CREATE a better future.
A BUSINESSWOMAN WHO SPEAKS SCIENCE

Lisa Graham (’95 B.S. Chemical Engineering, ’99 Ph.D. Chemical Engineering) gained a technical foundation at Oregon State that gave her the skill set necessary to adapt research and development methodologies to diverse industries, including pharmaceuticals, chemical processing, wafer manufacturing, and agriculture. She is now a business leader who speaks science. Graham recently founded Alkemy Innovation, a company that will enable rapid data analytics and model development for scientists in numerous industries.

“...There’s a challenge right now with big data, and an emphasis on being able to access that data and gain useful knowledge from it,” she said. “My company will develop science-based software solutions that provide specific technical guidance relevant to each industry.”

Graham also has a strong passion for encouraging girls and young women to work toward careers that involve science, technology, engineering, and math. “I didn’t get here on my own,” she said. “People have taken time they didn’t have to open doors for me.”

Graham was inducted into Oregon State’s Academy of Distinguished Engineers in 2016.

You will be among engineering giants like these:
- JEN-HSUN HUANG (’84), inventor of the GPU; co-founder and CEO, NVIDIA
- MARK OWEN (’81), inventor of water purification nanotechnologies; CEO and founder, Puralytics
- DON PETITT (’78), NASA astronaut; inventor of a zero-gravity coffee cup
- EDWARD YANG (’77), former vice president and chief technology officer, Hewlett-Packard
- DOUGLAS ENGELBART (’48), inventor of the computer mouse and the concept of email
- JIM HOWLAND (’38), Burke Hayes (’38), and Holly Cornell (’38), founders, CH2M
- MILES LOWELL EDWARDS (’24), inventor of the first artificial heart valve
LEARN in innovative research centers and world-class facilities.

You will have opportunities to explore cutting-edge technologies and transform ideas into solutions through many signature centers, institutes, and facilities, including:

- **Center for e-Design**: A collaboration with industry to invent new design processes and digital tools.
- **Center for Sustainable Materials Chemistry**: Focused on commercializing technological advances involving solution-based film precursors and films and their application in high-performance electronic devices.
- **Northwest National Marine Renewable Energy Center**: A center for wave, tidal current, and in-river energy research.
- **The O.H. Hinsdale Wave Research Laboratory**: The largest and most technologically advanced tsunami wave basin in the world, and the largest wave flume in the United States.
- **Oregon BEST**: A partnership with Oregon businesses to commercialize renewable energy research into on-the-ground products, services, and jobs that power the green economy.
- **Oregon Nanoscience and Microtechnologies Institute**: A center for academia, business, and government to accelerate research and commercialization of materials science and related device and system technologies.
- **The Radiation Center**: The only university facility of its kind in the Western United States. It houses several large-scale systems test facilities; research labs for nuclear instrumentation, thermal hydraulics, radiochemistry, and radioecology; and a 1.1-megawatt TRIGA Mark II Pulsing Reactor.

WORK alongside top-notch faculty.

You won’t just be taking notes and memorizing facts here. You will be invited to gain real-world experience and start making an impact as an undergraduate.

Our innovative curricula emphasize teamwork and hands-on learning. You can work side-by-side with remarkable faculty doing research in renewable energy, nanotechnology, sustainable infrastructure, robotics, and other cutting-edge fields.

You can join dynamic extracurricular programs like Engineers Without Borders, the Global Formula Racing team, the Robotics Club, the American Institute of Aeronautics and Astronautics student chapter, and the steel bridge and concrete canoe teams of the student chapter of the American Society of Civil Engineers.

The experiences of our successful graduates show that taking advantage of opportunities like these will distinguish you from your peers so you can easily transition into your engineering career.
BUILD a dynamic career and MAKE A DIFFERENCE.

Oregon State graduates are in high demand. Top companies like Boeing, HP, Intel, Kiewit, and Garmin seek our graduates because they enter the workforce with skills and experience in creative problem-solving, communication, and leadership.

Many of our graduates go on to start their own companies. If you can dream it, we can prepare you to do it. Imagine yourself:

• Developing processes to convert chemicals into useful products like biodiesel or artificial bones.
• Planning, designing, and building safer structures, alternative transportation systems, wastewater treatment facilities, or water supply systems.
• Designing computer systems, software, and machinery to enhance environmental quality and human health.
• Playing an important role in the design, function, and safety of nuclear operations in the power or health care fields.
• Designing new ways to generate clean energy from waves, wind, biofuels, algae, the sun, or some unknown source you will discover.

