Chemical and Biological Engineering (ChBE) at the University of Colorado Boulder is a world-class department with 27 faculty, 39 postdoctoral fellows and research technicians, 128 graduate students, and more than 500 undergraduate students. Our research program is extremely active, including research centers in biorefining and biofuels, renewable and sustainable energy, membrane separations, pharmaceutical biotechnology, and photopolymerization. Within the last five years, one department faculty member received the rare honor of being elected to all three branches of the National Academies, and our faculty have received national and international awards including the NSF Waterman Award, the CoMSEF Young Investigator Award, the NSPE Engineering Education Excellence Award, the ACS PSME Young Investigator Award, the AIChE R. H. Wilhelm Award, the AIChE Professional Progress Award, the AIChE Allan P. Colburn Award, the ASEE Curtis W. McGraw Award, and the ASEE Dow Lectureship Award.

As an innovation leader, the department has parlayed its research into eight successful startup companies through the technology transfer process. Synergy created through dynamic faculty collaborations has led to strong research thrusts in:

- Biomaterials and tissue engineering
- Biosensing
- Biotechnology and pharmaceuticals
- Catalysis and surface science
- Computational science and engineering
- Energy
- Fluids and flows
- Interfaces and self assembly
- Membranes and separations
- Nanomaterials and nanotechnology
- Polymers and soft materials
- Protein engineering and synthetic biology

Recent Highlights

- **Kristi Anseth** joined a very select group of approximately 15 scientists and engineers who are members of all three branches of the National Academies: the National Academy of Engineering, the National Academy of Sciences, and the Institute of Medicine.

- **Ryan Gill** and his team received a $9.2M DOE grant to engineer *E. coli* into biofuels such as ethylene and isobutanol.

- **Ted Randolph** and his team were awarded $4.4M by NIH to study aggregation of therapeutic proteins.

- Phillips 66 committed $3.5M toward the Phillips 66 Center of Energy Innovation in support of energy-related departmental research efforts.

- **Christine Hrenya**, who was named editor of *Aerosol Science and Technology*, received a $1.5M industry-sponsored grant for fundamental particle flow research and a $450K grant for solar power plant research.

- **Chris Bowman** licensed his team’s dental polymer technology to 3M.

- **Arthi Jayaraman** received a 2013 CoMSEF Young Investigator Award and an ACS PMSE Young Investigator Award.

- The department began a semi-annual series of research symposia focusing in turn on faculty research in the fields of energy, bioengineering, and materials.

- Graduate student honors included the 2013 AIChE Award for Best PhD Thesis in Particle Technology, the 2012 Outstanding Thesis Award from the Max Bergmann Center for Biomaterials in Dresden, and NSF, NIH, NASA, GAANN, Whitaker, Balsells, and Phillips66 Fellowships.

Department Facts

Recent national rankings of chemical engineering departments by the *Chronicle of Higher Education* ranks ChBE 8th in its Faculty Scholarly Productivity Index. According to this index, ChBE faculty were:

- Second in new grants per faculty
- Fifth in total value of new grants per faculty
- Tenth in publications per faculty, citations per faculty, and citations per paper

*U.S. News & World Report* ranks ChBE 14th overall and 8th among public graduate programs (2015).

The 2010 NRC Assessment ranked ChBE in the range of the top 7-29 U.S. PhD programs in its survey-based quality rating of 106 chemical engineering PhD programs. ChBE also ranked 11th in the Research Productivity category.

ChBE is home to 103 outstanding PhD students:

- The average GPA for incoming students is 3.83/4.0.
- The average quantitative GRE score for incoming students is 165/170.

All graduate students are fully supported via research funding.

Research expenditures of regular faculty in the department reached $11.8M in 2013, for an average of $453K per faculty member.
Research Centers and Facilities

Colorado Center for Biorefining and Biofuels (C2B2)
The CU-led C2B2 is a cooperative research and educational partnership with the National Renewable Energy Laboratory (NREL), Colorado State University, and Colorado School of Mines. C2B2 provides private industry with one-stop access to researchers, laboratories, students, and educators from four innovative institutions, each having unique strengths in biofuel and biorefining application areas.

Renewable and Sustainable Energy Institute (RASEI)
Launched in 2006 by researchers from CU and NREL, RASEI was developed to solve the energy crisis through research, education and technology. RASEI reflects a three-pronged approach through discovery, transformation, and entrepreneurship in linking the university’s research in renewable and sustainable energy with climate and environmental science, behavioral science, and policy analysis.

