

2014 YEAR IN RE VIEW



ORIGAMI IN SPACE

During the last five years Professors Larry Howell and Spencer Magleby have become some of the nation's experts in applying origami concepts to engineering problems. For example, in 2014 they finished this design of a solar array for NASA. It can be tightly folded to 1/10th its size for launch then fully deployed in space.

GREETINGS FROM THE CHAIR



Having evolved significantly since its founding more than 55 years ago, the Department of Mechanical Engineering at Brigham Young University is a vibrant community of scholars and educators who are focused on teaching and advancing the discipline. The department currently consists of 24 faculty members, 12 staff members, 950 undergraduate students, and 120 graduate students. Its goals are deeply integrated with the mission of BYU.

While the educational activities of the department are easily identified in terms of teaching and learning in the classroom and the laboratory, the intellectual struggles of scholarship and research are often

less apparent. These activities, however, are vital to its health and longevity. This publication highlights the varied and significant awards, activities, and accomplishments realized over the past year. One of the most significant accomplishments has been a redesigned curriculum that will roll out in fall 2015. I am pleased to share our recent successes with you and look forward to doing so on a regular basis.

Sincerely,

Daniel Maynes

Daniel Maynes, PROFESSOR AND CHAIR OF MECHANICAL ENGINEERING

DEPARTMENT AT A GLANCE

FACULTY AND RESEARCH

- 24 faculty members, with 9 full professors, 9 associate professors, and 6 assistant professors
- 7 faculty members serve as editor or associate editor for archival journals
- 154 undergraduate students worked with faculty on mentored research projects
- faculty members published 77 papers in professional journals

- 60 proposals were submitted for external funding; the department received \$3.5 million in research awards
- faculty members presented 39 peer-reviewed conference papers
- faculty members gave 118 presentations at professional conferences

DEGREES GRANTED

- Bachelor's 134
- Master's 31
- PhDs 4

UNDERGRADUATE PROFILE

- 950 undergraduate students
- 70 percent completed an outside internship
- 59 percent participated in research
- 42 percent of graduating seniors entered the workforce
- 38 percent of graduating seniors entered graduate school

GRADUATE PROFILE

- 120 graduate students
- 100 percent of students entering the job market secured employment with an average salary of \$75,844

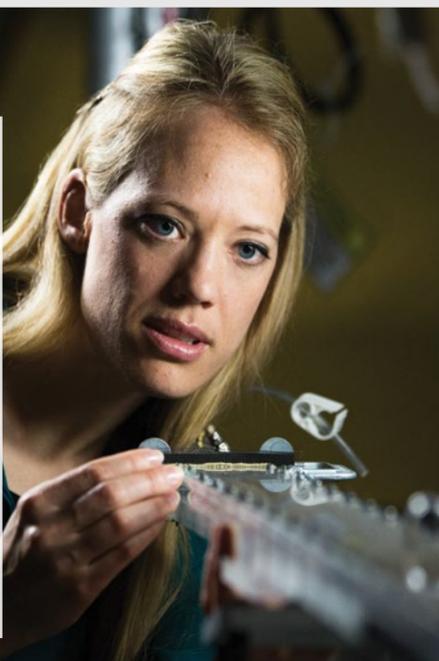
TOP 5 EMPLOYERS OF GRADUATES

1. Boeing
2. ATK
3. Ford Motor Company
4. Lockheed Martin
5. US Synthetic

RESEARCH SPOTLIGHT

SUPERHYDROPHOBIC SURFACES

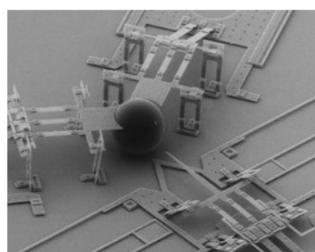
Research by Professor Daniel Maynes and Associate Professor Julie Crockett on developing the ideal super hydrophobic surface has been well received in publications and conference presentations. This research goes well beyond water-repellant coatings to create surfaces with specific micro-structures of ridges and posts to increase the efficiency of water repellency. Such surfaces can reduce costs and speed up processes used in multiple industry applications.



APPLYING TECHNOLOGY IN THE WORLD

Mechanical Engineering at BYU offers opportunities for students to participate in discovering and disseminating knowledge of real consequence. For instance, Dr. Anton Bowden included many students, both graduate and undergraduate, in his research, which resulted in four issued patents to date, with 16 additional applications in process. He included students in the invention process as research assistants in his labs and through involvement on three Capstone teams.

