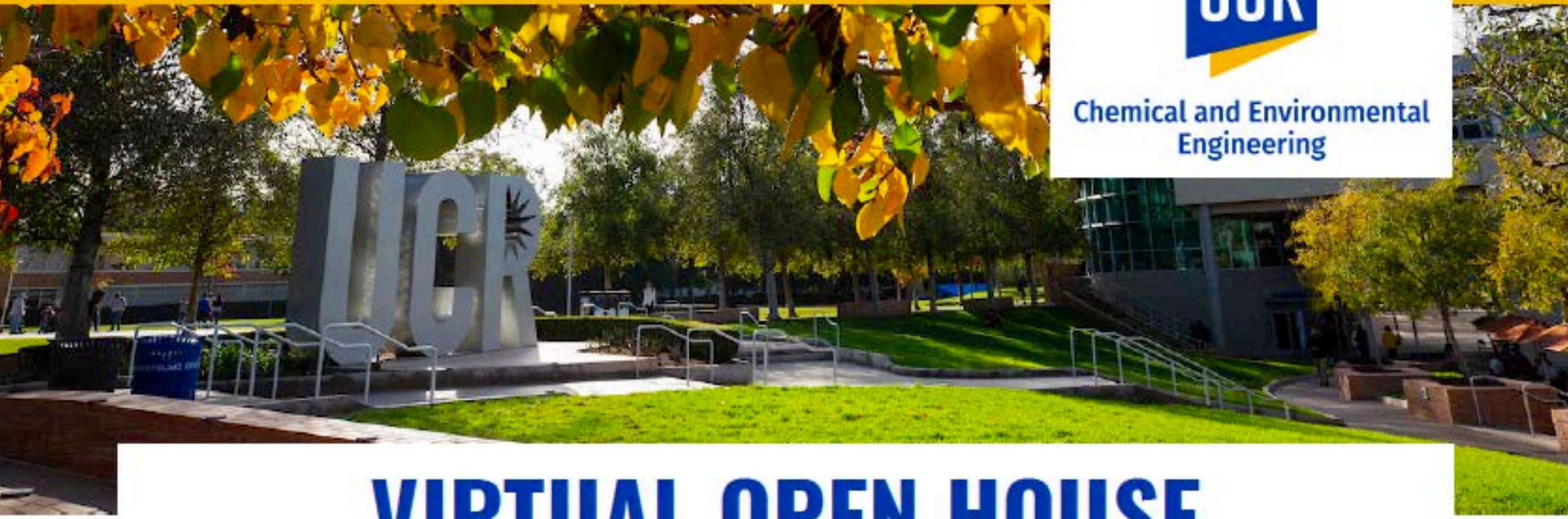

UCR

Chemical and Environmental Engineering

VIRTUAL OPEN HOUSE

Undergraduate Admissions

MONDAY, NOVEMBER 23, 2020

Apply to CEE!
Nov. 30th

CELEBRATING 30 YEARS
Marlan and Rosemary Bourns College of Engineering

Tonight's Agenda

Welcome: Prof. David Cocker, Chair

Undergraduate Admissions: Mr. Desmond Harvey

Research Thrust Overviews

- ***Materials*:** Prof. Leslie Abdul-Aziz
- ***Biotechnology*:** Prof. Robert Jinkerson
- ***Water Quality*:** Prof. Yun Shen
- ***Air Quality*:** Prof. Don Collins

Moderated Q&A: Faculty Panel

Close

Welcome!

Prof. David Cocker, Chair

UCR
CELEBRATING 30 YEARS
Marlan and Rosemary Bourns
College of Engineering

Undergraduate Admissions

Mr. Desmond Harvey

UCR CELEBRATING 30 YEARS
Marlan and Rosemary Bourns College of Engineering

DEGREE PROGRAMS

- Chemical Engineering
  - Chemical Engineering (CHEN)
  - Biochemical Engineering (BCEN)
  - Nanotechnology (NANO)

- Environmental Engineering
  - Air Pollution Control (AIRP)
  - Water Pollution Control (WTRP)

Chemical Engineering

Lower-Division Courses

- Introduction to Chemical & Environmental Engineering
- Calculus
- C++ Programming
- Differential Equations
- General Chemistry
- Multivariable Calculus
- Organic Chemistry
- Physics

Chemical Engineering

Upper-Division Courses

- Applied Fluid Mechanics
- Chemical Process Analysis
- Engineering Modeling & Analysis
- Fluid Mechanics
- Heat Transfer
- Kinetics
- Mass Transfer
- Process Dynamics & Control
- Professional Development
- Separation Processes
- Senior Design
- Thermodynamics

Chemical Engineering
Technical Electives

- Analytical Methods for Chemical & Environmental Engineers
- Catalytic Reaction Engineering
- Chemistry of Materials
- Combustion Engineering
- Electrochemical Engineering
- Fundamentals of Air Pollution Engineering
- Green Engineering

Environmental Engineering

Lower-Division Courses

- Introduction to Chemical & Environmental Engineering
- Calculus
- C++ Programming
- Differential Equations
- General Chemistry
- Multivariable Calculus
- Organic Chemistry
- Physics
- Statics

Environmental Engineering

Upper-Division Courses

- Applied Fluid Mechanics
- Engineering Modeling & Analysis
- Fate & Transport of Environmental Contaminants
- Fluid Mechanics
- Fundamentals of Air Pollution Engineering
- Introduction to Soil Science
- Mass Transfer
- Professional Development
- Senior Design
- Thermodynamics
- Unit Operations & Processes
- Water Quality Engineering
- Water Quality Systems Design

BREADTH REQUIREMENTS

- World History
- Fine Arts, Literature, Philosophy or Religious Studies
- Human Perspectives on Science & Technology
- Economics or Political Science
- Anthropology, Psychology, or Sociology
- Ethnicity