Membrane Science, Engineering and Technology Center (MAST)
Shared with the Department of Mechanical Engineering, the NSF-supported Industry/University Cooperative Research Center for Membrane Science, Engineering and Technology is a world-renowned leader in discovering and developing thin films and membranes for important industrial separation processes. It is one of NSF’s longest-running and most successful I/UCRCs.

Center for Pharmaceutical Biotechnology
The Center for Pharmaceutical Biotechnology is jointly run with the CU School of Pharmacy. The Center is divided into three research cores: pharmaceutics for drug stability and drug delivery research, molecular biology employing recombinant DNA technologies, and new analytical chemistry methods to characterize macromolecular structure, in vivo drug concentrations, and drug purity.

Industry/University Cooperative Research Center for Fundamentals and Application of Polyyolpolymerization
The Industry/University Cooperative Research Center for Fundamentals and Application of Polyyolpolymerization is operated jointly with the University of Iowa. The center strives to increase the understanding of kinetics and mechanics of photopolymerizations and their applications to industry.

Faculty in Chemical and Biological Engineering

Kristi S. Anseth
Distinguished Professor, Howard Hughes Medical Institute Investigator, Tony Tisone Professor and Professor of Surgery. Biomaterials, photopolymerization, tissue engineering, and drug delivery.

Christopher N. Bowman
Distinguished Professor, James M. Catherine Patten Professor, Professor of Dentistry and Co-Director I/UCRC. Biomaterials, photopolymerization, reaction kinetics, polymer chemistry.

Stephanie J. Bryant
Associate Professor and Patten Fellow. Functional tissue engineering, photopolymerization, biomaterials.

Jennifer N. Cha
Norviel Associate Professor. Nanoscience, nanoengineering, biomaterials, surface science, colloids, and self-assembly.

Anushree Chatterjee
Assistant Professor. Antibiotic and antiviral resistance transfer gene mutations, resistance free antibiotics, metabolic engineering, and biofuels.

David E. Clough
Professor. Dynamics and control of fluidized-bed process, adaptive control of chemical processes, expert systems in process control, real-time computing.

Robert H. Davis
Dean of the College of Engineering and Applied Science and Tony Tisone Professor. Fluid mechanics of suspensions, sedimentation, coagulation, filtration, particle collisions in fluids, microbial suspensions, biotechnology, membrane fouling.

John L. Falconer
Melvin and Virginia Clark Professor, President’s Teaching Scholar. Heterogeneous catalysis, photocatalysis, inorganic membranes, solar cells.

Hans H. Funka
Associate Professor Adjunct. Separations, inorganic membranes, nanoporous materials, thermochemical cycles.

Ryan T. Gill
Associate Professor and C2B2 Managing Director. Evolutionary and inverse metabolic engineering, genomics.

Douglas L. Gin
Professor of Chemical and Biological Engineering and Chemistry and Biochemistry. Polymer science, liquid crystal engineering, and nanomaterials chemistry.

Andrew P. Goodwin
Assistant Professor. Colloid and interface science, polymer science and engineering, self-assembly, chemical synthesis, imaging, drug delivery, and cancer research.

Christine M. Hrenya
Professor. Gas-particle fluidization, granular flow mechanics, turbulent flows, computational fluid mechanics.

Arthi Jayaraman
Patten Assistant Professor. Polymers, nanomaterials, biophysics, molecular simulations, statistical thermodynamics.

Joel L. Kaar
Assistant Professor. Non-aqueous enzymology, protein at interfaces, biofuels, tissue engineering, biomaterials.

Mark J. Kastantin
Assistant Research Professor. Interfacial phenomena, biomolecules at interfaces, surface modification, and nanoscale materials.

Dhinakar S. Kompala
Associate Professor. Recombinant mammalian and microbial cell cultures, high cell density bioreactors design, bioprocess engineering.

Melissa J. Mahoney
Assistant Research Professor. Novel drug delivery and tissue engineering strategies to promote regeneration in the central nervous system.

J. Will Medlin
Associate Professor and Associate Chair, Conoco Phillips Faculty Fellow, and C2B2 Site Director. Surface chemistry, heterogeneous catalysis, solid-state chemical sensors, computational chemistry.

Charles B. Musgrave
Professor and Associate Chair. Catalysis for energy conversion and storage, photovoltaics, batteries, atomic and molecular layer deposition, nanotechnology.

Prashant Nagpal
Assistant Professor. Nanoscale optoelectronics, optical nanomaterials, optoelectronics, optical devices, and interfacial phenomena.

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