

NORM ASBJORNSON COLLEGE of ENGINEERING

MONTANA STATE UNIVERSITY

– BOZEMAN, MONTANA – – –

think outside







The Norm Asbjornson College of Engineering is at the core of MSU's landgrant mission, providing an inclusive, hands-on learning environment that supports academic excellence, strives for innovation in research and serves the community in Montana and beyond.

Greetings from the Norm Asbjornson College of Engineering at Montana State University

I'm thrilled to share with you the phenomenal opportunities available to our students and faculty. In the pages that follow, you'll find them pushing the limits of what is considered possible, making exciting discoveries and building impressive technologies. And you'll find them giving back, whether it's our students creating access to clean water in Kenya through Engineers Without Borders or our college's namesake and mechanical engineering alumnus, with a generous gift of \$50 million, making possible the construction of Norm Asbjornson Hall, which opened in 2019.

I invite you to explore the opportunities that await you at MSU and consider how you can be a part of our legacy of excellence and service.

Brett Gunnink, Ph.D., P.E. Dean



UNDERGRADUATE AREAS OF STUDY

- Biological Engineering
- Biomedical Engineering
- Chemical Engineering
- Civil Engineering
- Land Surveying
- **Computer Engineering**
- **Computer Science** (STEM interest)
- Interdisciplinary Option
- Professional Option
- Computer Science (Arts, Humanities or Business interest)
- Construction Engineering Technology
- Electrical Engineering
- Environmental Engineering
- Financial Engineering
- Industrial & Mgmt. Systems Engineering¹
- Engineering Management
- Mechanical Engineering
- Aerospace
- Building Energy Systems
- Materials
- Mechatronics
- Mechanical Engineering Technology
- Military Aerospace Studies-Air Force ROTC
- Military Science-Army ROTC
- Military Studies

¹ Master of Science in Industrial & Management Engineering —one additional year

- Major Option within a major
- Minor A Special program

GRADUATE DEGREES

- M.Eng. Bioengineering
- M.Eng. Chemical Engineering
- M.Eng. Electrical Engineering
- M.Eng. Mechanical Engineering
- M.S. Bioengineering
- M.S. Chemical Engineering
- M.S. Civil Engineering
- M.S. Computer Science
- M.S. Electrical Engineering
- M.S. Environmental Engineering
- M.S. Industrial and Management Engineering
- M.S. Mechanical Engineering
- M.S. Optics and Photonics
- Ph.D. Chemical Engineering
- Ph.D. Computer Science
- Ph.D. Ecology and Environmental Sciences (Interdisciplinary)
- Ph.D. Electrical Engineering
- Ph.D. Engineering—Options in Applied Mechanics, Civil, Environmental, Industrial, and Mechanical
- Ph.D. Materials Science





AY 2020

FY 2020

MSU is one of the nation's top producers of Goldwater Scholars

The Goldwater Scholarship is a competitive national award given to math, science and engineering students. MSU has produced 78 Goldwater Scholars—including 8 engineering students in the last five years.— 2020

Top U.S. Institutions for Goldwater Scholars

- 1 Harvard (102)
- 2 Princeton 98)
- 3 Stanford (92)
- 4 University of Chicago (86)
- 5 **Duke** (85)
- 6 Cal Tech (82)
- 7 University of Michigan (81)
- 8 University of Illinois (80)
- 9 Penn State (79) (tie)
- 9 Washington Univ. St Louis (79)
- 10 Montana State (78) (tie)
- 10 MIT (78)
- 10 Kansas State (78)
- 11 Johns Hopkins (77)
- 12 Yale (75)
- 13 **Cornell** (74) (tie)
- 13 University of Wisconsin (74)
- 14 University of Maryland (70)

2 NORM ASBJORNSON COLLEGE OF ENGINEERING

FACTS & STATS



Engineering (1,371)



Norm Asbjornson Hall A \$50 million gift from Norm Asbjornson made possible a new, 110,000-square-foot building that opened in 2019. Its 17 labs and 9 classrooms foster dynamic interdisciplinary engagement and meaningful student-faculty interaction.



Cutting-edge building technologies helped Norm Asbjornson Hall become **one of only 10 buildings in Montana** to be certified as LEED Platinum, the U.S. Green Building Council's highest certification.



