

# utah

ENGINEERING

## FOCUS ON THE FUTURE

DAVID GRAINGER APPOINTED NEW CHAIR  
OF BIOENGINEERING



# TECHNOLOGY THAT IMPACTS QUALITY OF LIFE

David Grainger had made a difficult decision. His father, then a well-known orthopedic surgeon in Spokane, Washington, was hoping his son would follow in his footsteps and become a medical doctor.

But fate had other plans. While getting his engineering bachelor's degree at Dartmouth College in New Hampshire with an eye toward medical school, Grainger discovered something new: the work being done on the totally implantable artificial heart at the University of Utah in the early 1980s.

"It became very real for me," he says about how a Time magazine story of the pioneering artificial heart changed his life. "So I applied to the Ph.D. program at the University of Utah, we [Grainger and his new wife, Holly] got in our U-Haul truck and drove west.

We spent our first Utah night in the U-Haul in the Merrill Engineering parking lot because we knew nobody."

More than 30 years later, Grainger's destination may be somewhat different than his father's, but it has become no less essential. With a Utah doctorate in pharmaceutical chemistry and as a world-renowned researcher in bioengineering and pharmaceuticals, Grainger has been at the forefront of the interface between materials and medicine and biotechnology. In addition to being a professor of bioengineering, he is a Distinguished Professor and was chair of the U's nationally-ranked Department of Pharmaceutics and Pharmaceutical Chemistry. Now he is adding a new title: Chair of the Department of Bioengineering in the U's College of Engineering. Dean Richard B. Brown announced Grainger would take over the department on Jan. 1, 2017, replacing current chair, Patrick Tresco.

"I am delighted to welcome David as the incoming chair of bioengineering at the University of Utah," says Brown. "He has outstanding research, teaching and leadership credentials, and I expect him to guide our bioengineering department to even higher levels of achievement and recognition."

Grainger's early research focused on analyzing why medical implants can fail in the human body, particularly a problem when the device results in blood coagulation and/or infection. Today, he's turned his attention to two device drug delivery issues: implanted medical devices, such as catheters, coated with small drug doses to improve their performance (like fight infection), and nanotoxicology that seeks to discern where new-generation drug particles go in the body, and how they might improve the fight against difficult diseases such as cancer.

Meanwhile, he has won a variety of research awards including the 2013 Excellence in Surface Science Award from the Surfaces in Biomaterials Founda-





tion, and he is a Fulbright Scholar and Fellow of the American Institute of Medical and Biomedical Engineering. He also has been awarded for his teaching, including the 2010 Distinguished Postdoctoral and Graduate Student Mentoring Award and the US West/Qwest Faculty Education Excellence Award, among others.

As the new chair of Utah's bioengineering department, Grainger said he will focus on the undergraduate and graduate student experience and on research and technology that more directly impacts patients' quality of life.

"The future of this department on this campus is in better integration with the clinical enterprise," he says. "I want to improve the value of technology developed with our medical collaborators and ultimately translate that into patient care."

The University of Utah's bioengineering department (housed in the James L. Sorenson Molecular Biotechnology Building, pictured left) continues to gain national recognition. Its graduate program was

