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CHEMICAL ENGINEERING

The faculty and students of UW ChemE engineer the molecules, materials and devices that enable us to better treat disease, produce clean energy and live more sustainably.

PREPARING THE NEXT GENERATION OF ENGINEERING LEADERS

Chemical engineers are grounded in mathematics, chemistry and physics, and trained to solve complex problems that require highly collaborative, multidisciplinary approaches. With state-of-the-art laboratory spaces, powerful computing resources, and a project-based curriculum, the department is training the next generation of innovators who will envision, design and implement sustainable solutions to pressing societal needs and become leaders in diverse industries.

NANOSCALE AND MOLECULAR ENGINEERING

Nanoscale and molecular principles are fully integrated into our curriculum. Undergraduates have the option of completing a nanoscience and molecular engineering program with their degree, and the graduate program includes a nanotechnology and molecular engineering dual degree option.

DATA SCIENCE

We are launching exciting initiatives and educational opportunities at the nexus of data-intensive research and chemical engineering. We offer a data science master's track, a graduate capstone project with industry partners, and a Python-based course sequence focused on molecular and materials science and machine learning.

ENTREPRENEURSHIP

Students in all programs can access UW's extensive startup resources and regularly spin out their own companies. Our faculty and alumni include successful entrepreneurs in many industries.

DEPARTMENT HIGHLIGHTS

46

UNDERGRADUATE DEPARTMENT
SCHOLARSHIPS AWARDED ANNUALLY

100%

OF PH.D. STUDENTS
RECEIVE FIRST-YEAR FUNDING

60%

OF UNDERGRADUATES
PERFORM RESEARCH

FACULTY EXCELLENCE

7

Washington
State Academy of
Sciences members

2

American Institute
of Chemical
Engineers Fellows

5

NSF Early Career
Award recipients

4

AAAS Fellows

In 2018-19, two ChemE faculty received
presidential recognition for excellence
in **STEM research and mentoring**

TOP-TIER EDUCATION

DEGREE PROGRAMS

- **Bachelor of Science in Chemical Engineering (B.S. ChemE)** - Nanoscience and Molecular Engineering degree option available; optional focus areas in Bio & Biomedical Materials, Interfaces and Systems; Data Science; Computation, Statistics and Modeling; Entrepreneurship; Environmental Engineering; Energy Systems; and Polymers, Composites, Colloids, and Interfaces
- **Master of Science in Chemical Engineering (M.S. ChemE)** -
Research track: thesis and non-thesis programs, with a data science degree option
Data science track: a streamlined program intended for industry career preparation, requires completion of a capstone project
- **Doctor of Philosophy in Chemical Engineering (Ph.D. ChemE)** - Prepares individuals for leadership roles in industry, government and academia. Advanced data science degree option available

ACTIVITIES AND PROFESSIONAL DEVELOPMENT

- **Student organizations** provide opportunities for students to participate in career preparation workshops, networking, industry visits and other STEM outreach. ChemE has four student organizations, including the founding chapter of Women in Chemical Engineering (WChE).
- **The Science & Engineering as Art competition** challenges students to make their research and data visually stunning.
- **The Distinguished Young Scholars Seminar**, organized by and for students, brings rising stars to UW for a mock faculty interview.



PROJECT-BASED LEARNING: **Kitchen Engineering**

Professor Lilo Pozzo co-developed a culinary-focused freshman course to introduce students to a menu of fundamental concepts across all of the engineering disciplines

DATA SCIENCE INDUSTRY CAPSTONE PROJECTS

Teams of graduate students tackle real-world problems using data science principles under mentorship of industry and academic partners. Recent ChemE projects include:

- Using deep learning to predict how a promoter sequence influences gene expression in yeast
- Measuring eutectic solvents' melting points with high-throughput infrared image processing
- Predicting impurity energy levels of semiconductors using machine learning
- Estimating battery load requirements on King County Metro bus routes

OUR STUDENTS

204 Undergraduate students

63 Bachelor's degrees awarded

95 Graduate students

19 Master's degrees awarded

20 Ph.D. degrees awarded

data from 2019

ENTREPRENEURSHIP: **Undergraduate Special Design Program**

Undergraduates may participate in a 3-course entrepreneurship sequence to learn product design, prototyping and business development. Recent projects include:

PuriCake - Urinal cakes that adsorb and break up dissolved drugs before they can pollute water and harm wildlife; the team presented the product on KOMO4 News in 2019.



ElectroSolar Oxygen - A solar-powered oxygen concentrator for patients lacking reliable electricity sources; won the Clean Energy Prize at UW's Environmental Innovation Challenge and the Social Impact Prize at the Dempsey Startup Competition in 2019.