COURSE PLAN – CHEMICAL ENGINEERING

Marlan and Rosemary Bourns College of Engineering

Suggested Course Plan for a UC Riverside Major in

CHEMICAL ENGINEERING

Chemical Engineering Option

Catalog Year: 2020

Fall Quarter	Units	Winter Quarter	Units	Spring Quarter	Units
FIRST YEAR					
CEE 010 *Intro to Chem. & Envir. Engineering*	1	CHEM 001B & CHEM 01LB *General Chemistry & Lab*	5	CHEM 001C & CHEM 01LC *General Chemistry & Lab*	5
CHEM 001A & CHEM 01LA *General Chemistry & Lab*	5	ENGL 001B *Intermediate Composition*	4	ENGL 001C or Alternate* *Applied Intermediate Composition*	4
ENGL 001A *Beginning Composition*	4	MATH 009B *First Year Calculus*	4	MATH 009C *First Year Calculus*	4
MATH 009A *First Year Calculus*	4	PHYS 040A *Physics (Mechanics)*	5	PHYS 040B *Physics (Heat/Waves/Sound)*	5
SECOND YEAR					
CHE 110A *Chemical Process Analysis*	3	CHE 110B *Chemical Process Analysis*	3	MATH 010B *Multivariable Calculus*	4
CHEM 008A & CHEM 08LA *Organic Chemistry*	4	CHEM 008B & CHEM 08LB *Organic Chemistry*	4	CHEM 008C & CHEM 08LC *Organic Chemistry*	4
MATH 046 *Differential Equations*	4	MATH 010A *Multivariable Calculus*	4	CS 010A *C++ Programming*	4
PHYS 040C *Physics (Electricity/Magnetism)*	5	CHE 100 *Engineering Thermodynamics*	4	Breadth _____ *Humanities/Social Sciences*	4
THIRD YEAR					
BIOL 005A & BIOL 05LA *Cell & Molecular Biology & Lab*	5	CHE 120 *Mass Transfer*	4	CHE 116 *Heat Transfer*	4
CHE 114 *Applied Fluid Mechanics*	4	Technical Elective** _____	4	CHE/ENVE 130 *Advanced Engr. Thermodynamics*	4
ENGR 118 *Engineering Modeling & Analysis*	5	Breadth _____ *Humanities/Social Sciences*	4	CHE/ENVE 160A *Chem. & Envir. Engineering Lab*	3
Breadth _____ *Humanities/Social Sciences*	4	Breadth _____ *Humanities/Social Sciences*	4	CHE 122 *Chemical Engineering Kinetics*	4
FOURTH YEAR					
CHE 117 *Separation Processes*	4	CHE 118 *Process Dynamics and Control*	4	CHE 175B *Chemical Process Design*	4
CHE 160B *Chemical Engineering Lab*	3	CHE 160C *Chemical Engineering Lab*	3	Technical Elective** _____	4
Technical Elective** _____	4	CHE 175A *Chemical Process Design*	4	Breadth _____ *Humanities/Social Sciences*	4
CEE 158 *Professional Development for Engr*	3	Technical Elective** _____	4	Breadth _____ *Humanities/Social Sciences*	4

Total Units: 191

Maximum units: 223

To earn a B.S., you must complete all College and University requirements. For a full list of requirements, go to catalog.ucr.edu.

ENGLISH COMPOSITION*

A C or better is required in all English Composition courses to satisfy the graduation requirement. Please consult with your Academic Advisor for ENGL 1C alternatives.

BREADTH REQUIREMENTS

For an approved list of Breadth courses, go to http://student.engr.ucr.edu/policies/requirements/breadth.html.

Humanities: (3 courses)
- A. World History: _____
- B. Fine Arts/Lit/Phil/Rlst: _____
- C. Human Persp. on Sci: _____

Social Sciences: (3 courses)
- A. Econ. or Posc.: _____
- B. Anth., Psyc, or Soc.: _____
- C. General Social Science: _____

Ethnicity: (1 course)
1. _____

Upper Division: (2 courses)
1. _____
2. _____

TECHNICAL ELECTIVES **

Please note that Technical Electives may be offered throughout the Academic Year. Consult with your Faculty Mentor about potential offerings. See approved technical electives on back.

Course Plan is subject to change.

https://student.engr.ucr.edu/majors

CELEBRATING 30 YEARS
Marlan and Rosemary Bourns College of Engineering

COURSE PLAN – ENVIRONMENTAL ENGINEERING

Marlan and Rosemary Bourns College of Engineering

Suggested Course Plan for a UC Riverside Major in

ENVIRONMENTAL ENGINEERING

Catalog Year: 2020

Fall Quarter	Units	Winter Quarter	Units	Spring Quarter	Units
FIRST YEAR					
CEE 010 *Intro to Chem. & Envir. Engineering*	1	CHEM 001B & CHEM 01LB *General Chemistry & Lab*	5	CHEM 001C & CHEM 01LC *General Chemistry & Lab*	5
CHEM 001A & CHEM 01LA *General Chemistry & Lab*	5	ENGL 001B *Intermediate Composition*	4	ENGL 001C or Alternate* *Applied Intermediate Composition*	4
ENGL 001A *Beginning Composition*	4	MATH 009B *First Year Calculus*	4	MATH 009C *First Year Calculus*	4
MATH 009A *First Year Calculus*	4	PHYS 040A *Physics (Mechanics)*	5	PHYS 040B *Physics (Heat/Waves/Sound)*	5
SECOND YEAR					
CHEM 008A & CHEM 08LA *Organic Chemistry*	4	CHE 100 *Engineering Thermodynamics*	4	CS 010A *C++ Programming*	4
ENVE 171 *Fundamentals of Environmental Engr.*	4	CHEM 008B & CHEM 08LB *Organic Chemistry*	4	ENVE/CHE 130 *Advanced Engr. Thermodynamics*	4
MATH 046 *Differential Equations*	4	MATH 010A *Multivariable Calculus*	4	MATH 010B *Multivariable Calculus*	4
PHYS 040C *Physics (Electricity/Magnetism)*	5	Breadth _____ *Humanities/Social Sciences*	4	ME 010 *Statics*	4
THIRD YEAR					
BIOL 005A & BIOL 05LA *Cell & Molecular Biology & Lab*	5	CHE 120 *Mass Transfer*	4	ENVE 146 *Water Quality Systems Design*	4
CHE 114 *Applied Fluid Mechanics*	4	ENVE 133 *Fund. of Air Pollution Engineering*	4	ENVE/CHE 160A *Chem. & Envir. Engineering Lab*	3
ENGR 118 *Engineering Modeling & Analysis*	5	ENVE 142 *Water Quality Engineering*	4	Technical Elective** _____	4
Breadth _____ *Humanities/Social Sciences*	4	Breadth _____ *Humanities/Social Sciences*	4	Breadth _____ *Humanities/Social Sciences*	4
FOURTH YEAR					
ENSC/SWSC 100 *Intro to Soil Science*	4	ENVE 135 *Fate & Trans. of Envir. Contaminants*	4	ENVE 175B *Senior Design Project*	4
ENVE 120 *Unit Operations and Processes*	4	ENVE 160C *Environmental Engineering Lab*	3	Technical Elective** _____	4
ENVE 160B *Environmental Engineering Lab*	3	ENVE 175A *Senior Design Project*	4	Technical Elective** _____	4
CEE 158 *Professional Development for Engr*	3	Breadth _____ *Humanities/Social Sciences*	4	Breadth _____ *Humanities/Social Sciences*	4

Total Units: 193

Maximum units: 232

To earn a B.S., you must complete all College and University requirements. For a full list of requirements, go to catalog.ucr.edu.

ENGLISH COMPOSITION*

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Humanities: (3 courses)
- A. World History: _____
- B. Fine Arts, Lit., Phil., Rlst: _____
- C. Human Persp. on Science: _____

Social Sciences: (3 courses)
- A. Econ. or Posc.: _____
- B. Anth., Psyc, or Soc.: _____
- C. General Social Science: _____

Ethnicity: (1 course)
1. _____

Upper Division: (2 courses)
1. _____
2. _____

TECHNICAL ELECTIVES **

Please note that Technical Electives may be offered throughout the Academic Year. Consult with your Faculty Mentor about potential offerings. See approved technical electives on back.

