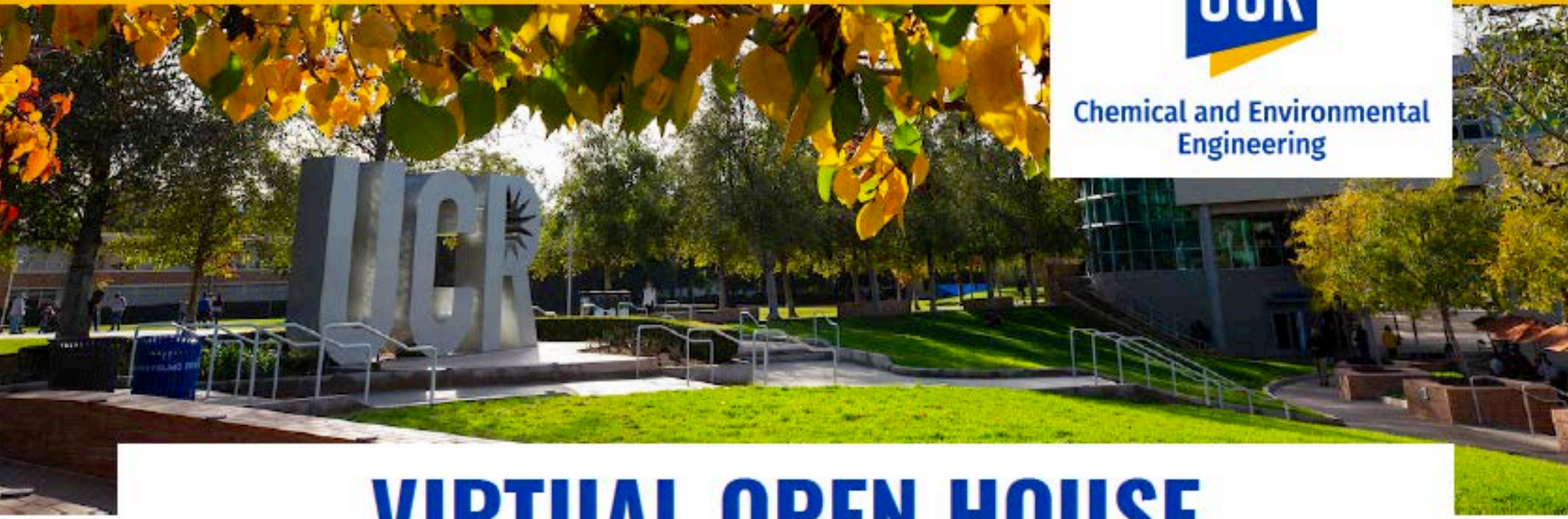


UCR

Chemical and Environmental Engineering

VIRTUAL OPEN HOUSE

Graduate Admissions

TUESDAY, NOVEMBER 24, 2020

Apply to CEE!
Jan. 5th

CELEBRATING 30 YEARS
Marlan and Rosemary Bourns College of Engineering

Tonight's Agenda

Welcome: Prof. David Cocker, Chair

Graduate Admissions: Prof. Juchen Guo

Program Overviews

- ***Materials*:** Prof. Younjin Min
- ***Biotechnology*:** Prof. Ian Wheeldon
- ***MSOL Water Quality*:** Prof. Jinyong Liu
- ***Air Quality Masters*:** Prof. Kelley Barsanti

Moderated Q&A: Faculty Panel

Close

Welcome!

Prof. David Cocker, Chair

UCR
CELEBRATING 30 YEARS
Marlan and Rosemary Bourns College of Engineering

Graduate Admissions

Prof. Juchen Guo

CELEBRATING 30 YEARS
Marlan and Rosemary Bourns College of Engineering

Bourns College of Engineering
University of California, Riverside

Department of Chemical and Environmental Engineering
Graduate Open House

Juchen Guo, Associate professor
Admissions Graduate Advisor

November 24, 2020

UCR

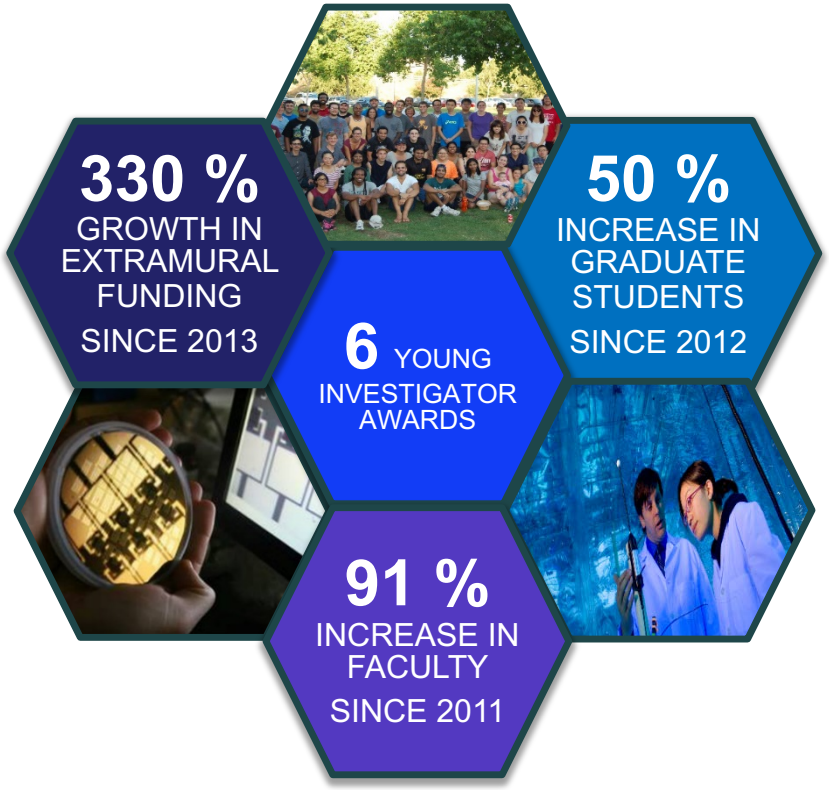
CELEBRATING 30 YEARS

Marlan and Rosemary Bourns College of Engineering

QUICK FACTS

CHEMICAL AND ENVIRONMENTAL ENGINEERING

- **~400 undergraduate students**
- **~100 graduate students**
- **21 Full-Time Tenured/Tenure-track faculty**
- **~$600k/per PI extramural funding**