Named for a generous donor and 1959 MSU electrical engineering alumnus, the **Bill Wurst Makerspace** includes specialty tools such as 3D printers for students and faculty to build, test and prototype their big ideas.

COLLEGE HIGHLIGHTS

Our faculty and students are developing creative solutions, making groundbreaking discoveries and earning national recognition for academic and research excellence.

CIVIL ENGINEERING

MSU receives \$1 million to transform undergraduate environmental engineering degree

The new program will focus on courses structured around real-world, multifaceted projects in order to better position graduates to excel in professional practice and serve communities.

• Entrepreneurial mindset



MSU received a nearly \$600,000 grant from the Kern Family Foundation to advance its goal of graduating engineers equipped not only with technical skills but also an entrepreneurial, can-do approach to their profession.

Three MSU engineering faculty win prestigious CAREER grants in 2019-2020

Stephanie McCalla is developing low-cost microRNA medical diagnostics for low-resource settings, Anja Kunze's research into nanomagnetic technology could lead to new cures for brain diseases, and Mark Jankauski models insect flight to improve flight design.





MSU scientist's big idea about materials will shape national research priorities

Researcher Chelsea Heveran's proposal to make durable, recyclable structures using native dirt and a new generation of advanced chemistries was one of only seven entries to win the National Science Foundation's 2026 Idea Machine Competition.



electrical & computer engineering

MSU computer technology once again visits space station

The updated prototype of a radiation-tolerant computer was packaged in a small satellite that the space station ejected into orbit for testing. The technology was developed by professor Brock LaMeres as part of a \$4 million NASA-funded project involving more than 150 MSU students, including 130 undergraduates.



CENTER FOR BIOFILM ENGINEERING

MSU's Phil Stewart named Montana University System Regents Professor

Stewart played a central role in making MSU a world leader in the study of biofilms. He has authored more than 186 peer-reviewed publications that have been cited more than 41,000 times, making him the most-cited researcher at MSU.





MSU partners with Idaho National Lab on \$3.1 million cybersecurity project

An interdisciplinary research team led by computer science professor Clemente Izurieta will monitor real-world data in real-time to develop new ways to detect, thwart and communicate cyberattacks.



RESEARCH OPPORTUNITIES

MSU offers engineering students, faculty and staff the opportunity to partner with world-class researchers across campus and around the world.

CENTER FOR

CHEMICAL & BIOLOGICAL ENGINEERING

MSU researchers study immune system with \$3 million grant from National Institutes of Health

Researchers James Wilking and Connie Chang are part of an interdisciplinary team using advances in microfluidics and 3D printing to build miniaturized systems that can simulate the human gut, with potential for developing oral vaccines that would be easier to administer.



MSU researchers ramp up \$6 million project seeking solutions to biofilm corrosion

The four-year project combines materials science, microbial chemistry, gene sequencing and cutting-edge computer science to understand how microbial mats interact with surfaces and to develop surface coatings that could prevent expensive corrosion.

Mechanical & Industrial Engineering



A team led by assistant professor Stephan Warnat developed new methods of 3D printing to make affordable micro-sensors for measuring water quality in streams and soils.

ELECTRICAL & COMPUTER ENGINEERING

MSU wins \$3 million grant for providing nanotechnology resources to region

The five-year funding renewal allows the Montana Nanotechnology Facility to continue to offer cutting-edge equipment and technical assistance as one of only 16 centers nationwide in NSF's National Nanotechnology Coordinated Infrastructure framework.



MECHANICAL & INDUSTRIAL ENGINEERING

MSU researcher advancing ways to make fire-resistant plastics using wood product

Professor Dilpreet Bajwa's team is backed by a \$220,000 grant from the National Institute of Standards and Technology to develop methods of infusing plastics and other polymers with particles called fire-resistant nanocrystals that are made from cellulose.



COMPUTER SCIENCE

MSU researchers work to improve worker-robot interaction

Laura Stanley, associate professor of computer science, is leading a team that won a \$1.2 million grant from the National Science Foundation to develop wearable technology, including headsets, that could serve as a bridge between workers and the automated tasks around them.





MSU researchers repurpose agricultural byproduct for building material

Working with local builders and the Montana Farmers Union, assistant professor Kristen Matteson is conducting tests of a structural and insulating material made with chipped up stalks of the industrial hemp plant, an emerging crop in Montana.