Course Plan is subject to change.

https://student.engr.ucr.edu/majors

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Marlan and Rosemary Bourns College of Engineering

ADMISSIONS

- Visit Admissions website for:
  - Financial Aid, Costs, and Fees
  - Important Deadlines
  - Resources & Support
  - UC Application

- November 30th Deadline

https://admissions.ucr.edu/

Advanced Materials and Nanotechnology

Prof. Leslie Abdul-Aziz

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Marlan and Rosemary Bourns College of Engineering

Chemical Engineering Major

Chemical Engineers transform raw materials into useful everyday products. Chemical engineers turn the discoveries of chemists and physicists into commercial realities.

Example: Scientists discovered effective COVID vaccine, ***Chemical Engineers*** will develop the process to mass produce vaccine for the general population

- Our graduates have found jobs in a variety of fields including pharmaceuticals, materials, chemical, fuels, pollution control, medicine, and nuclear and electronic industries

- The unique experience of our department is the synergy between chemical and environmental engineers!

Department Faculty – Advanced Materials and Nanotechnology

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- Advanced Materials and Nanotechnology Faculty

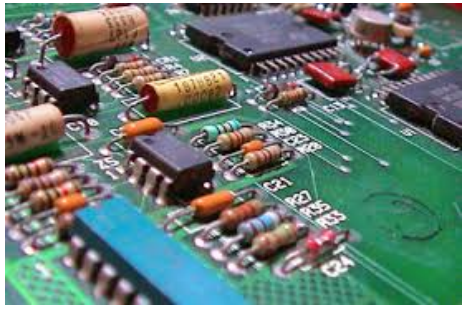
- 7 Faculty

- Research Areas range from:
  - Professor Zachariah: Aerosol, Energetic Materials
  - Professor Yan: Photonics
  - Professor Wu: Membranes, Soft materials
  - Professor Wong: Electron Dynamics in Nanoscale Materials
  - Professor Min: Polymers, Bioinspired Materials
  - Professor Guo: Batteries and Energy Storage
  - Professor Abdul-Aziz: Catalysis, Nanotechnology

  - *Incorporate Knowledge and Research in Courses to Ensure Student's Receive a Highly-rated World-Class Education with Adequate Preparation for Industry and Academia*

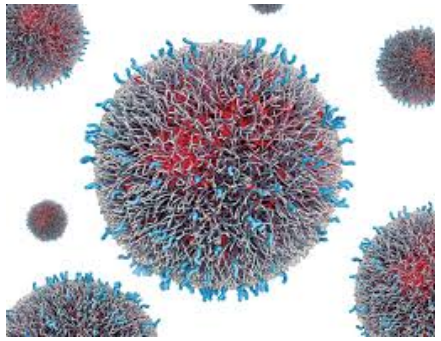
Chemical Engineering – Nanomaterials Examples

Electronics



Materials that modulate electron conductivity, energy storage

Pharmaceuticals



Nanomedicines for drug delivery and imaging

Cosmetics

Incorporate Materials improve functionality

Catalysis

Used in ~90% of Industrial processes to speed up chemical reactions

Chemical Engineering Major – Nanotechnology Option

- Focuses on the use of materials and nanotechnology in industry or nanoscale processes

- Electives include courses that incorporate the faculty's specialty/research areas

- CHE 105, CHE 161, CEE 135 (Chemistry of Materials)

- 8 Units of the Technical Elective (Select courses)
  - CHE 102 – Catalytic and Reaction Engineering
  - CHE 131 – Electrochemical Engineering
  - ENVE 133 – Fundamentals of Air Pollution Engineering
  - MSE 160 – Nanostructure Characterization Lab

Advanced Materials and Nanotechnology Research Opportunities

Gain hands-on experience by performing world-class research on-campus

Biochemical Engineering & Biotechnology

Prof. Robert Jinkerson

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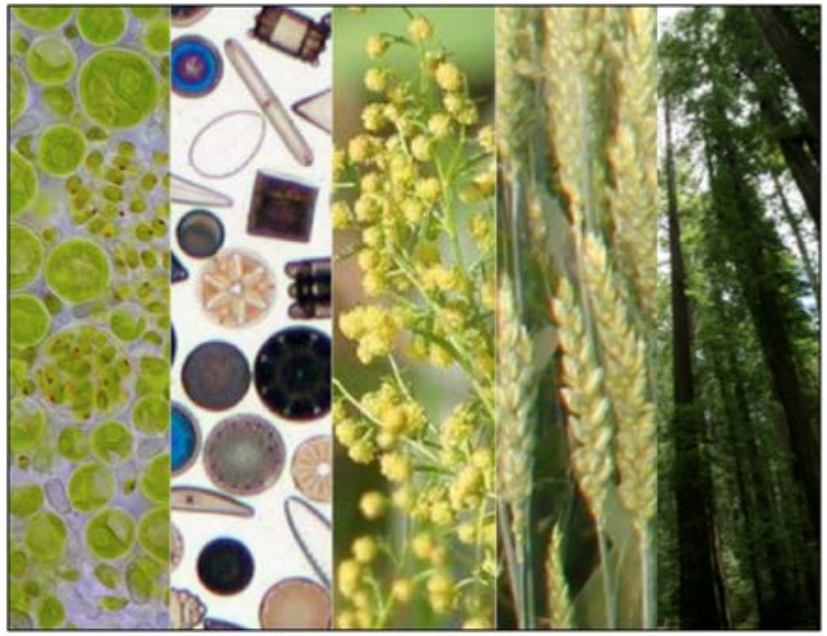
Marlan and Rosemary Bourns College of Engineering

Biochemical engineering & Biotechnology faculty @ UCR CEE

HEALTH	FOOD & AGRICULTURE	INDUSTRIAL/ BIOFUELS	ENVIRONMENTAL
• Xin Ge • Ashok Mulchandani	• Robert Jinkerson • Yanran Li	• Ian Wheeldon • Harvey Blanch • Charles Wyman	• Yujie Men • Yun Shen