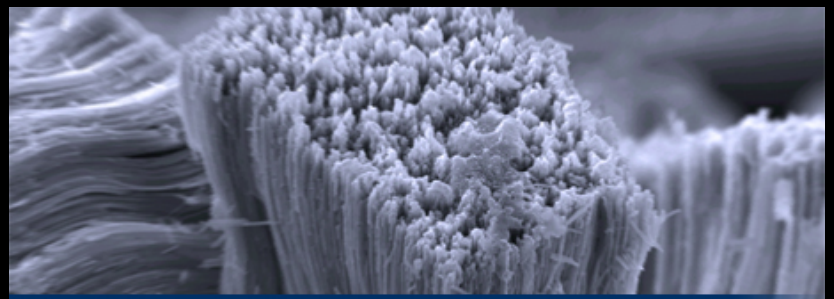
A Few Things We Are Proud Of…

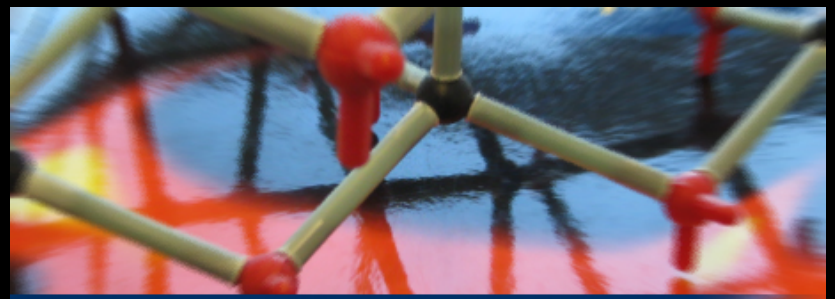
- Dynamic and highly productive faculty
- Multi-disciplinary research and collaborative projects
- Well supported infrastructure and outstanding laboratory research facilities
- Large graduate program and many research opportunities for undergraduates
- Outstanding colloquium series

Graduate Program Overview

- Started in Fall 1999
- Joint Chemical and Environmental Engineering graduate program
- Offering M.Sc. and Ph.D. degrees
- M.S. in Industrial Biotechnology
- 5-year B.Sc. / M.Sc. Degree offered

Research Areas





DEPARTMENT OF **CHEMICAL AND ENVIRONMENTAL ENGINEERING**

Chemical and Environmental Engineering Department
Bourns College of Engineering
University of California, Riverside

Graduate Program Courses

Core Courses – 16 units

- CEE 200: Advanced Engineering Computation (4 units)
- CEE 202: Transport Phenomena (4 units)
- CEE 204: Advanced Kinetics and Reaction Engineering (4 units)
- CEE 206: Advanced Chemical Engineering Thermodynamics (4 units)

Plus

Ph.D. – 8 units of regular lecture graduate and/or approved upper division courses

M.S. – A minimum of 20 units of approved coursework

CEE 286: Colloquium in CEE (1 unit)

– Taken every quarter and mandatory for all students

CEE 302: Teaching Practicum (2 units)

Chemical and Environmental Engineering Department
Bourns College of Engineering
University of California, Riverside

Ph.D. Program

Preliminary Exam

- A critical evaluation of a published scientific journal article, presented orally, followed by questions from a faculty panel.
- The article will be selected by the faculty panel comprised of faculty from CEE with appropriate expertise in the chosen area of study.
- Pass/fail based on the oral presentation and answers to questions.
- There is a second and final attempt to pass a makeup examination.
- Hold in the third quarter of study

Advancement to Candidacy Exam

- Committee member nominations due Fall quarter of 2nd year
- Qualifying Committee (4 members from CEE, 1 outside member)
- Thesis Proposal – 15 pages, must follow format guidelines
- Oral Presentation

Dissertation and Final Oral Examination

- Dissertation Committee (3 members)
- Thesis Defense

Advisor Selection

- Process begins Fall quarter
- Advisor Selection Form will be available online
- Student indicates 3 CEE faculty choices
- Graduate Committee will review Advisor Selection Forms in December and match students with a faculty advisor
- Students will be informed of who their advisor is before Winter break

Ideal Geographical Location

Advanced Materials and Nanotechnology

Prof. Younjin Min

What Chemical Engineers and Material Scientists Do?

- Materials science is one of the broadest and most active areas in chemical engineering.[1]

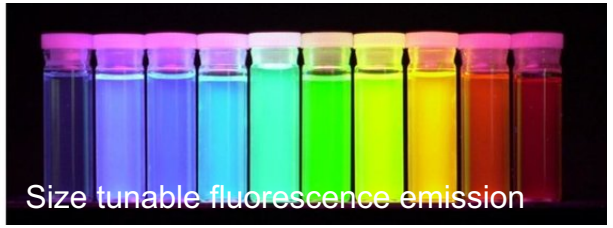
- It involves the discovery, evaluation, and manipulation of useful properties in different substances. The outcome is an expanding array of materials that feature unique characteristics used for the development and fabrication of revolutionary new products.

- Achievements of Chemical Engineers in Materials Science - Development of materials with the following properties:[1,2]

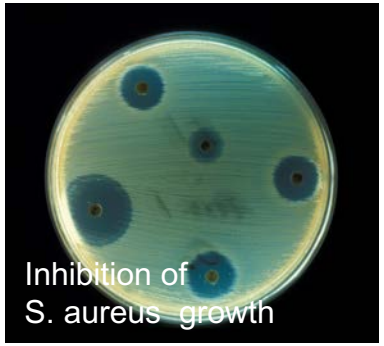
Broad resistance to chemicals

High performance polymeric tubing

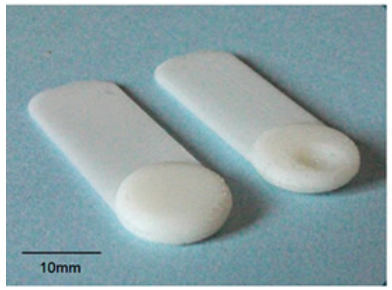
Unique optical properties

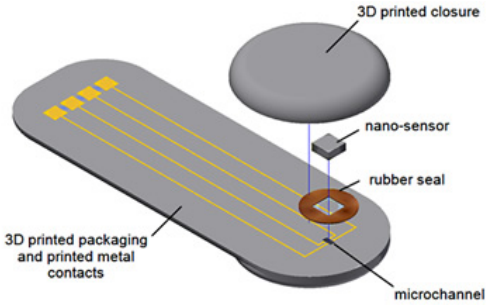


Increased antibacterial, antiviral, and antifungal capabilities



High-precision chemical sensing





Nanosensors for Disease Detection

[1]https://www.aiche.org/community; [2]https://www.webofscience.com/

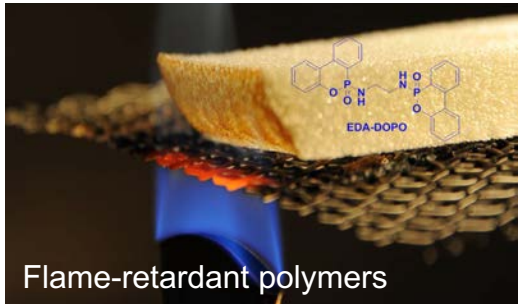
What Chemical Engineers and Material Scientists Do?

- Materials science is one of the broadest and most active areas in chemical engineering.[1]

- It involves the discovery, evaluation, and manipulation of useful properties in different substances. The outcome is an expanding array of materials that feature unique characteristics used for the development and fabrication of revolutionary new products.