STUDENT SUCCESS

The Norm Asbjornson College of Engineering is committed to ensuring the success of undergraduate and graduate students through academic support, networking opportunities and individual empowerment.

STUDENT CLOSE U

-

國國

Enabling Excellence

Going into her junior year, computer science major Payton Harrison was considering a part-time job to help her pay school expenses. "It was going to be difficult to balance with my upper-level classes," she said. A scholarship from local software company Oracle took the pressure off, allowing her to focus on her studies. It also gave her flexibility to accept a summer position with the **National Science Foundation-funded Research Experience for Undergraduates** program, where she is helping to develop new software-debugging methods. Harrison is also active in the Association for Computing Machinery and the Association for Women in Computing. "It's nice to feel like I'm supported by the department and achieving something here," she said.

ineering students study together in the Empower Center in Norm Asbjornsen Hall.

SUPPORTING STUDENT SUCCESS

• One-on-one faculty advising is available to all of our students.

ePALs student mentoring program: Freshman and sophomores are paired with juniors and seniors who provide guidance about classes, activities, internships and more.

• Walk-in tutoring is available at the Engineering Mechanics Help Center and the **Computer Science Success Center.**



AN INCLUSIVE COLLEGE

We remain committed to providing a place for all to realize their potential in engineering and computer science.

Housed within the engineering college, Empower promotes the success of underrepresented minorities and women in STEM fields through scholarships, tutoring and more.

The Women in Engineering program offers professional development and networking opportunities to create a community of successful women engineers and computer scientists.

Women students 235% 10 years increase

 Women faculty on tenure track 24% of total

female faculty

Fall 2020 class: 709 female students

Fall 2020: 18 tenure-track

STUDENT ENGAGEMENT

Students participate in roughly 40 student clubs, engage with community partners for design classes and access a variety of professional opportunities.

Engineers Without Borders

MSU students have completed more than 30 projects in the Khwisero region of Kenya, including 14 water well projects, 15 sanitation projects, a water pipeline and two rainwater catchment systems.

Senior Capstone Projects

As a requirement of graduation, seniors complete year-long, hands-on projects and present them to the public during the biannual Design Fair. In many cases, students design and build practical solutions for businesses, MSU researchers or government labs.

Design Unit

MSU civil engineering undergraduates work alongside Montana Department of Transportation staff to get hands-on experience helping to design roads and other infrastructure. More than 60 program alumni have joined MDT for their first job after college.



EMPLOYMENT DATA FOR GRADS

Engineering and computer science students are among the most sought-after by employers at the Biannual Career Fairs.

companies and organization typically recruit our students from MSU career fairs

Employers hiring MSU engineering graduates include: AdvR, Barnard Construction, Billings Clinic, Boeing, BP, Fluke, Great West Engineering, Los Alamos National Laboratory, Micron, Oracle, Raytheon Technologies, Spark R&D, State of Montana, U.S. Forest Service, Workiva

• Average salary (for recent MSU engineering grads)

> \$62,000 BACHELOR'S \$65,000 MASTER'S \$104,000 DOCTORATE

2020 STUDENT ACHIEVEMENTS

In 2019-2020, four engineering majors – Ellen Brooks, Carter McIver, Brenden Pelkie, Mikayla Wood – were awarded prestigious **Goldwater** scholarships, the nation's top scholarship for undergraduate majoring in the natural sciences, engineering and mathematics. Since the scholarship's inception in 1989, 78 MSU students have won the award. MSU has consistently been one of the top institutions in the country in the number of scholarships awarded, ahead of schools like Johns Hopkins, Yale and Cornell.

In 2019-2020, four engineering students or recent MSU graduates — Patrick Fischer, Alexis Ostwalt, Cara Robertus, Abigale Snortland – won National **Science Foundation Graduate Research** fellowships, which come with nearly \$50,000 to cover graduate research.

Joaquin Monterrosa, a double-major in business and computer science, was selected for a NASA internship that will involve programming launch control software at the Kennedy Space Center.

Taylor Blossom was awarded a Schwarzman Scholarship in 2020

FACULTY SUPPORT

MSU faculty and staff enjoy professional development, extensive support and recognition programming and cross-discipline collaboration in the heart of the beautiful Greater Yellowstone Ecosystem.