Photosynthetic organisms impact nearly every aspect of our lives

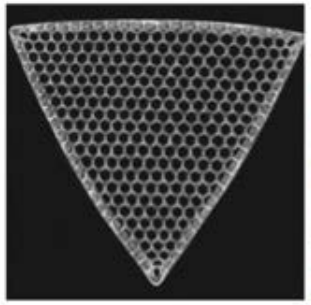


Photosynthetic Organisms

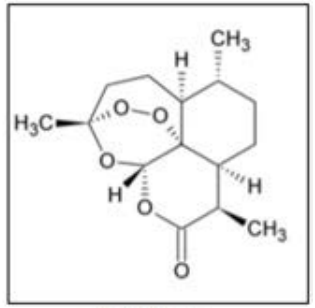
Carbon cycle

Food

Fuels

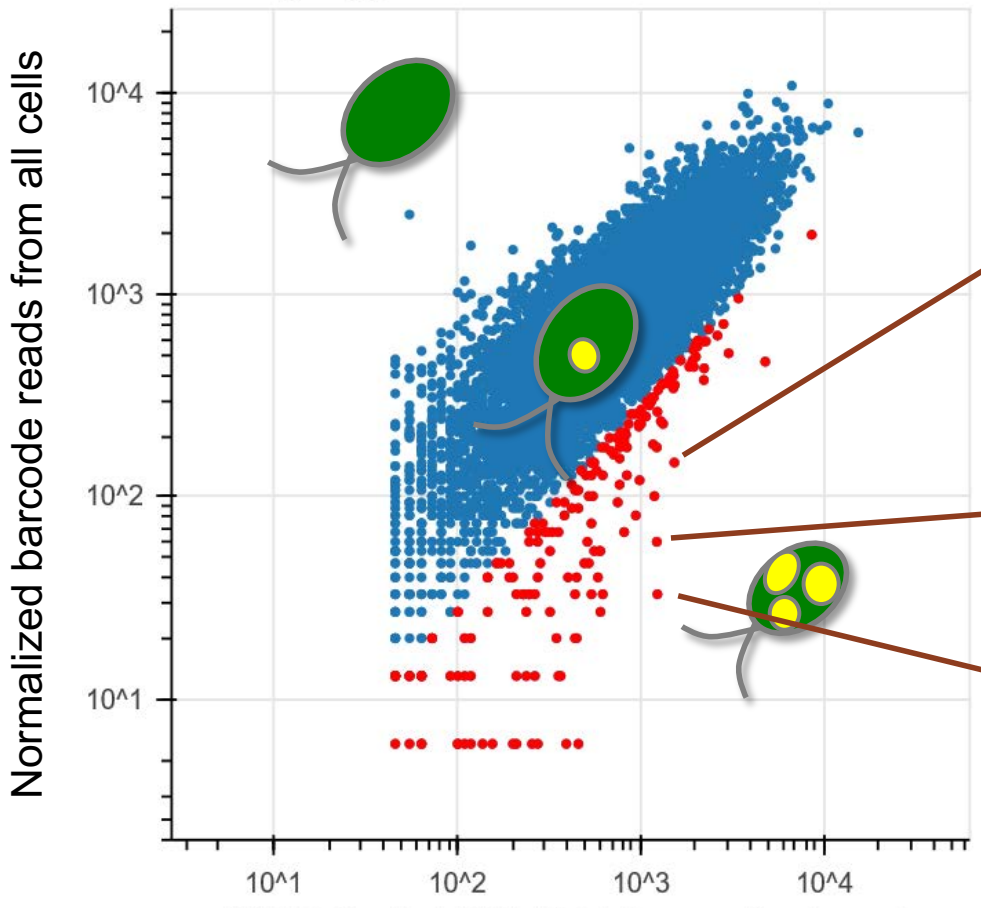


Materials



Drugs

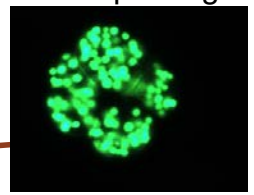
Engineering algae to make more biofuels



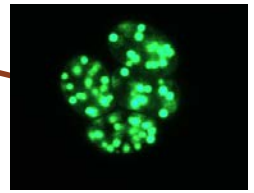
Mutants

Protein phosphatase

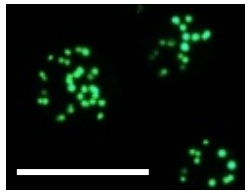
E3 ubiquitin ligase



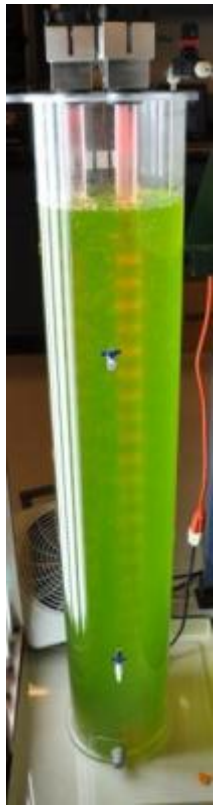
Transcription regulator