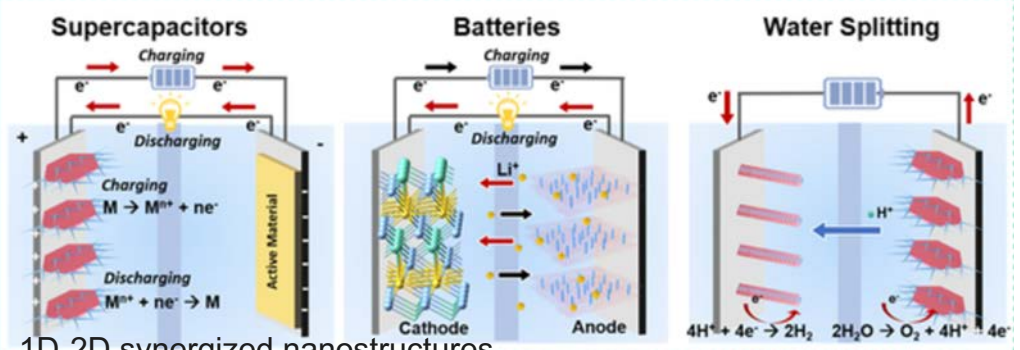
- Achievements of Chemical Engineers in Materials Science - Development of materials with the following properties:[1,2]

Improved flame retardance



Flame-retardant polymers

Superior electrochemical energy storage



1D-2D synergized nanostructures

Functional thermal and electrical insulation, Light weight with high durability, Improved tensile and impact strength, Light weight with high durability, Increased resistance to oxygen, ozone, or ultraviolet-radiation damage, etc.

[1]https://www.aiche.org/community; [2]https://www.webofscience.com/

Department Faculty at UC, Riverside
- Advanced Materials and Nanotechnology

Kandis Leslie Abdul-Aziz

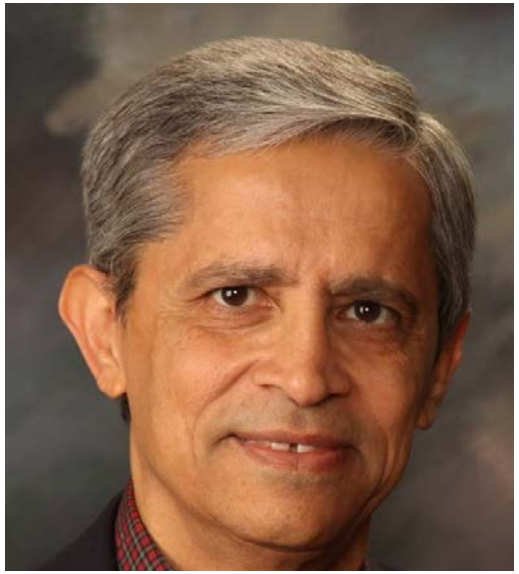
Sustainable Catalysis and Materials

Juchen Guo

Electrochemical Materials and Interfaces

Younjin Min

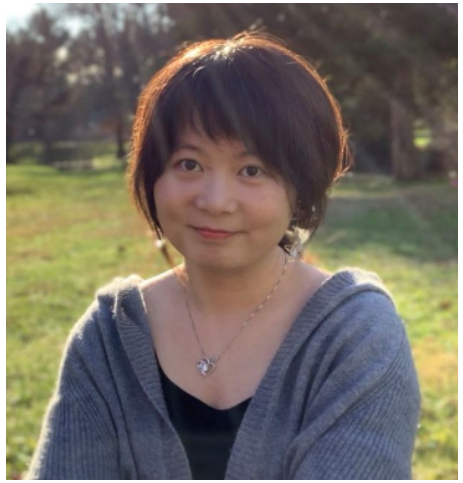
Interfacial Soft-Condensed Matter



Ashok Mulchandani

Nano- and Biotechnology for (bio)Analytical Devices, (bio)Energy Generation and (bio)Remediation Technologies

Department Faculty at UC, Riverside
- Advanced Materials and Nanotechnology



Yun Shen

Nanomaterials for Air Filters and Antibacterial Materials

Bryan M. Wong

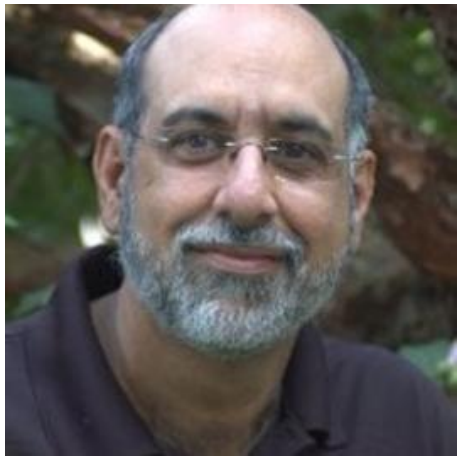
Nanoscale and Mesoscale Energy Materials

Jianzhong Wu

Molecular Theory and Modeling of Materials

Ruoxue Yan

Nanophotonics, Flexible Electronics, and Nanobiotechnology



Michael Zachariah

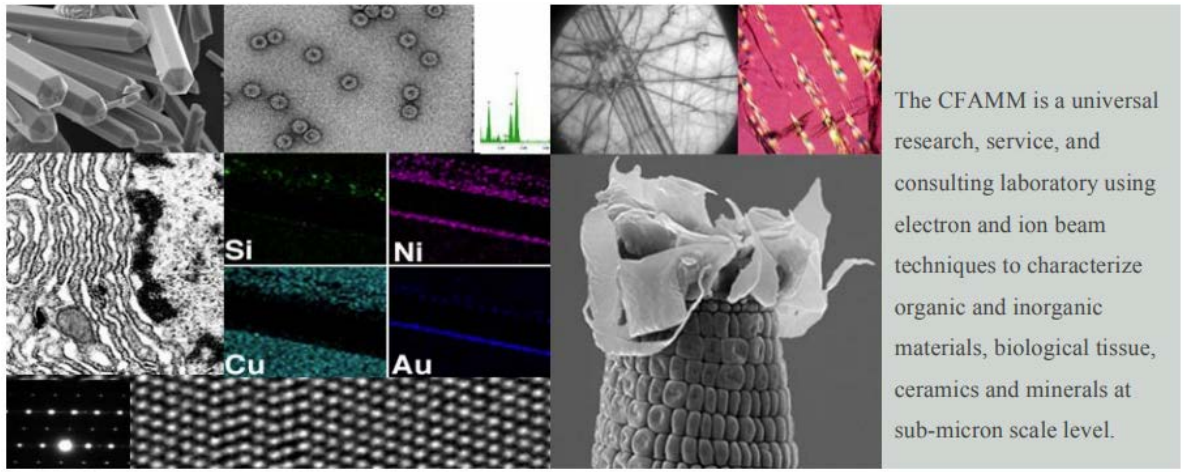
Nanoparticles and Nanotechnology for Energy and the Environment

Facilities at UC, Riverside

- Advanced Materials and Nanotechnology

Central Facility for Advanced Microscopy and Microanalysis

https://cfamm.ucr.edu/



Nanofabrication Facility

https://nanofab.ucr.edu/

Analytical Chemistry Instrumentation Facility

Microscopy and Imaging Core Facility

Some Companies Recruiting in These Areas in California

Quantum Research Scientist – Materials & Surface Scientist
Amazon
Glendale, CA
via LinkedIn
1 day ago · Full-time