Energy systems • Advanced materials & interfacial engineering • Data science & molecular simulation • Health & biotechnology

RESEARCH WITH IMPACT

Emergency power solutions

The Hurricane Maria Energy and Health Project, led by professor Lilo Pozzo, installed solar powered systems to Puerto Rican residents in order to provide emergency power for medical devices following a disaster.

Highly targeted drug delivery

Assistant professor Cole DeForest's group developed a new targeted drug delivery strategy that uses hydrogel biomaterials to release therapeutics in response to user-specified physiological conditions.

Improving renewable energy with data science

Professors Hugh Hillhouse, David Beck and Jim Pfaendtner are working on high-throughput screening and analysis techniques to improve the environmental stability and performance of thin film perovskite solar cells.

Protection from nerve agents

Professor Shaoyi Jiang and colleagues developed "nanoscavenger" particles that may provide long-acting protection against pesticide poisoning, sarin gas, and other nerve agents.

Streamlined renewable chemical discovery

Applying data mining and machine learning tools, professors Jim Pfaendtner and David Beck are systematically identifying novel biobased chemicals, starting with corrosion inhibitors and flame-retardant polymers that are at least as effective as — and greener than — conventional products.

FACULTY

27 Core Faculty

14 Endowed Positions

19 Affiliate Professors

16 Adjunct Professors

INTERDISCIPLINARY RESEARCH

ChemE faculty play lead roles at innovative UW centers.

- **The Center for the Science of Synthesis Across Scales** aims to define the rules that govern how molecular-scale building blocks assemble into ordered structures.
- **The Clean Energy Institute** supports the advancement of next-generation solar energy and battery materials and devices.
- **The eScience Institute** empowers researchers and students in all fields to answer fundamental questions through the use of large, complex, and noisy data.
- **The Center for Dialysis Innovation** develops and tests innovative treatment technologies in order to improve the health and well-being of people receiving dialysis therapy.
- **The Molecular Engineering and Sciences Institute** serves as a physical incubator and an intellectual accelerator for translational molecular-level research in clean tech and biotech.

NATIONAL ACCLAIM



Mary Lidstrom

National Academy of Sciences member



Dan Schwartz

Presidential Award for Excellence in STEM Mentoring



Elizabeth Nance

Presidential Early Career Award for Scientists and Engineers



Buddy Ratner

National Academy of Engineering member

ALUMNI AND MARKET IMPACT



Since 2012, the department has been responsible for:

248
patent applications

65
patents issued

17
commercialization agreements

RECENT STARTUP COMPANIES

Battery Informatics, Inc. is developing next-generation battery management systems for cost-effective use of lithium-ion batteries in power grids and electric vehicles.

Decafino is developing new natural and cost-effective materials that instantly decaffeinate beverages without the use of chemicals or affecting the taste.

Membrion produces the next generation of ion-transporting membranes for applications in grid-scale energy storage, water treatment and industrial separations.

PolyDrop makes innovative conductive polymer additives for use in paints, coatings, composites and adhesives.

Proteios focuses on providing researchers and pharmaceutical companies with affordable and easy-to-use reagents for purifying proteins and isolating cells.

Taproot Medical Technologies is developing a new class of highly biocompatible materials and applying this technology to medical device development.

TRAILBLAZERS

UW ChemE alumni have led ground-breaking enterprises in industry and pioneered far-reaching research in the field.



Jeet Bindra (M.S. '70; Distinguished Alumnus '97) is the former president of global manufacturing for Chevron Corp; he led the development of a pipeline from the Tengiz Field in Kazakhstan to the Black Sea.



Ron Litzinger (B.S. '81) recently retired as president of Edison Energy, the competitive business arm of Edison International. Previously, he was president of Southern California Edison, one of the nation's largest investor-owned electric utilities.



Linda Koffenberger (B.S. '69; Distinguished Alumna '95) is a 20-year veteran of DuPont, who also worked as director of new business for Union Carbide and president of Amerchol Corporation, a worldwide supplier of ingredients in the personal care industry.



Steven R. Rogel (B.S. '65; Distinguished Alumnus '00) has served as president, CEO, and chairman of Weyerhaeuser Company. He is now chairman of the board of EnergySolutions, Inc., and a director of Union Pacific Corporation.



Christoph Krumm (B.S. '11) is co-founder and CEO of Sironix Renewables, which designs molecules to eliminate the need for harmful chemicals in consumer products. He was one of the American Institute of Chemical Engineers' "35 Under 35" for 2017.



Jill Seebergh ('91 M.S.; '95 Ph.D.; Distinguished Alumna '18) is a senior technical fellow at Boeing who works on chemical technologies that improve aircraft performance, streamline manufacturing, reduce environmental impact and benefit worker health and safety.

"Our mission is twofold: to prepare students to be leaders in diverse careers and to advance technologies that tackle big societal problems. In UW ChemE, we strive to foster an environment of inclusivity and respect that enables students and faculty to realize their full potential." **Jim Pfaendtner, Professor and Chair**