Wild Type



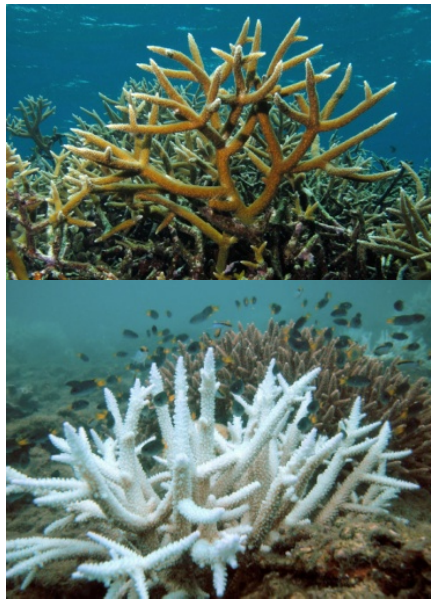
Scale up growth to evaluate



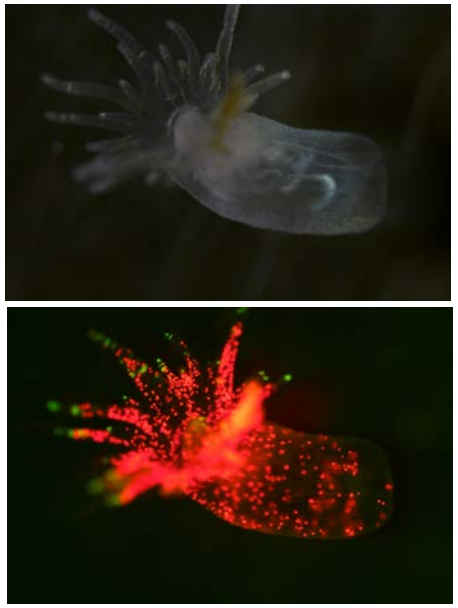
Each dot = 1 mutant

Engineering coral to be resistant to bleaching

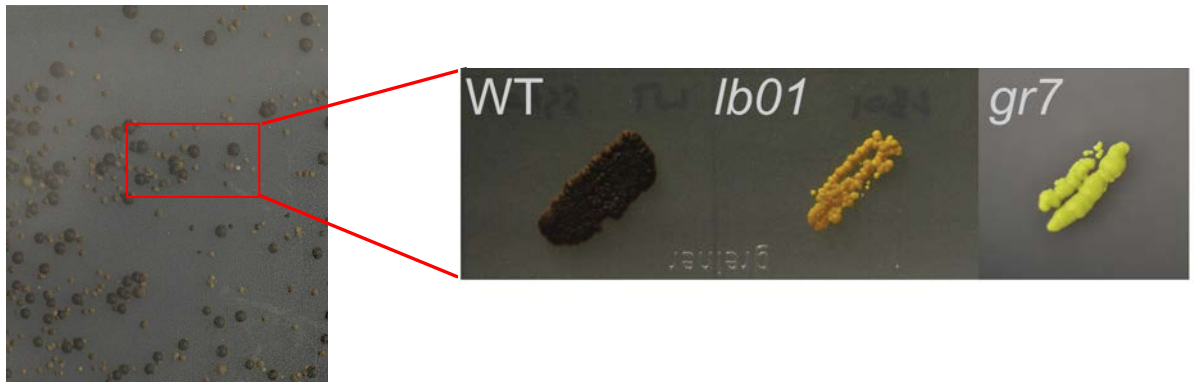
coral



lab model sea anemone

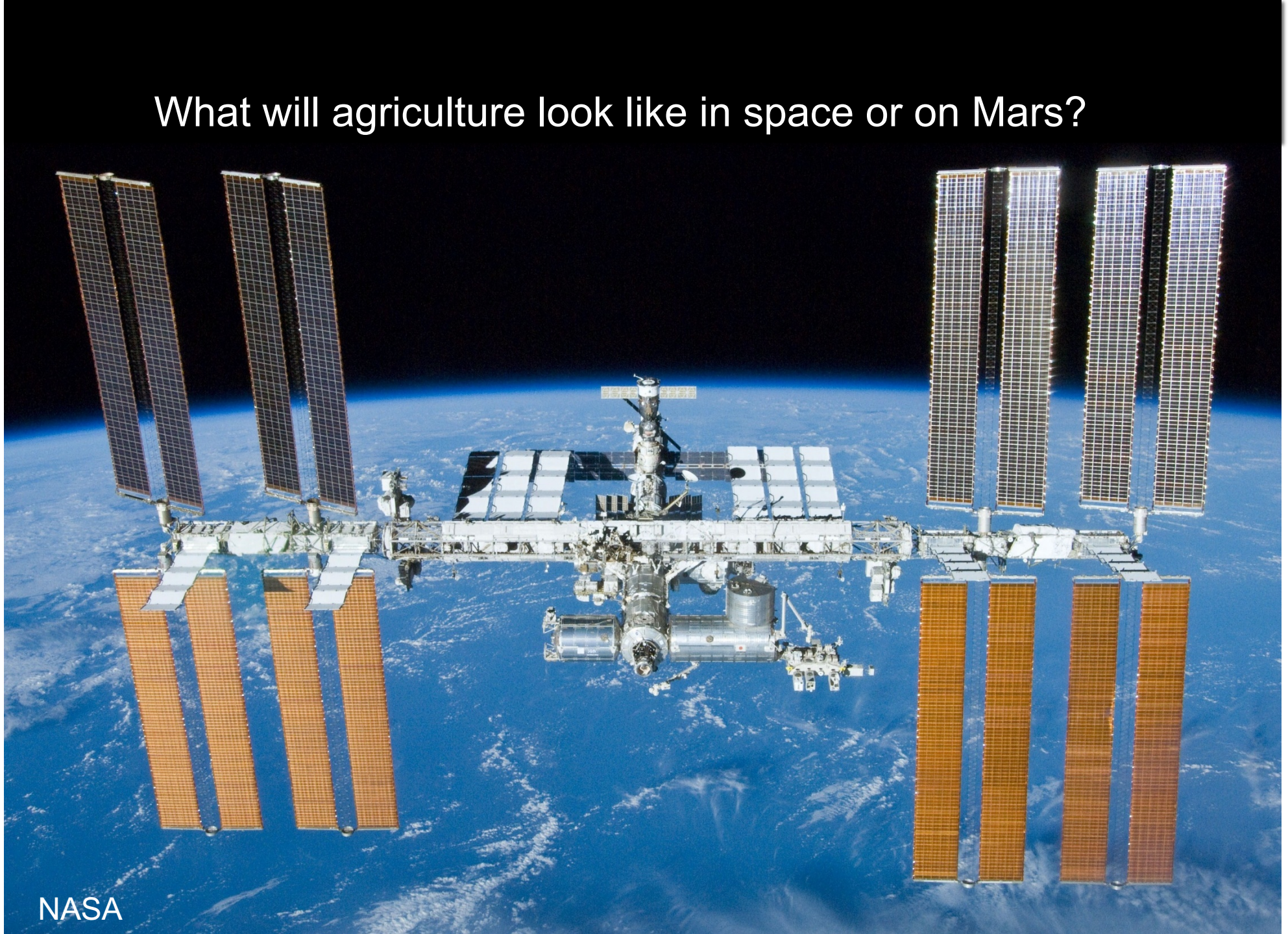


mutants



field evaluation

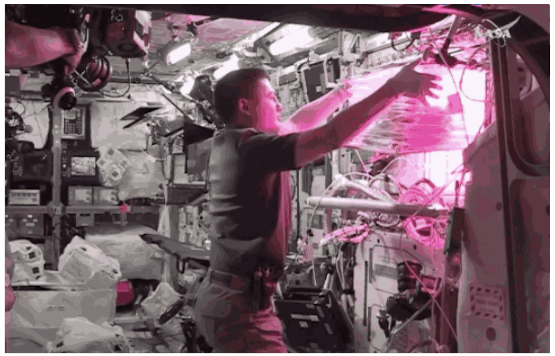
What will agriculture look like in space or on Mars?



NASA

We are developing plants that minimize the inedible portions to be better adapted for new agriculture environments.