Receiving patents and subsequent licensure for others to use inventions are important metrics for measuring the real-world impact of research conducted in the department. **In 2014, mechanical engineering faculty filed 56 patent applications, an increase of 22 percent from 2013.** These inventions have application in a variety of industries, including manufacturing, medical, space, computers, and business. Several inventions by faculty have been licensed for commercial development, with other inventions under First Option agreements. Of the 42 "selected promising BYU technologies" listed by the BYU Tech Transfer Office in September 2014, 24 percent were from Mechanical Engineering faculty.



PATENT APPLICATION #20140199765—Lance Device for Delivering Biological Material into a Cell

New gene therapy for injecting DNA into a cell—the micro-lance above at 1/100th the size of a human hair is 10 times smaller than current micro-injection needles.

2014 FACULTY HIGHLIGHTS



From left to right:

- Professor Brent Webb was honored with the **Purdue University 2014 Outstanding Engineer Award**, which is given to a Purdue alumnus who has made significant contributions to the mechanical engineering profession.
- Professor Tim McLain received the **College of Engineering Excellence in Citizenship Award** for providing tremendous service to the college and the engineering profession.
- Professor David Fullwood received the **Outstanding Mechanical Engineering Faculty Award** for his significant contribution to the department during the previous year.

- Professor Anton Bowden was recognized with the annual **University Technology Transfer Award** for having made significant research advances leading to the transfer of technology toward commercialization.
- Professor Larry Howell was granted the prestigious **Machine Design Award** by the American Society of Mechanical Engineers for his contributions to the field.
- Professor Chris Mattson (*not pictured*) was named a **2014–15 Fulbright Scholar** to study at the renowned interdisciplinary design school Loughborough University (England) to advance the design of poverty-alleviating products for the developing world.

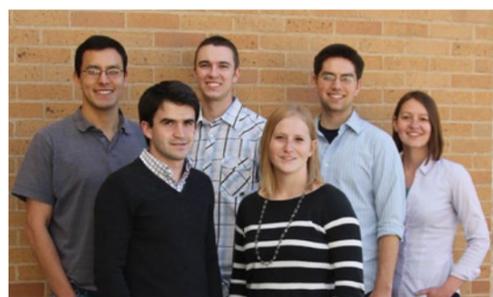
CAPSTONE HIGHLIGHTS



- **32 Capstone build-and-test projects** were completed, with 28 projects sponsored by an industry partner.
- Each Capstone team consisted of **5–10 senior students** and a faculty coach.
- Nine students took the **BYU Baja vehicle** (*left*) to the International Collegiate Design Series.
- The **BYU Mars Rover** (*middle*) garnered the first-ever Design Award in a May 2014 competition.

- The **human powered drill** (*right*) was improved to cut through hard rock.
- Competing against 17 universities and three service academies, one BYU Capstone team placed third at the **Air Force Research Lab Challenge**. The team developed a Batman-like device to shoot a grappling hook 90+ feet and lift a person faster than current special-forces capacity.

2014 STUDENT HIGHLIGHTS



- **Two current students and one former student** received prestigious national fellowships for continued graduate education.
- **31 students** coauthored award-winning papers, presentations, or poster sessions.
- **More than 10 percent** of the students named as national 2014 Beta Pi Scholars were from BYU; seven were from the ME Department.
- **24 students and three faculty** engaged in study-abroad programs in Singapore, Spain, Italy, Romania, and Greece.

NEW FACULTY

From left to right:

- Assistant Professor Marc Killpack received his BS from BYU and his MS and PhD from Georgia Tech. In September 2014 he was awarded a three-year NASA Early Career Award to support his research in robotics and controls.
- Assistant Professor John Salmon received his BS from the University of Calgary and his MS and PhD from Georgia Tech. His research focuses on the design and optimization of large-scale systems.
- Assistant Professor Andrew Ning received his BS from BYU and his MS and PhD from Stanford University. Previously a senior engineer and a postdoctoral researcher at the National Renewable Energy Laboratory, he conducts research on optimization of wind power and aerospace systems.



KEN FORSTER RETIRES AFTER 43 YEARS; NICK HAWKINS STEPS IN

Ken Forster, Project Labs supervisor, retired after 43 years of service to the university. He mentored thousands of students during his career and was a major contributor to the excellence of the university's nationally recognized Capstone program. In 2014 Ken was honored with the BYU President's Appreciation Award, which is given to staff members who have demonstrated exceptional commitment and service to the university. The new Project Labs supervisor, Nick Hawkins, comes with significant skills in lab management and hands-on problem solving.



STAY CONNECTED



Department of Mechanical Engineering
Brigham Young University, 435 CTB
Provo, UT 84602
801-422-2625
me.byu.edu

R. Daniel Maynes, Department Chair
Anton E. Bowden, Graduate Coordinator
Dale R. Tree, Associate Chair/Undergraduate Coordinator

Mechanical Engineering alumni website:
me.byu.edu/content/alumni-home
Capstone program:
capstone.byu.edu