APPLY for scholarships and achieve your goals.

Take advantage of multiple scholarship opportunities, both at the university level and within the College of Engineering. Our programs offer substantial scholarship support through generous donations from alumni and industry partners.

As an incoming first-year student, you are automatically considered for all available scholarships when you complete the scholarship application included with the undergraduate admission application.

EARN while you STUDY.

Internships combine what you learn in the classroom with real-life experience from the workplace. You can gain valuable on-the-job skills through premier, industry-leading programs. MECOP, the Multiple Engineering Cooperative Program, offers two paid six-month internships during your third and fourth years of study. Not only will you get real-world engineering experiences, you could wind up with a job offer before graduation.

You also will have access to many other internship opportunities, including international assignments.
JOIN a community where diversity is sought and supported.

Engineers take on a wide variety of challenges, and the talents required to solve them are equally varied. That’s why Oregon State and the College of Engineering encourage a diverse student body and offer programs, scholarships, and support to help you succeed — both as a student and, later, as an engineer.

At Oregon State, our commitment to increasing the number of women and minorities in engineering is not just something we talk about. We actively champion this effort through coaching, mentoring, and peer support to help women and minority students develop their academic, leadership, and career potential.

Funded by the National Science Foundation, the Louis Stokes Alliance for Minority Participation focuses on increasing the number of underrepresented students graduating in the STEM fields — science, technology, engineering, and mathematics — by encouraging undergraduate research experiences and serving as an additional resource for minority students. For more information, visit lsamp.oregonstate.edu.

You also will find student organizations, tutoring, and volunteer opportunities, along with programs where you can meet professional engineers and industry leaders. For more information, visit the Office of Women and Minorities in Engineering or explore engr.oregonstate.edu/wme.

CHOOSE and CONQUER your area of study.

All academic programs in the College of Engineering are fully accredited. Your freshman and sophomore years involve pre-engineering course work to prepare you for the professional programs in your junior and senior years. You can take pre-engineering and pre-computer science classes at Oregon State, at other four-year schools, or at community colleges that offer equivalent courses.

The college is organized into five schools, which cover a broad range of engineering disciplines and career fields:

- Chemical, Biological, and Environmental Engineering
- Civil and Construction Engineering
- Electrical Engineering and Computer Science Engineering
- Mechanical, Industrial, and Manufacturing Engineering
- Nuclear Science and Engineering

GENERAL ENGINEERING

If you are uncertain about which major you want to pursue, you may begin by choosing to explore the options within the College of Engineering. As an engineering student, you’ll receive specialized advising and access to resources designed to help determine which major suits you best. Most students in the General Engineering program spend one to three terms exploring before moving to their final major. Students cannot graduate with a degree in General Engineering.

HUMANITARIAN ENGINEERING MINOR

Oregon State is one of the few universities that offer an undergraduate minor in Humanitarian Engineering. Applying the combined power of science and engineering, humanitarian engineers help people access essential resources that fulfill basic human needs. They improve quality of life and enhance community resilience, whether in the face of natural disasters or economic turmoil.
CHEMICAL ENGINEERING
Chemical engineers apply the sciences of chemistry and biology and the engineering principles of momentum, heat and mass transfer, and thermodynamics to convert raw materials into useful products such as electronics, biofuels, synthetic fibers, high-tech polymer composites, advanced ceramics, medicines, medical devices, and fuels.

Chemical engineers:
• Design chemical processes for manufacturing microelectronics.
• Develop renewable energy systems based on solar cells and biofuels.
• Create new biodegradable plastics, high-performance composites, and biocompatible materials.
• Reduce air pollution and global warming.
• Design chemical production facilities and oil refineries.

BIOENGINEERING
Bioengineers apply the sciences of chemistry and biology and the engineering principles of momentum, heat and mass transfer, and thermodynamics to contribute to the rapidly growing bioscience-based biotechnology industries.

Bioengineers:
• Develop pharmaceuticals and drug delivery strategies.
• Design biomedical devices and diagnostics and improve the biocompatibility of implants.
• Construct tissues to replace impaired or lost functions.
• Design processes to produce new food products that use enzymes and living cells.

ENVIRONMENTAL ENGINEERING
Environmental engineers apply science and the engineering principles of momentum, heat and mass transfer, and thermodynamics to enhance and protect the quality of our land, water, and air.