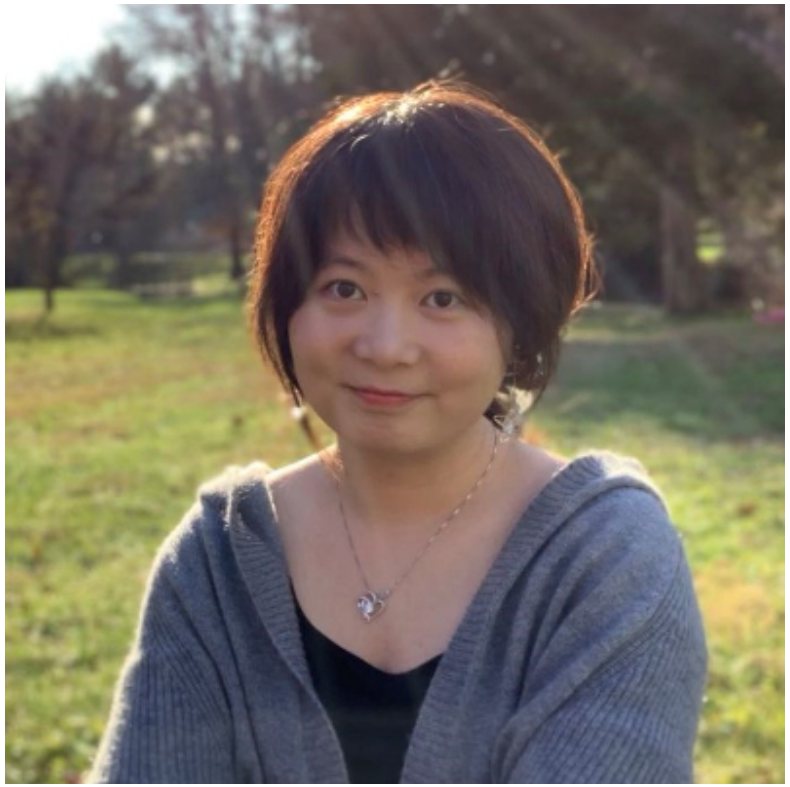
Harvest on the ISS



Collaboration with Martha Orozco-Cárdenas

Water Quality Systems Engineering

Prof. Yun Shen



CELEBRATING 30 YEARS
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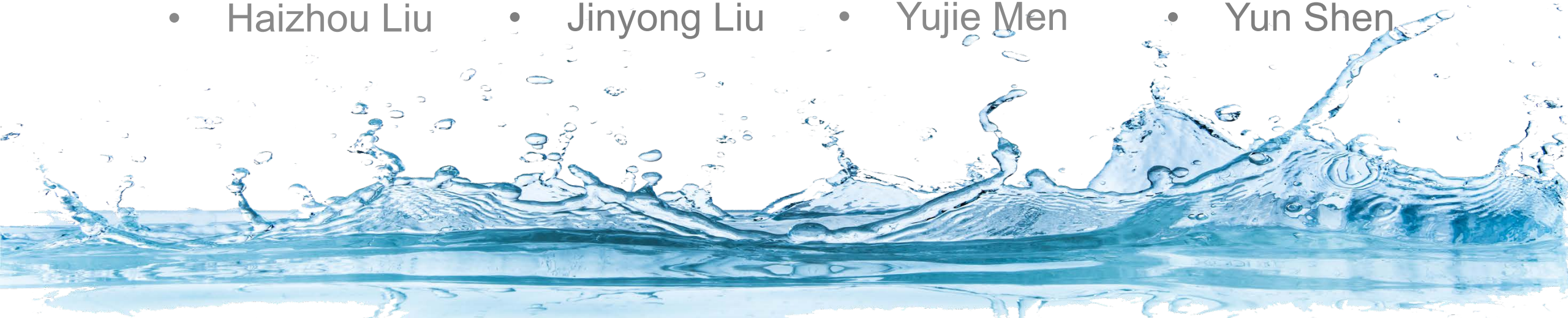
Water Quality Systems Engineering Overview

Mission: Promote clean and safe water supply

Faculty members:

- Haizhou Liu
- Jinyong Liu
- Yujie Men
- Yun Shen



Featured course introduction

- ENVE 121 Biological Unit Processes
  - Important **biological** treatment processes used in water/wastewater treatment.
  - Apply the knowledge to municipal, industrial, and other hazardous waste problems
- ENVE 142 Water Quality Engineering
  - Water quality characterization and modeling techniques for natural and engineered systems.
  - Discusses application of **chemical** equilibrium and kinetic models to water quality.
- ENVE 146 Water Quality Systems Design
  - Application of fluid mechanics to the **design** of water distribution networks, wastewater and storm water collection systems, and pumps and pump station.
- ENVE 160C Environmental Engineering Lab
  - Apply principles learned in the classroom to solve practical problems.
  - Design processes, take measurements, analyze the data, and report results from the **lab** experiments.

Featured course introduction

- ENVE 121 Biological Unit Processes
  - Important **biological** treatment processes used in water/wastewater treatment.
  - Apply the knowledge to municipal, industrial,
- ENVE 142 Water Quality Engineering
  - Water quality characterization and modeling techniques for natural and engineered systems.

Prepare future leaders in water quality system engineering.

Design

- Application of fluid mechanics to the **design** of water distribution networks, wastewater and storm water collection systems, and pumps and pump station.

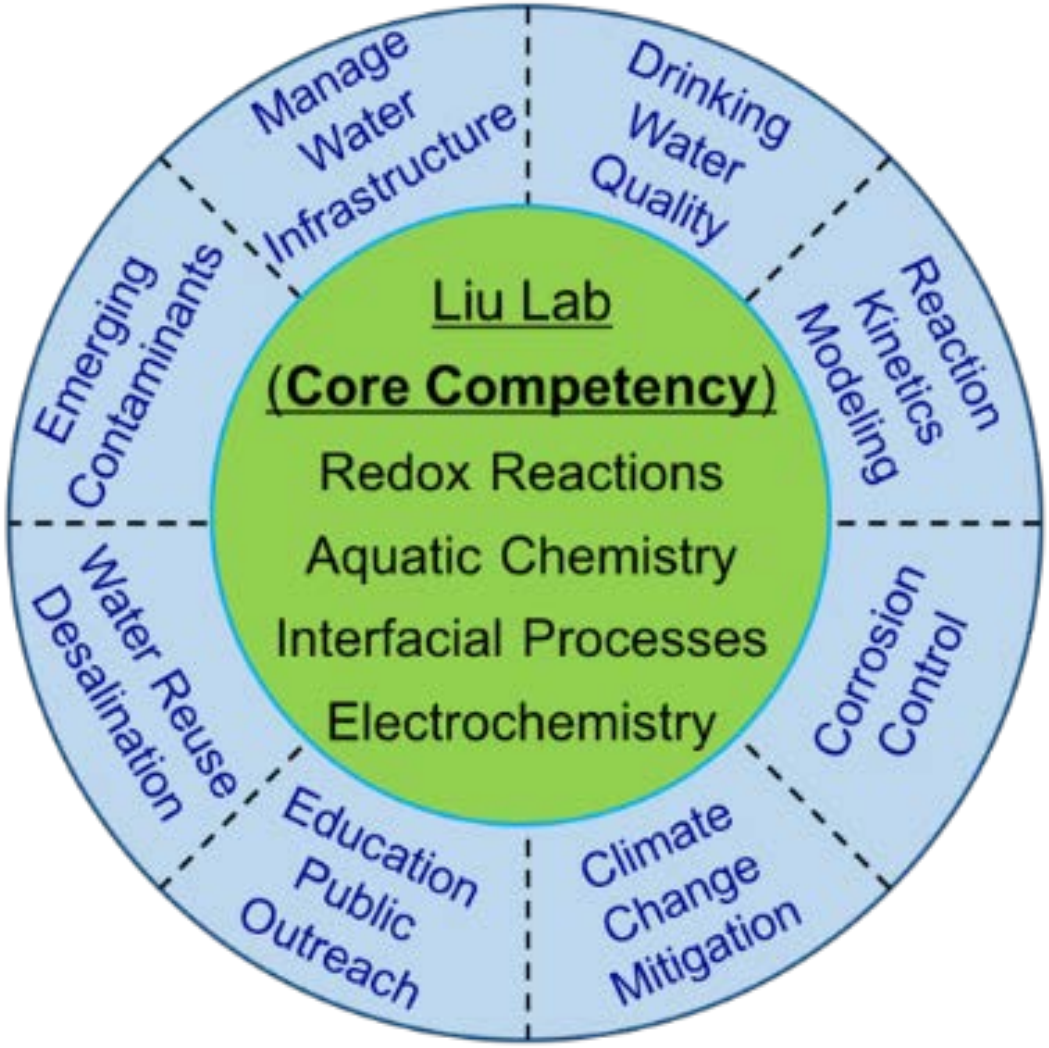
Lab

- Apply principles learned in the classroom to solve practical problems.
- Design processes, take measurements, analyze the data, and report results from the **lab** experiments.