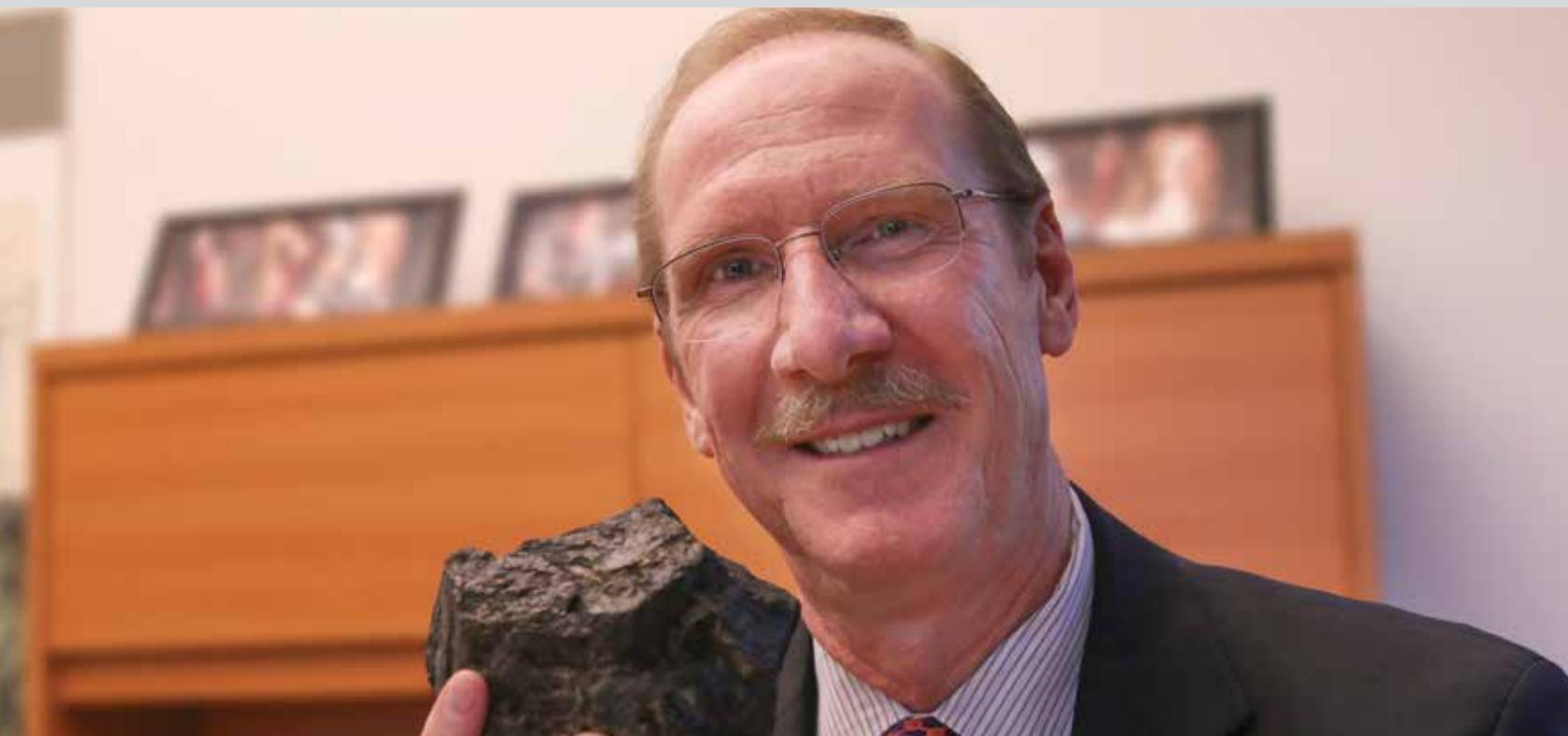
ranked 30th in the nation in the latest *U.S. News & World Report* rankings and ranked 2nd by students in GraduatePrograms.com's "Fall 2015 Rankings of Top Biomedical Engineering Graduate Programs." Its research strengths range from tissue engineering and regenerative medicine to biosensors, biomedical imaging, and neural engineering and neuroprosthetics.

Grainger says he is proud to take over the reins of a bioengineering department with such a spectacular legacy and is excited to help guide it through its next chapter.

He may not have become the physician his late father initially envisioned, but he knows his father was proud of his son's vast accomplishments in a different area of medical impact.

"He saw me speak at a Portland Bone symposium once, and I remember him sitting there and being delighted, absolutely smiling at me," Grainger remembers. "Afterwards, I could see he was blown away with the message. It was wonderful."