Battery Materials Engineer
Apple
Cupertino, CA
via LinkedIn
6 days ago · Full-time

Senior Materials Engineer in Richmond, CA
Chevron Corporation
Richmond, CA
via Richmond, CA - Geebo
5 days ago · Full-time

Principal Material Process Engineer
Northrop Grumman
Redondo Beach, CA
via Clearance Jobs
3 hours ago · Full-time

Research Assistant
DuPont
Hayward, CA
via Careers - DuPont
Over 1 month ago · Full-time

Chemistry, Chemical Engineering, Materials Science Intern
HP
San Diego, CA
via Glassdoor
20 hours ago · Internship

Materials Engineer
Exponent
Los Angeles, CA
via ZipRecruiter
Over 1 month ago · Full-time

Chemical Engineer
Agilent Technologies, Inc.
Folsom, CA
via Folsom, CA - Geebo
5 days ago · Full-time

Corrosion & Finishes Material & Process Engineer
Lockheed Martin
Palmdale, CA
via Clearance Jobs
18 hours ago · Full-time

Materials Engineer - Polymers for SpaceX
SpaceX
Hawthorne, CA
via Talent.com
10 days ago · Full-time

Materials Engineer, Polymers
Tesla
Fremont, CA
via Glassdoor
20 hours ago · Full-time

Polymer Technician
PPG
California Hot Springs, CA
via Lensa
12 days ago · Full-time

Biotechnology Master's

Prof. Ian Wheeldon

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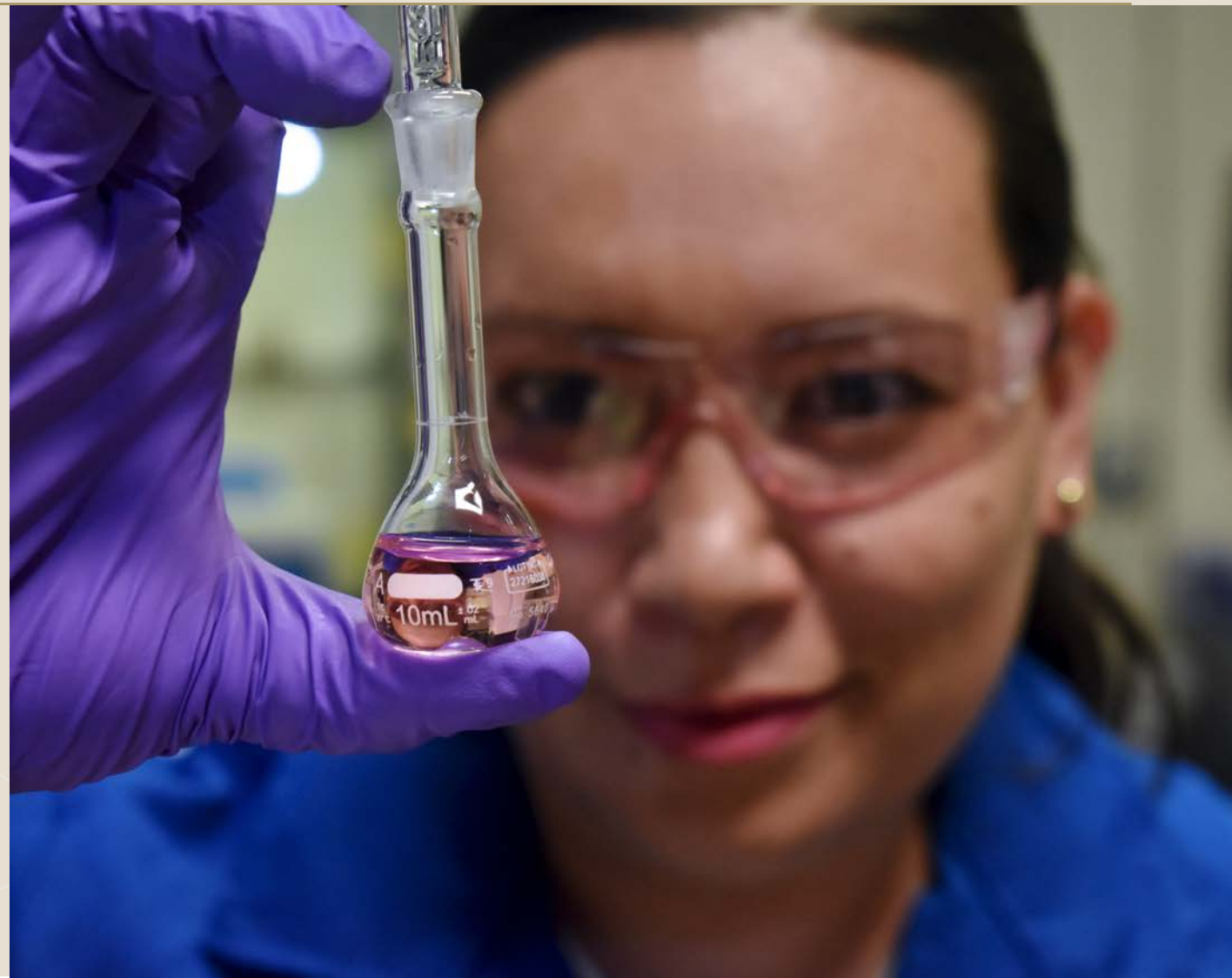
PROFESSIONAL SCIENCE MASTER'S IN INDUSTRIAL BIOTECHNOLOGY

NEXT-GEN BIOTECH EDUCATION

- M.S. in as few as 9-12 months
- One of only a few programs training biotech & bio-pharmaceutical skills
- Four focus areas
- Distinguished faculty interaction
- Biotech career prep in research, development, and production