Water Chemistry and Technology Lab (Dr. Haizhou Liu)

Research Goals

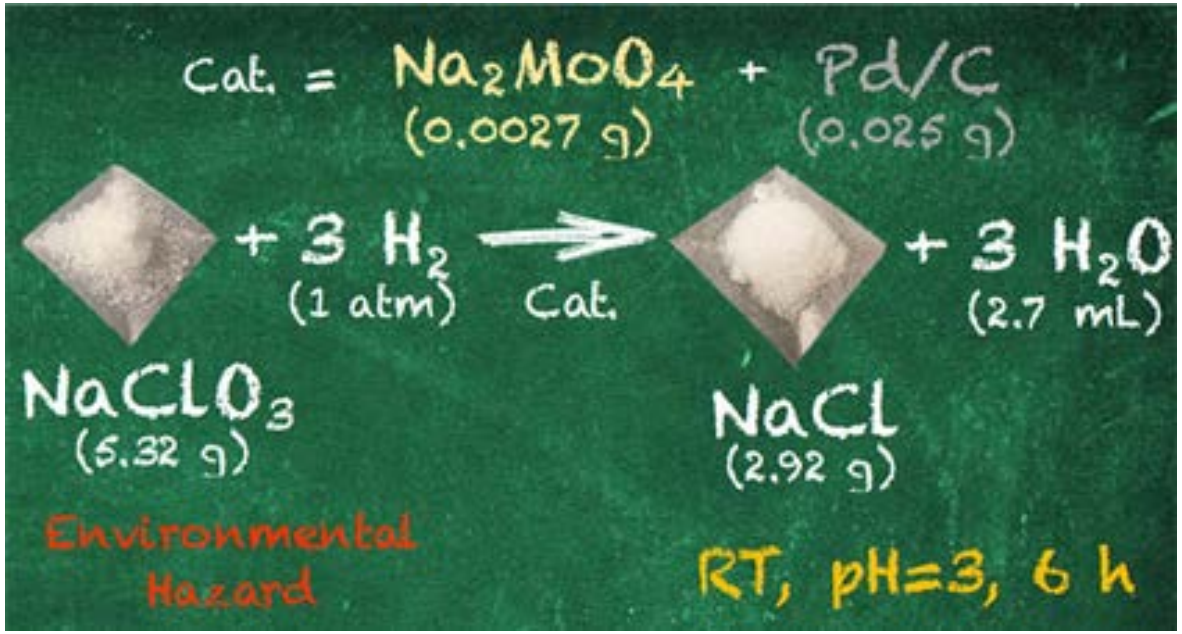
- Understanding and application of **aquatic chemical processes** to improve water quality, design treatment processes and provide more reliable water supplies.



Chemistry for the Environment Lab (Dr. Jinyong Liu)

Research Goals

- Understand and apply **reduction reactions** and **catalysts** to treat current and future chemical contaminants with (1) high activity, (2) high robustness, (3) easy preparation, and (4) low cost.



Solve Environmental Problems Differently!

Microbe-Environment Nexus Lab (Dr. Yujie Men)

Minimize the health risks

- Evolution and fate of **antibiotic resistant microbes** in the environment

Harmful microbes

Beneficial microbes

Promote application of microbes

- Utilize microbes to treat chemical waste
- Optimize functions of microbes to produce biofuel.

Health

Sustainability

Solutions to Health-Environment Nexus Lab (Dr. Yun Shen)

Built Environment

Water

Food

Research Goals

- Elucidate pathogen (including coronavirus) transmission across different media
- Develop engineering solutions to control pathogens and protect public health

Air Quality Systems Engineering

Prof. Don Collins

CELEBRATING 30 YEARS
Marlan and Rosemary Bourns College of Engineering

Some of our undergraduate courses on air quality

ENVE 133	Fundamentals of Air Pollution Engineering
ENVE 134	Technology of Air Pollution Control
ENVE 138	Combustion Engineering
ENVE 160B	Environmental Engineering Lab – Air Quality
ENSC 135	Atmospheric Chemistry
ME 136	Environmental Impacts of Energy Production and Conversion

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

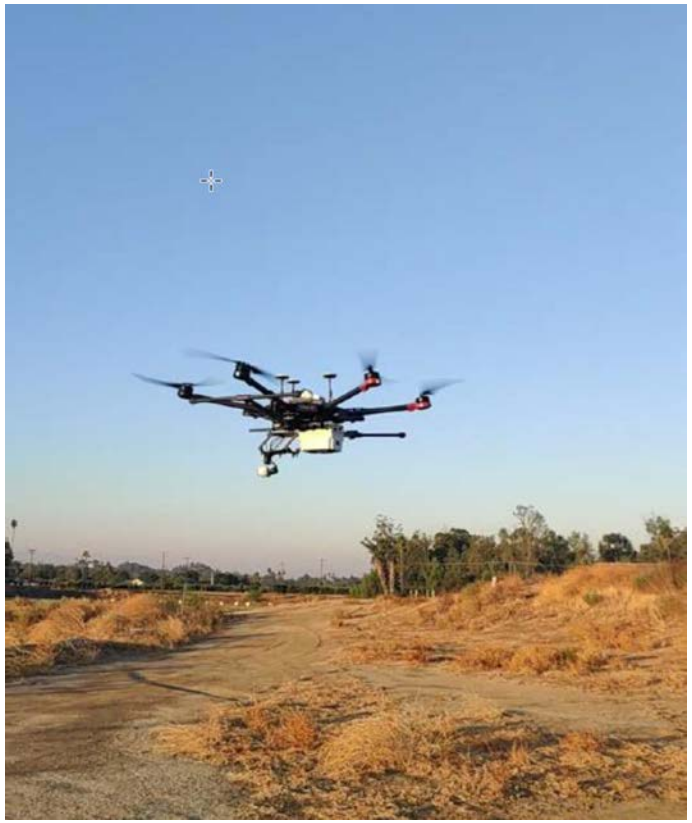
SEP. 10, 2020 | 11:45 AM **UPDATED** 5:09 PM

Air quality research we do in our labs

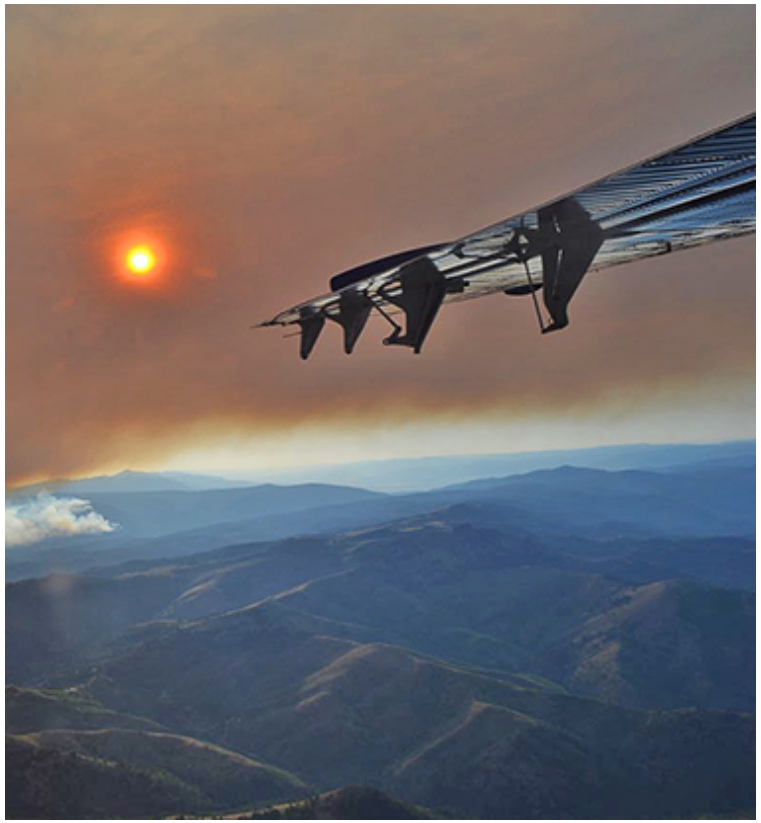
THE MOBILE ATMOSPHERIC CHAMBER IN USE IN
THE VEHICLE EMISSIONS RESEARCH LABORATORY

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.

