A&M.

“The fast growth of my lab has been possible only because of Christie’s versatile skill set and ability to serve as lab manager,” Moreno said. “In addition to her own dissertation project, Christie has been involved to varying degrees in many of the ongoing projects in my lab. Her work ethic has been exceptional.”

P.E.O. was founded on January 21, 1869 at Iowa Wesleyan College in Mount Pleasant, Iowa. Originally a small campus friendship society, P.E.O. has grown to almost a quarter of a million members in chapters in the United States and Canada.

P.E.O. aims to make a difference in women’s lives through six philanthropies that include ownership of Grotty College, a women’s college with two-year and selected four-year programs, and five other philanthropies that provide higher educational assistance, including the P.E.O. Scholar Awards.

Editor’s note: Working in Moreno’s lab, Bergerson is developing a novel total knee replacement device with an extended functional lifespan, eliminating the need for the revision procedures common with existing technologies.

Marks Awarded Whitaker Fellowship

Haley Marks, a graduate student in the Department of Biomedical Engineering at Texas A&M University, has been named recipient of the Whitaker International Fellowship.

As a fellowship recipient, Marks studied at the University of Strathclyde in Glasgow, Scotland in the lab of Professor Duncan Graham during the summer of 2014.

While there, Marks, who is advised by Professor Gerald L. Coté, worked on biosensor technology aimed at allowing physicians, emergency responders, toxicologists or other researchers to instantly perform blood tests while with the patient for trace levels of carcinogens, radiation exposure biomarkers and other environmental agents.

“I am excited to have had Haley work for two months with Dr. Graham, we have collaborated with Dr. Graham for several years, and he is a clear global leader in functionalizing nanoparticles for use in biomarker detection for disease diagnosis,” Coté said. “This experience will provide Haley with not only a quality research opportunity but also a global experience to enhance her future career.”

The Whitaker International Program sends emerging leaders in U.S. biomedical engineering (or bioengineering) overseas to undertake a self-designed project that will enhance their careers within the field. The goal of the program is to assist the development of professional leaders who are not only superb scientists but who also will advance the profession through an international outlook. Along with supporting grant projects in an academic setting, the Whitaker International Program encourages grantees to engage in projects in an industry setting.

The Whitaker International Fellows and Scholars Program was created by the Institute of International Education with a grant from the Whitaker Foundation. Its mission is to promote international collaboration in the growing field of biomedical engineering. Whitaker International Fellows are those who have received a degree in biomedical engineering but have not yet obtained a Ph.D. Whitaker International Scholars are biomedical engineers who have already received a Ph.D. within two years of application.

Smith Named Outstanding Senior Engineer

Harrison Smith, a senior in the Department of Biomedical Engineering at Texas A&M University, has been named a recipient of the Craig C. Brown Outstanding Senior Engineer Award.

The award is the most prestigious honor bestowed on a graduating senior in the Dwight Look College of Engineering. The award is based on outstanding scholastic achievement, leadership and character. This year’s recipients received a $5,000 education grant and an award. Their names will be added to the program’s recognition plaque.

Throughout his time at Texas A&M, Smith has been involved in a variety of organizations and has received numerous academic awards. He plays the clarinet in Texas A&M’s wind symphony and holds leadership positions in the Student Engineers’ Council, Aggie Habitat for Humanity and Tau Beta Pi. Smith works at the Cardiovascular Pathology Laboratory where he assists with pre-clinical studies of actual devices seeking approval from the FDA and post-clinical studies. He also has volunteered his time with organizations such as Habitat for Humanity and Relay for Life.

The Craig C. Brown Outstanding Senior Engineer Award was first presented in 1947 as the Engineering Faculty Senior Award. In 1996, the award was renamed to recognize Craig C. Brown for his vision to expand and enhance the program through a permanent endowment.

Brown is a 1975 civil engineering graduate and past recipient of the Engineering Faculty Senior Award. He also received a Master of Business Administration from Texas A&M and is the president, owner and chief operating officer of Bray International Inc.

Editor’s note: After interning with HeartWare, Smith has returned to Texas A&M and is pursing his graduate degree.
Biomedical Engineering Students Excel at Engineering Showcase

Undergraduate students from the Department of Biomedical Engineering notched several top honors at the second-annual Texas A&M University Engineering Project Showcase this past spring.