INNOVATIVE DUAL EDUCATIONAL APPROACH

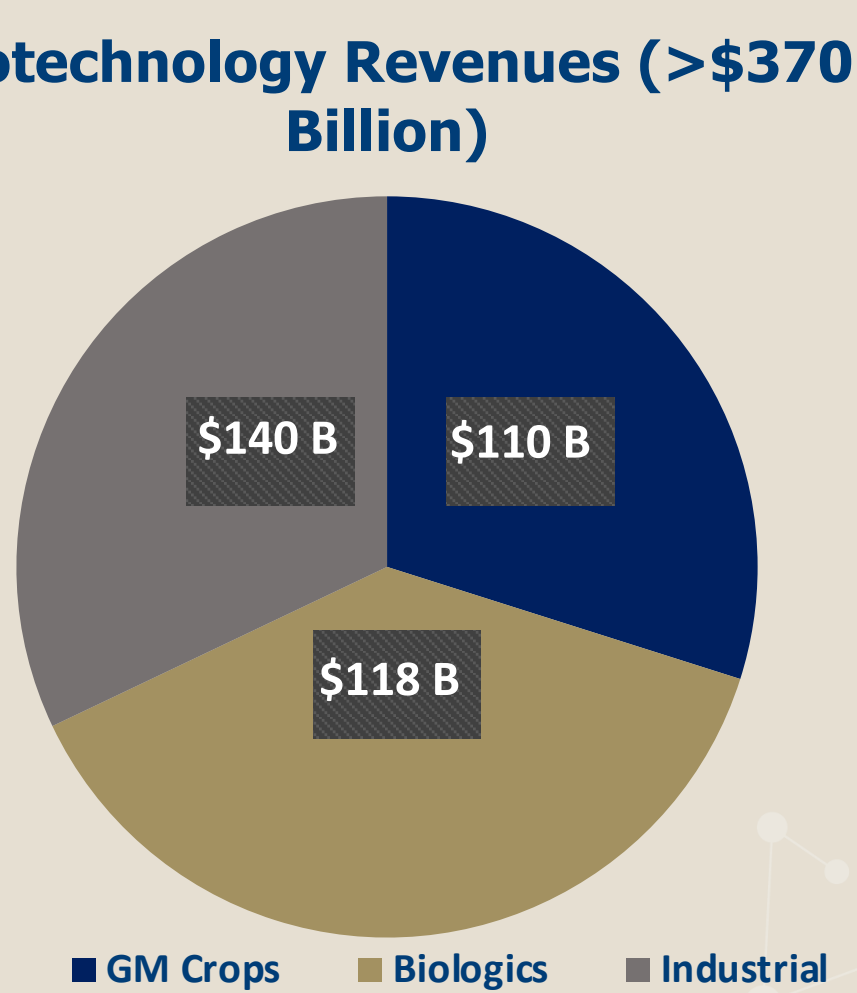
- Class and lab instruction
- Industrial internships
- Undergraduate mentoring
- Built-in CIB research training

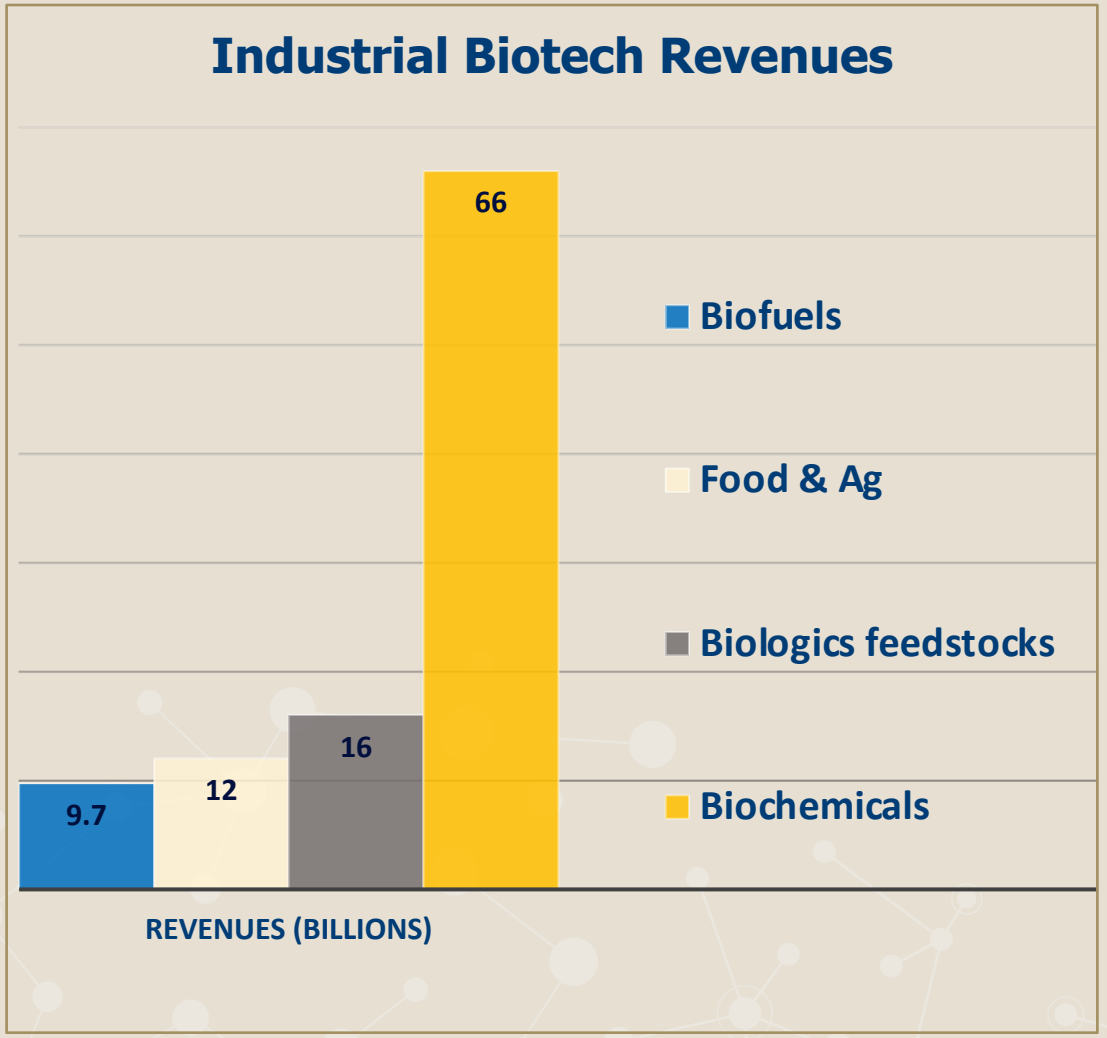


INDUSTRIAL BIOTECHNOLOGY

HEALTH	FOOD & AGRICULTURE	BIOFUELS	INDUSTRIAL
• **Reduces** rates of infectious disease • **Minimizes** health risks and side effects through tailored treatments	• **Generates** higher crop yields with fewer inputs • **Improves food** and crop oil content for cardiovascular health	• **Cuts** greenhouse gas emissions by 52% or more • **Reduces** fossil fuel dependence	• **Lowers** the temperature for cleaning clothes, potentially saving $4.1B annually • **Produces** biodegradable plastic alternatives