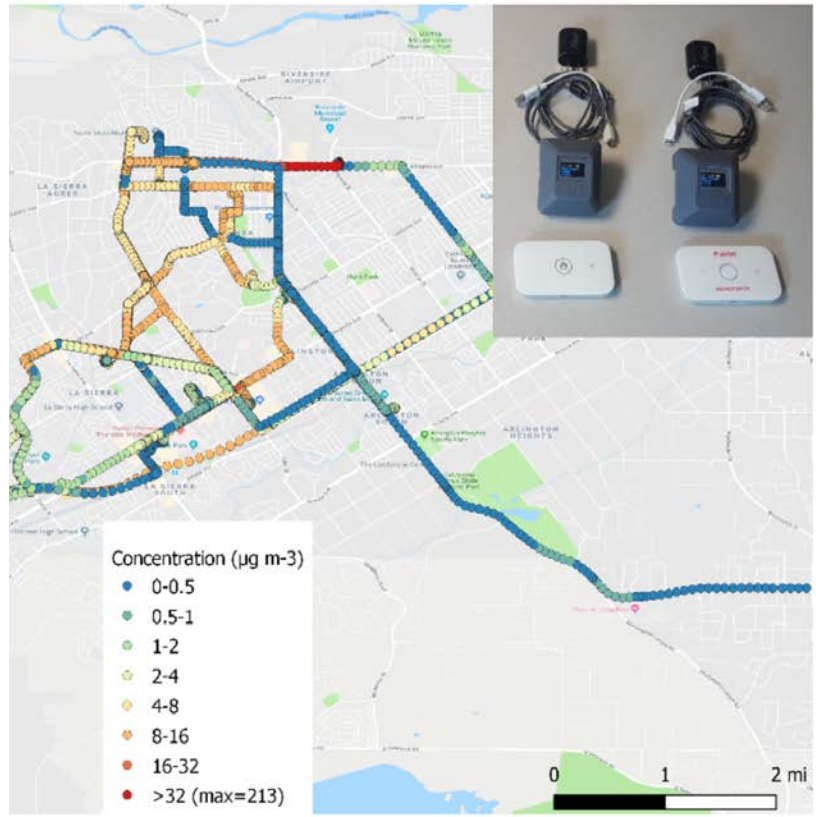
Air quality research we do in the field



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

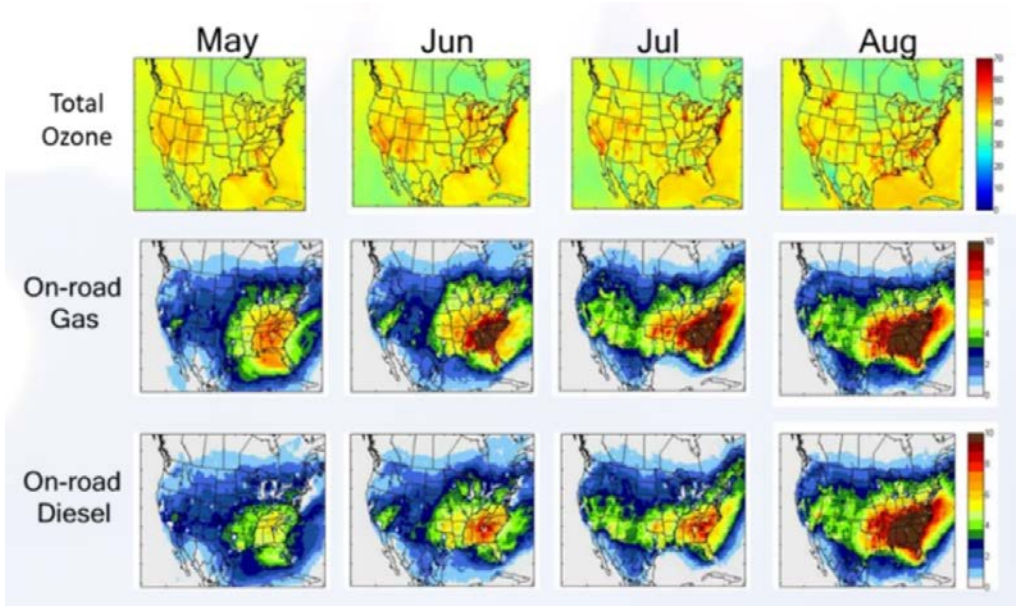


Kelley Barsanti's group collects wildfire smoke samples from aircraft

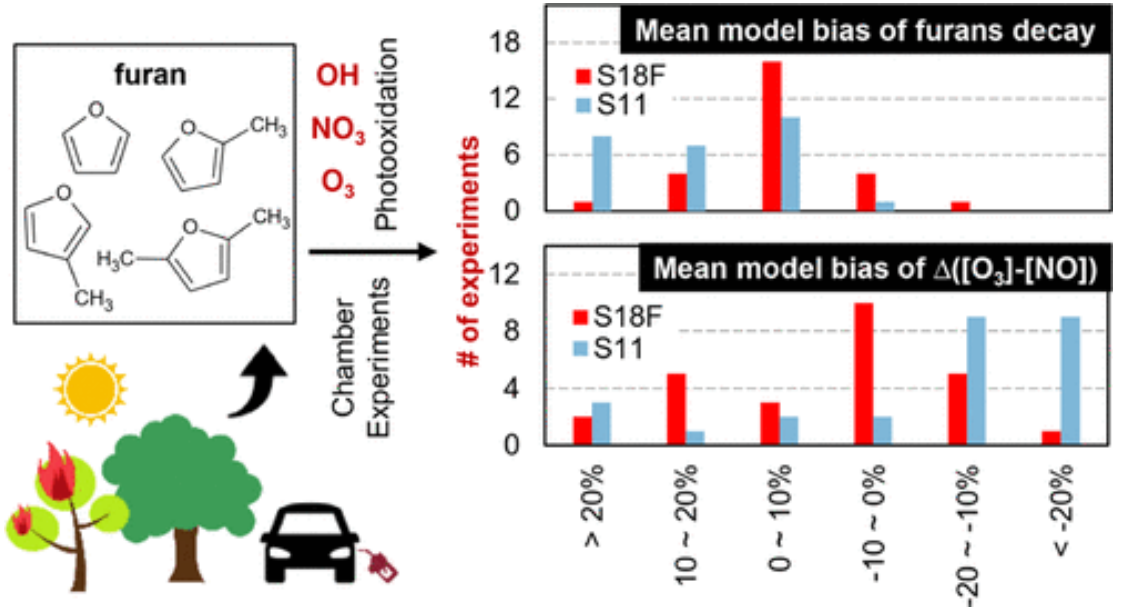


Sunni Ivey's group uses lightweight samplers to study personal exposure

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)

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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

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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 **dharvey@engr.ucr.edu**.

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