# MAKING A NEW PITCH FOR COAL



Turning coal into carbon-fiber material could be the technology that revives struggling mining communities across the country.

Engineers from the University of Utah are launching a \$1.6 million project to research cost-effective, carbon-friendly methods of turning coal-derived pitch into carbon-fiber composite material, as well as analyze its market potential and whether it can help revitalize coal communities threatened by a decline in production. It is one of a new slate of POWER grants by the U.S. Department of Commerce that will finance projects to help struggling coal communities around the country.

“There’s an abundance of coal and we would like to find an alternative use for it. It is a huge natural resource in the U.S., and we have a whole coal-mining community that is desperate for a new direction,” said University of Utah chemical engineering professor and associate dean for research Eric Eddings, who leads the research team.

Typically, when coal is heated it produces hydrocarbon materials that are burned as fuel in the presence of oxygen. But if it is heated in the absence of oxygen—as in the cooking process smelters use to produce iron—those hydrocarbons can be captured, modified and turned into an asphalt-like material known as pitch.

The pitch can then be spun into carbon fibers used to produce a composite material that is strong and light. Products such as skis, camping equipment, and aircraft and automobile parts already use a form of carbon-fiber materials. Eddings will be researching to see if these same products can be made from coal-derived material specifically.

With the new Utah grant, Eddings and his team also will analyze the makeup of Utah coal — which has its own unique properties from coal in other regions — to determine how well it can be used for pitch-based carbon-fiber material.

Researchers will produce different variants of pitch and then deliver them to Matthew Weisenberger and his team at the University of Kentucky’s Center for Applied Energy Research, who are subcontractors in the project and experts at spinning pitch into carbon fibers. Engineers will research the best ways of producing pitch with as little CO<sub>2</sub> as possible.

The research team is also working with the Utah Advanced Materials and Manufacturing Initiative (UAMMI), a consortium of materials companies, research institutions and state agencies, to examine the market potential for producing this composite material from Utah coal, and if other coal communities can benefit from this technology.

## DAVID JORGENSEN CHAMPION FOR STUDENTS

David Jorgensen understands the importance of what a good education means to young people and what it can do to help kickstart their lives. Just look at Jorgensen's own career beginning at the University of Utah.

The electrical engineering alumnus graduated in 1961 and went to work for Boeing in Seattle. While working full time, he also obtained an MBA from the University of Washington.

In 1964, he went to work for Stanford Research Institute in California (SRI). SRI sponsored him for graduate school at Stanford where he obtained a master's degree in industrial engineering.

Jorgensen, who was born and raised in Salt Lake City, would later become a successful entrepreneur and investor. He became chief executive of a high-tech market research firm and co-founded another company that grew to \$350 million in annual sales. That company was sold in 2002.

Today, Jorgensen is retired and living in northern California with his wife, Annette (who also graduated from the University of Utah, with a degree in education). In 1987, they started the David and Annette Jorgensen Foundation that funds philanthropic endeavors. David is actively engaged with two non-profit organizations: the Free to Choose Network where he is vice-chairman and the Pacific Legal Foundation where he is a member of the National Philanthropic Council.

In 2013, David and Annette Jorgensen established a scholarship program in the University of Utah's College of Engineering. The program provides \$6,000 to \$7,000 annually to five U engineering students based on grade point average and financial need. The scholarship helps defray costs for four first-year students and one sophomore who otherwise would find it extremely difficult to attend college. Each one is renewable annually for up to five years. There are 26 currently-active scholarships, and more than 40 students have received money through the program (the Jorgensens have also made a \$2 million endow-

ment for engineering scholarships and fellowships at the U in perpetuity through a charitable gift annuity).

"Without [the scholarship] I wouldn't be able to attend the U and pursue my dream," said recipient Rebecca McGowan, who is studying computer science. "It takes such a weight off my shoulders, so much stress that I would have had. I wouldn't have been able to focus on my studies, so I am so grateful for this scholarship."