INDUSTRIAL BIOTECHNOLOGY IS A LARGE AND GROWING SECTOR OF THE US ECONOMY





INDUSTRIAL BIOTECHNOLOGY IN CALIFORNIA

1 YEAR MS CURRICULUM IN INDUSRIAL BIOTECHNOLOGY

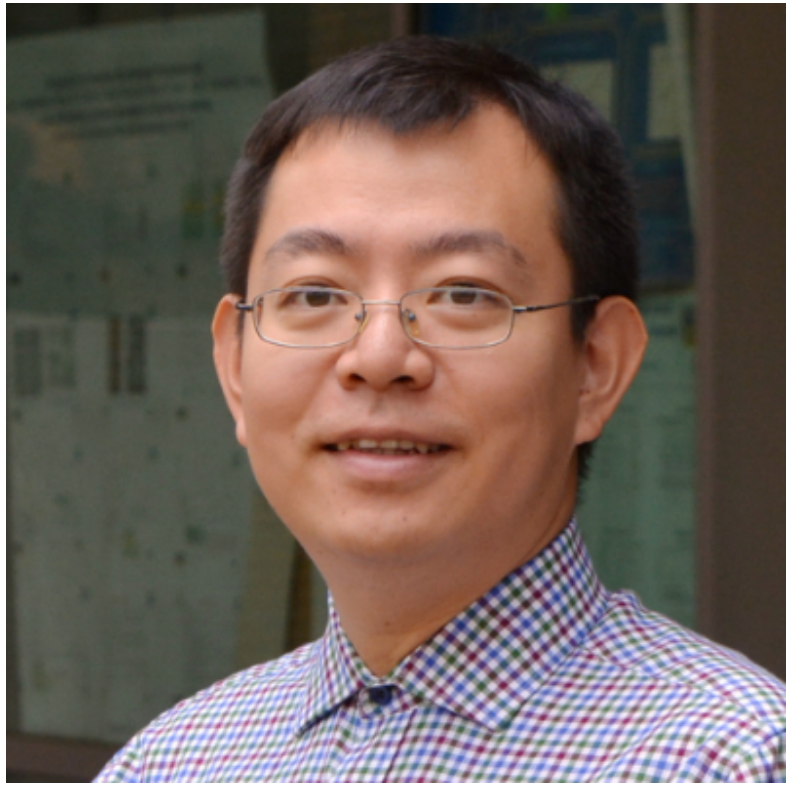
Fall Quarter	Winter Quarter	Spring Quarter	Summer Quarter
CHE 124 Biochemical Engineering Principles	CEE 212 Bioseparations	CEE 210 Cell Engineering	CEE 298i Industrial Internship (6-8 weeks)
CHE 124L Biochemical Engineering Lab	CEE 211 Upstream Processes in Biotechnology	CEE 248 Quantitative Analysis of Upstream	
CEE 236 Energy: Production, Uses, Economics, and Sustainability	CEE 238B Bioprocess Design Laboratory II	CEE 238C Bioprocess Design Laboratory III	
CEE 238A Bioprocess Design Laboratory I	CEE 286 CEE Seminar	CEE 286 CEE Seminar	
CEE 286 CEE Seminar			

Legend

- Process design and analysis
- Core lecture material
- Wet lab course

MSOL: Water Quality Systems Engineering

Prof. Jinyong Liu



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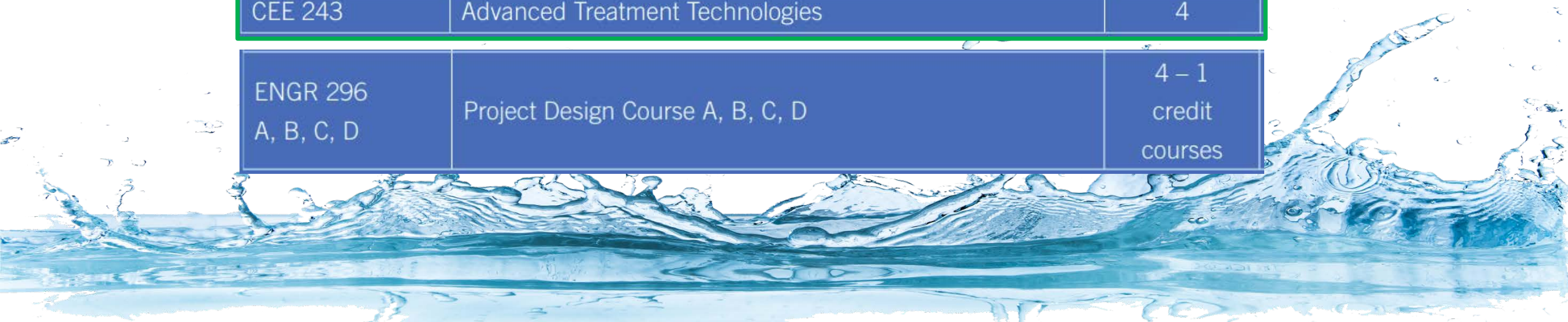
Environmental Engineering Systems (Water)

- Explore the science and engineering principles that are essential to providing clean water and improving the natural environment.

- This specialization incorporates elements of water treatment and chemistry, covering topics such as water systems fundamentals, physical and chemical processes, biological treatment, and advanced technologies.

Environmental Engineering Systems (Water)

Course Prefix	Course Name	Credit Hours
ENGR 200	Engineering in the Global Environment	4
ENGR 201	Technology Innovation and Strategy for Engineers	4
ENGR 202	Introduction to Systems Engineering	4
ENGR 203	Principles of Engineering Management	4
CEE 241	Water Chemistry in Natural and Engineered Systems	4
CEE 225	Physical and Chemical Separation Processes	4
CEE 226	Biological Treatment Processes	4
CEE 243	Advanced Treatment Technologies	4
ENGR 296 A, B, C, D	Project Design Course A, B, C, D	4 – 1 credit courses



Environmental Engineering Systems (Water)

CEE 241 Water Chemistry

Chemical principles and advanced calculation for acid-base equilibrium, metal-ligand coordination, solid precipitation-dissolution, redox chemistry, reaction kinetics

CEE 225 Physical and Chemical Processes

Water Treatment: Coagulation-flocculation-sedimentation-filtration; Disinfection; Water softening; Membrane filtration

CEE 226 Biological Processes

Wastewater Treatment: Microbial principles, BOD removal, Nutrient removal, Sludge treatment, Energy and resource recovery

CEE 243 Advanced Water Treatment Technologies

Materials and modeling for adsorption, ion-exchange, and membrane technologies; Advanced oxidation and reduction methods; Treatment train systems; Case studies and project design on PFAS treatment, nutrient control, catalyst development, and critical thinking on frontier research and development.

Faculty Members

Prof. Haizhou Liu

Water Treatment and Reuse; Advanced Oxidation; Disinfection Byproduct Control; Heavy Metals in Water Distribution Systems

Prof. Jinyong Liu

Groundwater Remediation; Advanced Reduction; PFAS Treatment; Catalytic Reduction of Perchlorate

Prof. Yujie Men

Fate, Transport, and Bioremediation of Emerging Organic Contaminants

Prof. Yun Shen

Pathogen Transmission and Control in Built Environment, Water, and Food

Master's in Air Quality Systems Engineering

Prof. Kelley Barsanti

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Some of our courses on air quality

Department Courses	
CEE 136	Aerosol Technology
CEE 207	Air Quality Modeling
CEE 233	Advanced Air Pollution Control and Engineering
ENVE 134	Technology of Air Pollution Control
ENVE 138	Combustion Engineering

Courses Outside of the Department	
ENSC 245	Chemistry and Physics of Aerosols
ME 136	Environmental Impacts of Energy Production and Conversion
PBPL 233	Environmental Economics and Policy

California air quality in the news

Los Angeles Times

CALIFORNIA

Los Angeles suffers worst smog in almost 30 years

1/23 Brooks Hubbard with the U.S. Army Corps of Engineers takes photos from the historic North Broadway Bridge over the Los Angeles River Tuesday morning as smoke and ash from the Bobcat fire cloak the area. (Al Seib/Los Angeles Times)