Environmental engineers:
• Design facilities to treat drinking water, stormwater, and wastewater.
• Develop innovative ways to clean up hazardous waste sites.
• Monitor air pollution and design better control devices.
• Minimize waste streams, materials, and energy use in manufacturing processes.
• Design processes that break down waste using living systems or chemical treatment.

A CATALYST FOR CONVERTING CARBON DIOXIDE
What if the greenhouse gas carbon dioxide could be converted to an endless source of clean energy? Oregon State researchers are solving fundamental physics problems to find the answer.

Their research focuses on catalytic surface reactions. Catalysts are substances that speed up reactions. They come into play at some point in every industrial chemical process in the modern world today, including making fuels, pharmaceutical products, and plastics.

Understanding how catalysts work — and designing more reactive, selective, and effective catalysts — will help industry save materials and pollute less.

For example, catalytic conversion of CO₂ into more reactive intermediate molecules is highly desirable. Reactive intermediates such as the formate HCOO — formed by hydrogenation of CO₂ — can be further reacted into larger hydrocarbons and liquid fuels.

Developing a catalyst involves multiple variables, so to narrow down the experimental possibilities, Oregon State researchers use density functional theory — an approximation of the Schrödinger equation that is fundamental to quantum mechanics — to calculate interactions between electrons.

Applying theoretical principles, engineers can map out exactly how a reaction takes place and indicate which materials are most likely to work. Experimental results can then be compared to theoretical data, giving researchers a deeper understanding of the reaction mechanisms for a particular material.

In the short term, this research could explain the role of alkali metals in activating reactions. The ultimate goal is to find a catalyst that could not only remove atmospheric CO₂ but also make something beneficial out of it.
CIVIL ENGINEERING

Civil engineers plan, design, and construct the infrastructure we use every day: highways, bridges, buildings, water supply, wastewater treatment plants, and many other facilities.

Civil engineers:
- Design bridges, highways, buildings, and mass-transit systems.
- Improve community resilience.
- Improve tsunami detection and evacuation plans.
- Implement safe fish passage in rivers.
- Plan better neighborhood development.
- Design for earthquake preparedness.

ECOLOGICAL ENGINEERING

A bachelor’s degree in Ecological Engineering is offered in collaboration with the College of Agricultural Sciences (bee.oregonstate.edu).

Ecological engineers design sustainable systems that integrate human activities with the natural environment to benefit both. They use ecology as a fundamental design standard, emphasizing resiliency, adaptation, and a systems approach to solve environmental problems.

Ecological engineers:
- Restore ecosystems and river systems.
- Design closed-loop systems with reduced ecological footprints.
- Design functional ecological systems that mitigate pollutants.
- Apply ecosystems analysis and modeling to solve complex environmental problems.
- Design and manage constructed wetlands and tidal marshlands.

CONSTRUCTION ENGINEERING MANAGEMENT

Construction engineers blend engineering and construction knowledge with sound business practices to efficiently build and manage major engineering projects.

Construction engineers:
- Transform engineering designs into roads, bridges, buildings, and other facilities.
- Plan, schedule, and coordinate construction activities.
- Work with engineers and architects to ensure successful projects.
- Make construction safer, faster, and more economical.
- Build sustainable, green buildings.

PREPARING FOR THE REALLY BIG ONE

After the stir caused by the July 2015 New Yorker article titled “The Really Big One,” many people in the Pacific Northwest realized that they wouldn’t be ready for the vast destruction expected from a Cascadia subduction zone earthquake and tsunami.

Engineering faculty at Oregon State, however, were not caught off guard. They’ve been saying some version of “we need to prepare for this” for years.

When a major earthquake hits, Oregon State faculty are on the scene. In Nepal and Japan, they studied liquefaction, the phenomenon in which saturated soil behaves like a liquid. Liquefaction can create major foundational instability for buildings, bridges, and other infrastructure. During the 2011 earthquake in Japan, the shifts in soil destroyed water, sewer, and gas pipelines, which crippled critical community services.

Data gathered from these earthquakes are helping engineers develop computer models to help the construction industry build structures that will better withstand liquefaction. Other models will aid in creating more resilient and economical retrofit or repair strategies for existing buildings, such as reinforced concrete frames for brick buildings.