FACULTY SUPPORT

• Guided by faculty interests and goals, and the values of innovation, collaboration, and partnerships, the **Center** for Faculty Excellence develops and provides experiences, opportunities, and resources that support the growth of faculty across all career stages in achieving excellence in teaching, including academic advising, research/ scholarship, and service.

MSU's Research Cyberinfrastructure program aims to provide MSU researchers with the cyber-infrastructure and support they need to remain on the cutting edge of their fields. Computing resources include the NSF-funded Bridger High Performance Research Network and the 22-teraflop Hyalite Research Computing Cluster, which is the largest super computer in Montana.

MSU's Office of Sponsored Programs helps faculty connect with state, federal and private **funding sources** for research, and also provides general research guidance through principal investigator trainings and more.

MSU's Academic Technology and Outreach helps faculty access online teaching tools and other educational technologies, supports outreach activities such as MSU Family Science Day, and provides opportunities for faculty to teach outside of the university.

The annual Provost's Distinguished Lecturer Series recognizes outstanding MSU faculty for their scholarship and leadership. Faculty reflect on the inspirations for their work in lectures attended by the MSU community and the public.

At a ceremony each spring, the Norm Asbjornson College of Engineering honors exceptional faculty and staff for their contributions in research, teaching, mentorship, outreach and more.

The Norm Asbjornson College of Engineering supports faculty research and teaching with two grant programs. The Thorson Excellence in Engineering Research program, made possible by a \$2.7 million endowment, awards multiple grants each year up to \$25,000. The Bryan **Innovation Instructional Grant** program provides up to \$9,500 for curriculum development.

• Our college has a culture of **work-life balance** in which faculty are supported while pursuing both their academic and personal goals.

CENTERS, LABS, AND OTHER AFFILIATED ENTITIES

Center for Biofilm Engineering

A world leader in microbial biofilm research since 1990. Multidisciplinary teams develop uses for biofilms and find solutions to industrially relevant biofilm problems, with applications in medicine, food safety, energy and more. Matthew Fields, Co-director 406-994-4770 cbeinfo@biofilm.montana.edu

Magnetic Resonance Laboratory

Offers a variety of tools for researching biofilms, gels, ice and more using MRI. Sarah Codd, Director 406-994-1944 scodd@coe.montana.edu

Montana Engineering Education Research Center

Positions Montana as a national leader in engineering education research and transforming engineering education through collaborative, empirical research. Brock LaMeres, Director 406-994-2505 lameres@montana.edu

Conducts and promotes research and education focused on Subzero Research Laboratory A unique, internationally recognized, state-of-the-art suite of the biology and interrelated physical and chemical processes laboratories used to study snow, ice and the effects of the cold of geothermal environments in the Greater Yellowstone on projects across a range of scientific disciplines. Ecosystem. Kevin Hammonds, Director Brent Peyton, Director 406-994-2167 bpeyton@coe.montana.edu kevin.hammonds@montana.edu 406-994-7419

Western Transportation Institute

A national leader in rural transportation research, the institute Provides state-wide outreach and assistance to Montana's houses eight research centers with specialties in wildlife manufacturers, helping their businesses grow and innovate. passage, infrastructure sustainability, public lands and more. Paddy Fleming, Director 406-994-3812 David Kack, Director 406-994-6114 pfleming@montana.edu wti@coe.montana.edu





Center for Biofilm Engineering

Subzero Research Laboratory



Energy Research Institute

Enables the advancement of biofuels, wind energy, carbon sequestration, fuel cells and other energy technologies. Lee Spangler, Director 406-994-1658 energy@montana.edu

Montana Nanotechnology Facility

One of only 16 centers that are part of the NSF's National Nanotechnology Coordinated Infrastructure framework providing access to nanotech research facilities and expertise. David Dickensheets, Director 406-994-7874 davidd@ece.montana.edu

Optical Technology Center

A multidisciplinary center offering opportunities to find practical solutions to optics-related problems and discover new applications for optical technology. Joseph Shaw, Director 406-994-7261 joseph.shaw@montana.edu

Thermal Biology Institute

Montana Manufacturing Extension Center

Optical Technology Center



Magnetic Resonance Laboratory















Norm Asbjornson College of ENGINEERING

P.O. Box 173820 Bozeman, MT 59717-3820 406-994-2272 engrinfo@coe.montana.edu montana.edu/engineering