By TONY BARBOZA | STAFF WRITER

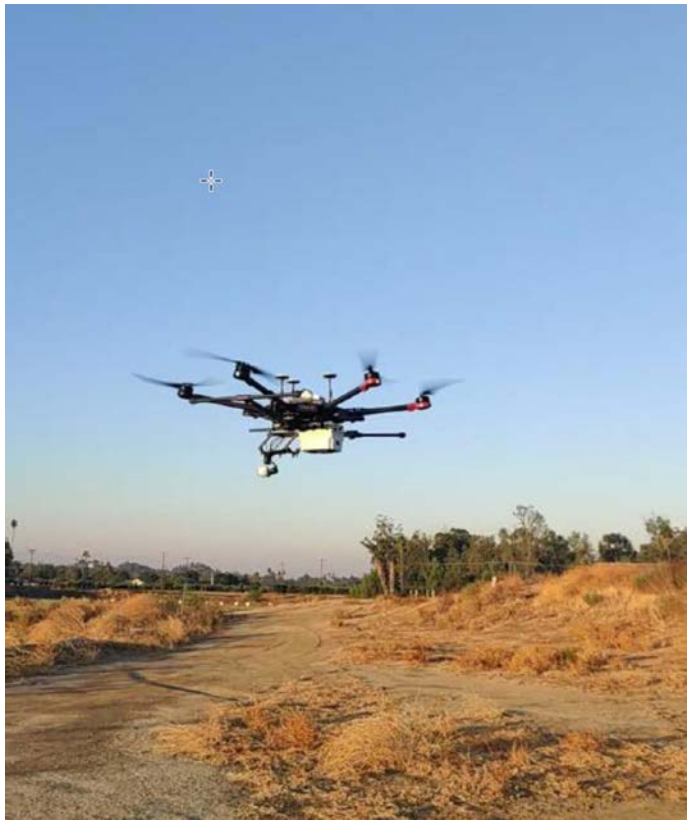
SEP. 10, 2020 | 11:45 AM **UPDATED** 5:09 PM

Air quality research we do in our labs

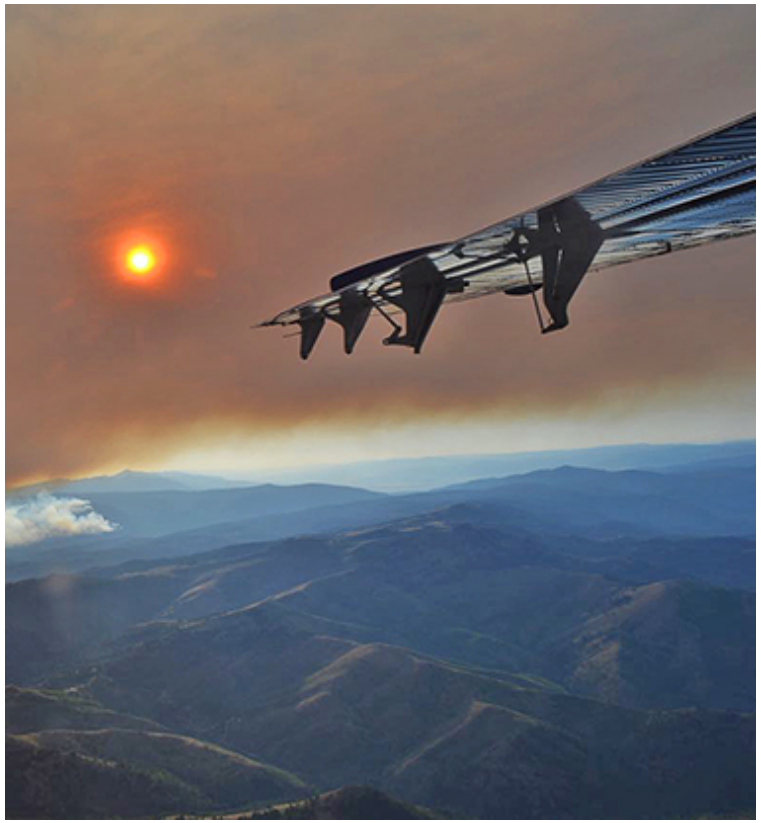
THE MOBILE ATMOSPHERIC CHAMBER IN USE IN
THE VEHICLE EMISSIONS RESEARCH LABORATORY

David Cocker's group uses large Teflon chambers to study pollutant formation from sources like cars and in the complex mixture of species found in the atmosphere.