Impacts of this vital research extend far beyond Oregon. Natural disasters like earthquakes and tsunamis happen all over the world, and we need to be prepared for them.
ELECTRICAL AND COMPUTER ENGINEERING

Electrical and computer engineers apply physics and mathematics to design, build, market, and support electrical and electronic products and computer hardware. They develop new technologies for a broad range of applications, including wireless communications, power systems, health care and medicine, multimedia, and navigation.

Electrical and computer engineers:
- Develop wind, wave, and solar energy systems.
- Design medical imaging systems for hospitals and pacemakers for heart patients.
- Build smaller, faster, and more powerful electronic devices.
- Create versatile smartphones and tablets.

COMPUTER SCIENCE

Computer scientists use creativity and logic to create software to help solve problems. They work with people from numerous fields such as science, health care, and business. Areas of specialization include software engineering, computer graphics, artificial intelligence, cybersecurity, human-computer interaction, mobile computing, and data science.

Computer scientists:
- Help save lives by writing software used in ultrasounds, MRIs, and CAT scans.
- Prevent cyberattacks.
- Invent new special effects and animation for blockbuster movies and video games.
- Design and implement software for smart grid management.

PUTTING WAVE ENERGY SYSTEMS TO THE TEST

Exploring all forms of renewable energy sources is a high priority for the College of Engineering. For about two decades, faculty and students have been working hard to make Oregon and the United States leaders in wave energy by designing, building, and testing devices that generate electricity using ocean waves.

One major contribution to the field is the Ocean Sentinel, a mobile, seaworthy platform that allows researchers to test scaled wave energy devices in harsh ocean conditions. In 2012, researchers used the Ocean Sentinel to perform a six-week test on WET-NZ, a wave energy converter prototype from New Zealand. It measured and recorded power output from the WET-NZ device, collected and stored data transmitted from a wave-measuring buoy moored nearby, conducted environmental monitoring using onboard instrumentation, and wirelessly transmitted collected data to a station on shore.

In 2013, studies on the Ocean Sentinel itself compared the effects of ocean waves and currents on the mooring system to model simulations. Typhoon Pabuk off the coast of Japan provided a perfect opportunity to test the mooring system’s limits. The storm produced 30- to 40-foot waves off the Oregon coast, which caused the Ocean Sentinel to drag its anchors along the ocean floor and move it about 400 feet. Although that wasn’t what researchers wanted to happen, finding limits of the mooring system is helping them refine their model and improve its accuracy.
MECHANICAL ENGINEERING

Mechanical engineers apply the properties of energy, fluids, forces, materials, and motion to create products and processes that advance society and improve people’s lives.

Mechanical engineers:
- Build satellites, space stations, and autonomous vehicles.
- Design miniature heat pumps for use in protective clothing.
- Develop new materials for medical and dental products and sports equipment.
- Design wind turbines, photovoltaic panels, and other renewable energy sources.
- Create processes and instruments to assess stream and forest health.

INDUSTRIAL ENGINEERING

Industrial engineers focus on improving complex system integrations and operations. They use their knowledge and skills to improve systematic processes through the use of statistical analysis, interpersonal communication, design, planning, quality control, operations management, computer simulation, and problem solving.

Industrial engineers:
- Implement new hospital processes to improve health care.
- Redesign workstations and tasks to reduce repetitive stress injuries.
- Create information systems for manufacturing operations.
- Design cockpit controls to improve pilot performance and safety.
- Improve company operations by determining where a new facility should be located.

MANUFACTURING ENGINEERING

Manufacturing engineers focus on the design and operation of integrated systems that produce high-quality, economically competitive products. These systems may include computer networks, robots, machine tools, and materials-handling equipment.

Manufacturing engineers:
- Automate a chemical manufacturing facility through computer-integrated technology.
- Design circuit board manufacturing processes to reduce costs and improve product quality.
- Develop the best assignment of machines and equipment to various manufacturing cells in discrete parts manufacturing.
- Develop and implement fabrication processes for nano- and micro-devices.
- Identify the most cost-effective material handling and facility layout alternative for an aerospace manufacturing company.

ENERGY SYSTEMS ENGINEERING

A bachelor’s degree in Energy Systems Engineering is offered at OSU-Cascades in Bend, Oregon (osucascades.edu). Energy systems engineers oversee complex energy conversion and distribution systems, work to improve energy storage systems, and manage energy efficiency in buildings, manufacturing, and processing systems. They also assess the secondary effects of energy use, including environmental impact and climate change.

Energy systems engineers:
- Manage wind turbine farms.
- Analyze the efficiency of hydroelectric systems.
- Oversee production of fuel-cell technologies.
- Evaluate the economic viability of new solar power installations.
- Assess the environmental impact of alternative energy systems.