The event, which featured 150 projects that represented the work of more than 600 students in the college, was created to demonstrate and display the diverse projects in the college and exhibit the ways in which engineers build solutions that solve real-world problems.

In total, biomedical engineering students accounted for seven top-awards first, second and third place in the undergraduate research category; second and third place in the capstone design category; third place in the Aggie-Challenge category; and third place in the TEES commercial-ready category.

The event brought more than 140 industry representatives from 60 companies to campus – a 50-percent increase in companies that attended, compared to last year’s showcase. The showcase provided industry representatives the opportunity to discuss possible collaborations for future industry-sponsored projects with undergraduates and faculty.

“As one of the largest engineering schools in the country with top-educated engineering graduates, we are often asked about how industry can engage with our students,” Magda Lagoudas, executive director of industry and nonprofit partnerships said. “This is a wonderful opportunity to bring in industry to see the engineering abilities of our students as well as their innovative side. The showcase was created to provide that opportunity to our students and industry.”

The showcase culminated with an awards ceremony during which the top student teams were formally recognized for their submissions.

Students from the Department of Biomedical Engineering swept the undergraduate research category, taking home first-, second- and third-place honors.

"Design and Characterization of an Endovascular Mechanical Thrombectomy Device" by biomedical engineering student Jason Szafrań and faculty mentor Professor Duncan Maitland won first place.

"Birefringence Microscopy: Use and Potential Applications" by biomedical engineering student Zach Steelman and faculty mentor Professor Vladimir Yaksheva won second place in the category.

Rounding out the category with a third-place finish was “Using Ultrashort Pulsed Lasers to Understand and Physically Model Embryonic Brain Development” by biomedical engineering student Brian Kelly and faculty mentor Associate Professor Alvin Yeh.

The Personal Lung Fluid Analyzer team notched second place in the capstone design category. The team consisted of biomedical engineering students Ana Flores, Eric Gross, Michael Holtclaw, Sandeep Kancharla, Zachary Paulson and Phillip Simpson. Professor of Practice Alan Brewer, Professor Duncan Maitland and Professor Michael McShane served as faculty mentors for the team.

The High-Throughput Histological Analysis (AutoHistorex) team was awarded third place in the same category. The team consisted of biomedical engineering students Ritvik Bansal, Jared Newton and Austin Smith. Associate Professor Mary McDougall and Professor Michael McShane served as faculty mentors for the team.

In the Aggie-Challenge category, the Low-Cost Spectrophotometer team of biomedical engineering students John Paul Hernandez Alcala, Edwin Xiao Cai, Karla Gonzalez, Claire Kalkbrenner, Stanley Lu, Jeffrey Smith and Andrew Van was awarded third place in the same category. The team consisted of biomedical engineering students Ritvik Bansal, Jared Newton and Michael McShane served as faculty mentors for the team.

In the TEES Commercial-ready category, the Mobile Behavioral Health Monitoring System team, consisting of biomedical engineering students Kaci DiCock, Boang Liu, Cameron Schafer, Joshua Silveus and Harrison Smith, was awarded third place. Professor of Practice John Hank, Associate Professor Javier Jo and Professor Michael McShane served as faculty mentors for the team.

Students from the Department of Biomedical Engineering swept the undergraduate research category, taking home first-, second- and third-place honors. The Department of Biomedical Engineering at Texas A&M University is dedicated to becoming a global leader in biomedical engineering research and education.

Our faculty members are developing innovative research solutions that have the potential to greatly enhance and even save lives through technologies that can diagnose, prevent and treat disease and injury. In addition, we are creating a truly rewarding educational environment – one that provides our students with vital engineering competencies, entrepreneurial knowledge, and the leadership skills they will need to become outstanding biomedical engineers.

We’re excited about our progress, but cultivating such an environment demands resources, such as the means to support faculty development and vital research so that we can recruit and retain the best possible teachers and scholars; undergraduate scholarships and graduate fellowships that enable our students to pursue their educational goals; and departmental and building namings to enhance overall departmental excellence in all areas.

Join us as we achieve the breakthroughs that will change lives while empowering the next generation of biomedical engineers to even greater heights.

We’re committed to next-generation research and the next generation of biomedical engineers.

Contact Reagan Chessher, Biomedical Engineering Development, Texas A&M Foundation. 979.862.1936 or rchessher@tamu.edu.

For more information about giving opportunities, visit engineering.tamu.edu/biomedical and click “partner with us.”

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