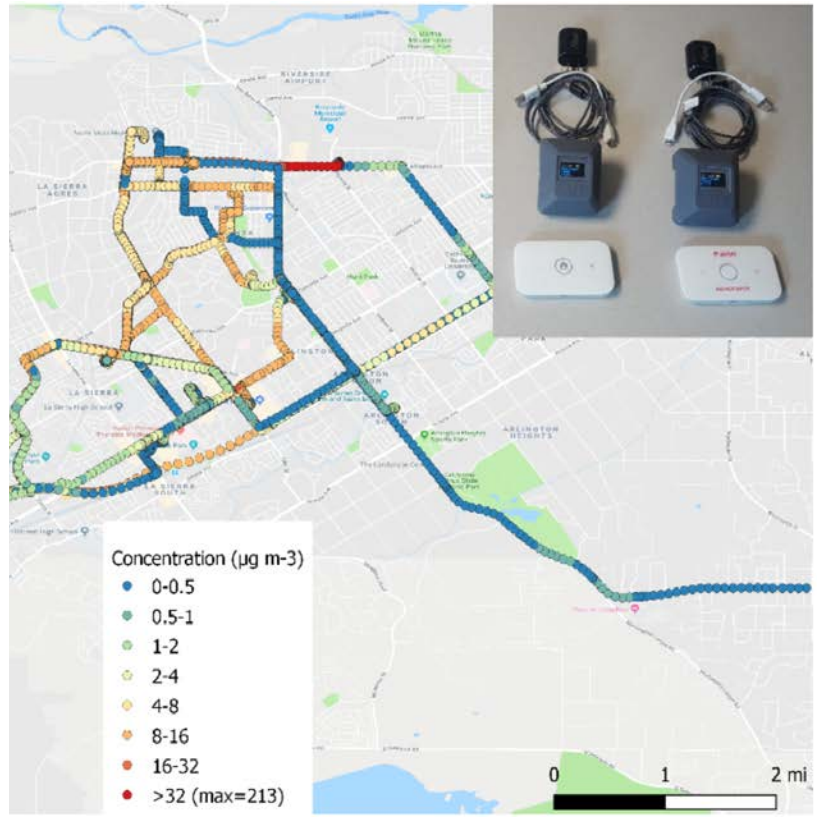
Air quality research we do in the field



Don Collins' group uses drones to measure ozone and other pollutants

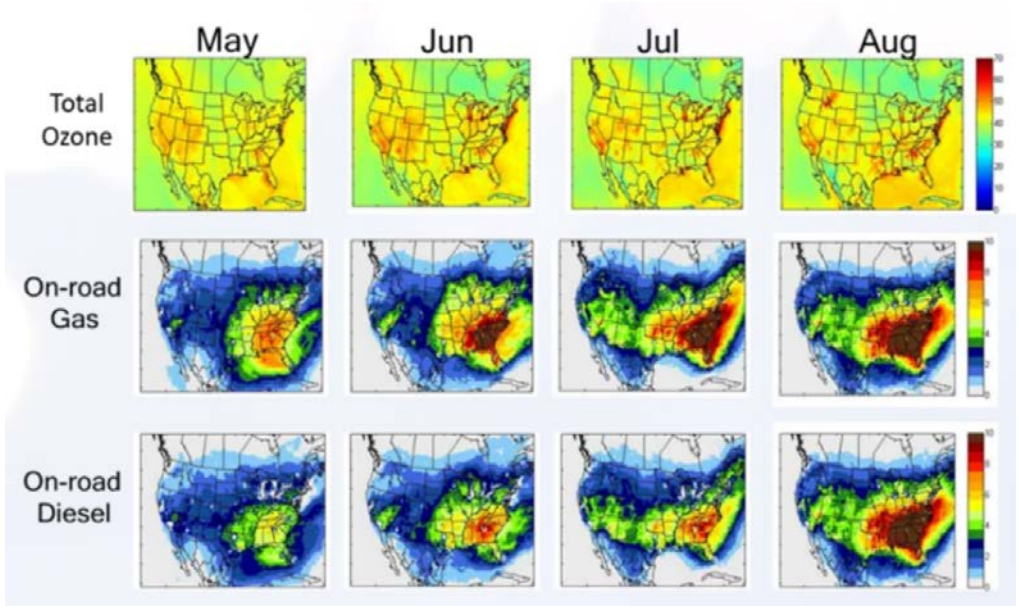


Kelley Barsanti's group collects wildfire smoke samples from aircraft

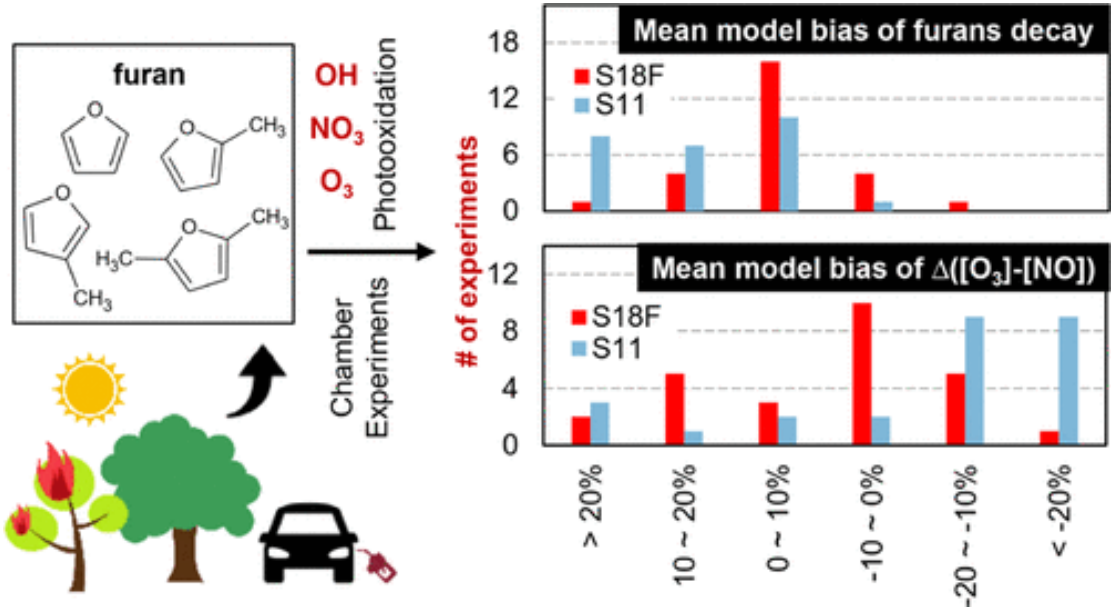


Sunni Ivey's group uses lightweight samplers to study personal exposure

Air quality research we do with our computers



Sunni Ivey's group uses regional air quality models to simulate ozone formation and concentrations



Kelley Barsanti's group uses laboratory data to improve simulation of atmospheric chemistry

Many, many others at UCR doing air quality research

Fundamental Interactions

J. Zhang
(Chemistry)

Davies
(Chemistry)

CALIFORNIA AIR RESOURCES BOARD

CARB-UCR MOU

Ensemble Dynamics

Bahreini
(Env. Sci.)

Cocker
(Chem. Env.)

Lin
(Env. Sci.)

H. Zhang
(Chemistry)

Collins
(Chem. Env.)

Barsanti
(Chem. Env.)

Environmental Interactions

Hopkins
(Env. Sci.)

Ivey
(Chem. Env.)

Li
(Env. Sci.)

Jung
(Mech. Eng.)

Porter
(Env. Sci.)

Allen
(Earth Sci.)

Increasing length scale and complexity

Molecular scale
Molecular and photon interactions
Chemical kinetics
Spectroscopy

Nanoscale to microscale
Aerosol chemistry and trace gas interactions
Particle formation
Aerosol composition

Local scale
Exposure
Health
Cloud interactions
Solar interaction

Urban scale
Emissions
Exposure
Health

Regional scale
Biomass Burning
Source Apportionment
AQ-Meteorology

Global scale
Transport
Climate and AQ
Remote Sensing

Diagram: J.F. Davies and C. Ivey

An exciting addition to our (almost) campus

CALIFORNIA AIR RESOURCES BOARD

ABOUT OUR WORK RESOURCES SERVICES RULEMAKING NEWS EQUITY

Southern California Headquarters

CARB is building a new Southern California Headquarters

Under construction on a 19-acre site near the campus of UC Riverside, the approximately 380,000 square-foot facility will be one of the largest and most advanced vehicle emissions testing and research facilities in the world. It will also be the largest 'net-zero energy' structure (producing as much energy as it uses) of its type in the nation. The facility will also be designed to achieve Leadership in Energy and Environmental Design (LEED) Platinum certification and meet CalGreen Tier 2 standards. The facility is scheduled to be completed in early 2021.

"This striking design will make CARB's new Southern California headquarters an immediately recognizable landmark," said CARB Chair Mary D. Nichols. "It incorporates the highest standards of sustainability in the office and public spaces, and meets the exacting laboratory specifications we need to keep California at the forefront of our world-leading efforts to clean up our air and fight climate change."

Faculty Q & A Panel

Please submit your questions in the chat!

All specific admissions inquiries may be sent to Mr. Desmond Harvey **gradcee@engr.ucr.edu**.

Connect With Us!

Chemical and Environmental Engineering

gradcee@engr.ucr.edu

@CEEatUCR

www.cee.ucr.edu

Apply to CEE!
Jan. 5th

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