BASKETBALL STAR, ROCKET SCIENTIST

Ruth Hamblin (’16 B.S. Mechanical Engineering) didn’t begin playing basketball with any serious intent until she was in the ninth grade in the remote town of Houston, British Columbia. To any basketball fan who has witnessed the 6-foot-6-inch center’s dominating presence and stifling shot blocking — which earned her the nickname Canadian Hammer — this almost defies belief.

In 10th grade, she was practicing with the B.C. Provincial Team, representing the best talent in British Columbia, when Scott Rueck, Oregon State’s head coach, noticed the future star. She attended Oregon State on an athletic scholarship. Hamblin began entertaining the notion of becoming an engineer during her senior year of high school. Her brother, Gavin, told her that engineers often combine creativity with analytical thought.

“I’d never thought about it before, but it seemed like a way to combine my strengths and the things I liked to do most,” Hamblin said.

It was a perfect fit. While helping lead the Beavers to the Final Four of the 2016 NCAA basketball championship and playing 36 international games as part of the Canadian National Team, Hamblin earned a 3.85 GPA and graduated with honors. For her senior capstone project, she worked with a team of students to design and build a rocket that blasted more than four miles high, then drifted safely back to earth.

Today, Hamblin wears the blue and green uniform of the Dallas Wings, a member of the Women’s National Basketball Association. When basketball is behind her, she plans to get an advanced degree and begin a second career in aerospace engineering — maybe something with NASA.
NUCLEAR ENGINEERING

Nuclear engineers research and develop new reactor designs, advanced computational techniques, nuclear fuel recycling and management strategies, and radioisotope technologies for use in medicine and industry.

Nuclear engineers:
- Design safer nuclear power plants for electricity production.
- Design nuclear power systems for satellites and deep-space exploration.
- Design advanced nuclear reactors for hydrogen production.
- Design methods for nuclear fuel recycling.
- Use radiation to explore the structure and dynamics of materials.

RADIATION HEALTH PHYSICS

Radiation health physicists integrate studies of the physical aspects of radiation, biological effects, and the methods used to protect people and their environments from radiation hazards while also enabling the beneficial uses of radiation and radioactive material.

Radiation health physicists:
- Develop programs to protect people from excess radiation exposure.
- Manage radiation safely at nuclear plants and hospitals.
- Design radiation shields for industrial and medical applications.
- Design and use sophisticated radiation detection systems.
- Study the effects of radiation on biological and environmental systems.

TAKING RADIATION DETECTION TECHNOLOGY TO MARKET

While he was at Oregon State, Abdulsalam Alhawsawi amassed a record of creativity, innovation, and entrepreneurial spirit, producing a patent application, a startup company, and the potential for an academic partnership with Saudi Arabia.

He completed a master’s degree in Nuclear Engineering in 2011 and then simultaneously earned a Ph.D. and an MBA. Along the way, he collaborated with Kendon Shirley ('13 B.S. Radiation Health Physics) on a solid-state scintillation detector.

The device, which is small enough to fit easily into a smartphone, could be used as an affordable, consumer-friendly radiation detector. Or, when networked through many phones, it could generate a map identifying the size and location of a radiation public health emergency.

Alhawsawi and Shirley launched GenX Detectors to further develop and market the device.

After defending his dissertation, Alhawsawi will head back home to Saudi Arabia and begin his duties as an assistant professor at King Abdulaziz University. He hopes to establish a research partnership with Oregon State as well as a summer internship program for Saudi engineering students. He thinks this will be an easy sell to his students.

“OSU is a top-notch engineering school,” Alhawsawi said. “We’re doing cutting-edge research, and that’s what keeps me going. I don’t want to do what someone else has already done; that’s why I think this is a great place for ambitious engineering students.”
COME SEE for yourself!
Nothing beats a campus visit to see what it’s like to study engineering at Oregon State. Take a tour of our beautiful, historic campus and our state-of-the-art engineering facilities.

To arrange a visit, contact the Office of Admissions at 800-291-4192 or oregonstate.edu/admissions.

QUESTIONS?
Ask one of our student ambassadors! Send email to askengineering@oregonstate.edu. Or call the College of Engineering at 877-257-5182.

Visit our online community at engineering.oregonstate.edu
Read inspiring student stories, learn about current research projects and academic programs, view photos, and much more.