Colorado School of Mines

Founded in 1874 as the first college in the state
A public, state supported university of science and engineering

6000 total students
  4600 undergraduates
  1400 graduate students

15:1 student to faculty ratio
PhD Program Curriculum

Chemical Engineering Core
- Applied Math in Chemical Engineering (CBEN 507)
- Advanced Thermodynamics (CBEN509)
- Advanced Kinetics (CBEN518)
- Introduction to Chemical Engineering Research and Teaching (CBEN568)
- Transport Phenomena (CBEN516)

Additional Curriculum
- 6 hours (2 courses) chemical engineering electives
- 12 hours (4 courses) additional electives
- Colloquium (CBEN605) every semester
- Thesis research credits (42 credits)
- Minimum of 72 credit hours total
PhD Program Timeline

1. Qualifying Exam: January of 1st year
   - 50% core GPA + 50% written and oral proposal

2. Students are assigned to a research group: January of 1st year

3. PhD Proposal: Before beginning of 5th semester (3rd year)
   - Literature review, preliminary data, and proposal in a written document and an oral defense with your thesis committee
   - PhD Defense: Typically 4.5–5 years following matriculation
Research Advisor Selection

- Project descriptions will be provided to you in September. Faculty will make presentations about their projects over the course of the semester.

- Make appointments with faculty members with projects of interest to you.

- Turn in your top 3 choices by December 1.

- Advisors are assigned in early January shortly after the Oral component of the Qualifying Exam.
Research Portfolio

Approximately $8 million in annual research awards.

Research area include bioengineering, conventional energy conversion, hydrates, renewable energy, simulation and modeling, soft materials, and electronic materials.

Strong collaboration and research opportunities with the National Renewable Energy Laboratory, Children's Hospital Colorado, National Institutes of Standards and Technology.
Bioengineering
(Boyle, Cash, Krebs, Marr, Neeves)

Human trabecular meshwork cells seeded on collagen scaffolds

Microfluidic model of vascular injury

Biosensors
Diagnostics
Drug delivery
Metabolic engineering
Microfluidics
Tissue engineering

Nanosensors for in vivo monitoring of metabolites

Metabolic engineering of photosynthetic organisms
Colloidal molecules assembled by electric fields

Magnetically actuated colloid pump and valves

Colloids
Complex fluids
Interfacial rheology
Micropropulsion
Polymers

Dynamics of fluid-fluid interfaces

Rheology of tissues

Graphene

Heptane

Water

TEM: Graphene Films

Effective screening length (nm)

Fractional packing model (see Eq. 14), and Ethier's media models: a resistors-in-parallel model (see Eq. 11), a range from

\[ D_P/a_p \]

\[ L \]

\[ (\text{platelets})/m. \]

\[ f_p \]

\[ (SD) \]

\[ k_f \]

\[ 20 \]

\[ m \]

\[ E \]

\[ 2 \]

\[ c \]

\[ 2 \]

\[ 500 \]

\[ 500 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]

\[ 2 \]
Membranes and Catalysis (Carreon, Gomez-Gualdron, Herring, Way, Wilcox)

Carbon capture  
Catalytic membrane reactors  
Fuel cells  
Hydrogen purification  
Zeolite membranes

Post-combustion capture and conversion
Solar and Electronic Materials (Agarwal, Wolden, N. Wu)

Plasma synthesis of silicon nanocrystals

CuSbS$_2$ solar absorber

Thin film synthesis
Plasma processing
Colloidal synthesis

Atomic layer deposition

Internal Reflection Element for In Situ IR Spectroscopy

CRSP
Center for Revolutionary Solar Photoconversion
Third Generation Solar Photon Conversion

COLORADO SCHOOL OF MINES
Hydrates (Koh, Sum)

Hydrates in Flow Assurance

Hydrates in Science

Hydrates in Nature
Benefits

PhD graduate research assistants
  – Annual stipend $27,000
  – Fully paid tuition, fees, health insurance
  – Total value: >$60,000/year

15 miles from downtown Denver…

…minutes from world class outdoor recreation
Where do our graduates get jobs?

- **Industry**
  - Oil and Gas: ConocoPhillips, Exxon, Haliburton
  - Chemical: Pall, Dow, DuPont, Cargill
  - Biotech: NovoNordisk, Cerus, Horiba
  - Semiconductor: Intel, Motorola, Sun
  - Beer: Mountain Toad, New Terrain, Coors

- **National Laboratories**
  - NREL, ORNL, LLNL

- **Academia**
  - Kansas State, Carnegie Mellon, University of Colorado, Stanford, Oregon Health & Sciences University
Questions? Contact

Prof. Keith Neeves
Chair of Graduate Affairs
kneeves@mines.edu
303–273–3191

Jennie Gambach
Student Services Administrator
jgambach@mines.edu
303–273–3246