Jorgensen says that these scholarships are their most satisfying charitable donations because they can see direct results from the money they are giving. Meanwhile, he stays in touch with the students throughout their college career as a friend and mentor.

"When you read the applications of these students and find out what they've gone through to get where they are, it really tugs at your heart. You realize how tough and resilient they are, and you desperately want them to succeed," says Jorgensen, who will be honored with the 2017 Distinguished Alumni Award during the University of Utah's Founders Day this March. "We feel a tremendous sense of gratification in seeing the positive impact we are having on their lives and their educational experiences."



# IN BRIEF

## MECHANICAL ENGINEERS AWARDED \$1.75M GRANT

University of Utah mechanical engineering associate professor Mark Minor received a \$1.75 million grant from the National Science Foundation to develop a “smart helmet” that can collect sensory data to predict and characterize impacts to the head in real-time. It also can optimize protective mechanisms based on impact and transmit all of this information to a database for further analysis.

The mission of the project is to give researchers a tool to further examine traumatic brain injury, which results from vehicle crashes, falls, sports injuries and industrial accidents.

## FACULTY EARN BRAIN AWARDS

Four faculty members from the University of Utah’s College of Engineering received grants from the National Institute of Health’s Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative.

In 2014, President Obama launched the BRAIN Initiative to equip researchers with insights necessary for treating a wide variety of brain disorders like Alzheimer’s, schizophrenia, autism, epilepsy, and traumatic brain injury.

Electrical and computer engineering assistant professor Ross M. Walker will receive a grant for his proposal to shrink the size of computer chips for electrode arrays used in deep brain stimulation and neural prosthetics. Electrical and computer engineering professor Steve Blair, research associate professor Loren Rieth and ophthalmology/visual sciences professor Alessandra Angelucci receive a grant to develop and test functional multi-optrode penetrating arrays in experiments. School of Computing assistant professor Preston Thomas Fletcher is getting a grant to develop open-source tools for analyzing certain neurological disorders.

## DISTINGUISHED ALUMNI AWARDS

Not one but two alumni from the College of Engineering will receive the University of Utah’s annual Distinguished Alumni Award in 2017.

School of Computing assistant professor Miriah Meyer and entrepreneur David Jorgensen will receive the awards during the university’s Founders Day banquet on March 3.

Meyer earned her doctorate in computer science from the U in 2008 and became a USTAR assistant professor in 2011. She also is a faculty member in the Scientific Computing and Imaging Institute. Her research focuses on the design of visualization systems to help make sense of complex data.

David Jorgensen graduated with a degree in electrical engineering in 1961 and became a successful entrepreneur and investor. He became the chief executive officer of a high-tech market research firm and co-founded Katun, which provided replacement parts and supplies for copiers and printers.

The Distinguished Alumni Awards are given out by the University of Utah’s Alumni Association. Four are awarded each year to recognize those who have excelled professionally and served in local and national communities.



The ARCS Foundation Utah Chapter honored three new engineering students and a medical researcher for 2016 during the organization’s annual Scholar Awards luncheon in November. The scholarships by the local chapter of the nonprofit women’s organization supports U.S. students in engineering and ophthalmology.

This year’s recipients include Alex Jafek, who received his bachelor’s in mechanical engineering and whose research is in microfluidics; Amanda Reynolds, who earned a bachelor’s in bioengineering and is researching properties and uses of Collagen Mimetic Peptides in drug delivery and imaging applications; Marcus Parry, who is doing graduate work in materials science and engineering and is focusing on discovery, synthesis, and characterization of new materials for energy applications; and Rebekah Gensure of the Moran Eye Center who received a doctorate in biomedical engineering from Rutgers University.

A photograph of two men standing in front of a modern, multi-story building with large windows. The man on the left is wearing a light blue button-down shirt and dark jeans. The man on the right is wearing a white short-sleeved button-down shirt and dark trousers. Both are smiling. The building behind them has a dark facade and large glass windows. The sky is clear and blue.

# ADVANCED MANUFACTURING SERVICES FOR UTAH INDUSTRY

A hot-button issue in America's economy has always been companies outsourcing work overseas instead of figuring out how to keep manufacturing jobs here in America. To aid these businesses, two University of Utah mechanical engineering professors have established a new center to help local manufacturing companies spur innovation and utilize the latest in technology.

University of Utah mechanical engineering associate professor Bart Raeymaekers and mechanical engineering professor Bruce Gale have launched the new University of Utah Manufacturing Extension Partnership (MEP) Center, which will deliver services for small and medium-sized manufacturing companies by providing expertise in advanced manufacturing technology, innovation, worker education, operational excellence, and on how to connect companies with investor opportunities.

"What we propose is to not only focus on operational excellence, but we believe the future of manufacturing involves transitioning to advanced manufacturing technologies and innovating in new products and markets," says Raeymakers.

The center, in partnership with other entities and organizations throughout Utah, will help local businesses use data to identify products and markets that are growing and provide resources for the prototyping

of new products. It also will implement advanced manufacturing equipment and technology and educate their workforce to use these new technologies. Meanwhile, it will connect companies with investors and teach them how to secure government grants, and it will teach businesses how to make their operations more efficient in order to maximize profits.

The University of Utah's MEP Center has received funding from the U.S. commerce department's National Institute of Standards and Technology (NIST) and the Utah Governor's Office of Economic Development (GOED). All told, the center will receive \$16 million in funding over the next five years from both federal and state governments as well as local industry. Utah is one of 11 states and Puerto Rico to have received NIST funding this month for local MEP centers.

The Utah center, which will be under the U's College of Engineering, began operations Oct. 1 and is headquartered on the U campus. It will employ at least a dozen permanent employees, consultants and industry professionals.

There are more than 3,300 manufacturing companies in Utah, ranging in areas from chemical products and computer and electronic products to metals, aerospace equipment and food products.

# STUDENT LIFE

## McKAYLA WHITEHEAD

It may seem like the worlds of dance and engineering are light-years apart, but University of Utah mechanical engineering senior McKayla Whitehead has found harmony in both. While she is knee-deep in calculations and engineering designs for thermal systems and heating-and-cooling concepts, she also has been pirouetting across the dance floor of the West Jordan studio where she teaches.

Whitehead was only two when she first discovered dancing at her sister's dance practices and began following along with the instructor in the back of the class. By the age of nine, she was a teacher's assistant in her dance academy and realized that she was more interested in teaching others than just performing.

That might have been enough for any kid growing up in the suburbs of Salt Lake County, but Whitehead realized she had another passion brewing inside – her love of math. “I’ve always loved math,” she said “In elementary school, I would get my math assignments done quicker, so my mom got me extra math books just to keep me entertained.”

So instead of enrolling in dance at the U, she began her college education in mechanical engineering where she is studying thermal systems and HVAC (heating, ventilation and air conditioning) design and technology. And she's been focusing on her college courses thanks to three engineering scholarships: the Clair and Kay Coleman Scholarship, A. Harold and Lucile F. Blake Educational Endowed Fund and the Julie Penrod



Guida Scholarship, all of which receive matching funds from the College (Whitehead was the featured speaker during the October 27 College scholarship awards banquet). Last year, the college distributed more than \$1.7M in scholarships and fellowships to 447 students.

She has interned with a Salt Lake City-based mechanical engineering design firm and plans to get a fulltime job there when she graduates in May. Meanwhile, she'll continue to teach the intricacies of ballet, modern, jazz and contemporary dance and hopes to one day own her own dance studio while still designing heating and air conditioning systems.

“My goal is to do both and we'll see how realistic that is,” she says, laughing. “I've always wanted to own my own studio and I realized that I need to financially support myself, and I can do that with my engineering degree.”