
TRITON DAY
UC San Diego

UC San Diego

Congratulations!

You did it!

TRITON DAY

UC San Diego

Agenda

- Department Introductions
- Faculty Introductions
- Student Introduction
- Panel Discussion
- Q & A

TRITON DAY

UC San Diego

DEPARTMENT INTRODUCTIONS

Department Chair: Professor George Tynan

Undergraduate Chair: Professor Bob Bitmead

Undergraduate Academic Advising

Director of Student Affairs: Zachary Dake

Academic Advisors

- Chad Baldwin (A-L)
- Nadia Familier (M-Z)

Intake Advisor: Regina Ready

TRITON DAY

- UC San Diego is recognized as a leading research institution
- **UCSD's JSOE is ranked 5th among public engineering schools, and 9th in the country**.
- MAE Research Areas: Controls, Engineering Education, Fluids Mechanics, Materials, Oceanography, Robotics, Biomechanics, Medical Devices, Plasma & Fusion, and Renewables.

TRITON DAY

UC San Diego

Aerospace vs Mechanical

AEROSPACE 1 & 2 YEAR	MECHANICAL 1 & 2 YEAR
Math 20A- Calculus for Science & Engineering Math 20B- Calculus for Science & Engineering Math 20C- Calculus and Analytic Geometry for Science and Engineering Physics 2A- Physics - Mechanics Physics 2B- Physics- Electricity & Magnetism Chem 6A- General Chemistry **MAE 2- Introduction to Aerospace Engineering**	Math 20A- Calculus for Science & Engineering Math 20B- Calculus for Science & Engineering Math 20C- Calculus and Analytic Geometry for Science and Engineering Physics 2A- Physics - Mechanics Physics 2B- Physics- Electricity & Magnetism Chem 6A- General Chemistry **MAE 3- Introduction to Engineering Graphics and Design**
Math 20D- Introduction to Differential Equations Math 20E- Vector Calculus Math 18- Linear Algebra Physics 2C & 2CL- Physics—Fluids, Waves, Thermodynamics, and Optics MAE 8- Matlab Programming for Engineering Analysis **MAE 21- Aerospace Materials Science** MAE 30A- Kinematics MAE 30B- Dynamics and Vibrations MAE 131A- Solid Mechanics I	Math 20D- Introduction to Differential Equations Math 20E- Vector Calculus Math 18- Linear Algebra Physics 2C & 2CL- Physics—Fluids, Waves, Thermodynamics, and Optics MAE 8- Matlab Programming for Engineering Analysis **MAE 20- Elements of Materials Science** MAE 30A- Kinematics MAE 30B- Dynamics and Vibrations MAE 131A- Solid Mechanics I

UC San Diego

Aerospace vs Mechanical

AEROSPACE 3 & 4 YEAR	MECHANICAL 3 & 4 YEAR
MAE 11- Thermodynamics MAE 105- Introduction to Mathematical Physics MAE 107- Computational Methods in Engineering MAE 101A- Introductory Fluid Mechanics MAE 101B- Advanced Fluid Mechanics MAE 143A- Signals and Systems MAE 143B- Linear Control MAE 170- Experimental Techniques **MAE 180A- Spacecraft Guidance I** **SE 160A- Aerospace Structural Mechanics I** **SE 160B- Aerospace Structural Mechanics II**	MAE 11- Thermodynamics MAE 105- Introduction to Mathematical Physics MAE 107- Computational Methods in Engineering MAE 101A- Introductory Fluid Mechanics MAE 101B- Advanced Fluid Mechanics MAE 143A- Signals and Systems MAE 143B- Linear Control MAE 170- Experimental Techniques **MAE 40- Linear Circuits** **MAE 131B- Fundamentals of Solid Mechanics II** **TE- Technical Elective**
MAE 101C- Heat Transfer **MAE 104- Aerodynamics** **MAE 175A- Aerospace Engineering Laboratory I** **MAE 142- Dynamics and Control of Aerospace Vehicles** **MAE 113- Fundamentals of Propulsion** **MAE 155A- Aerospace Engineering Design I** **MAE 155B- Aerospace Engineering Design II** **TE- Technical Elective** **TE- Technical Elective**	MAE 101C- Heat Transfer **MAE 150- Computer-Aided Design** **MAE 171A- Mechanical Engineering Laboratory I** **MAE 156A- Fundamental Principles of Mechanical Design I** **MAE 156B- Fundamental Principles of Mechanical Design II** **TE- Technical Elective** **TE- Technical Elective** **TE- Technical Elective** **TE- Technical Elective**

Specializations

- Take 4 Technical Electives in a subject area and receive a specialization
  - Resume building, Advanced knowledge
- Choose from 70 courses
- Specialize in the following subject areas:
  - Controls & Robotics
  - Fluid Mechanics & Thermal Systems
  - Mechanics of Materials
  - Materials Science & Engineering
  - Renewable Energy & Environmental Flows (REEF)

COOPERATIVE EDUCATION (CO-OP)

The Cooperative Education (Co-op) Internship Program is an immersive work experience in which students are employed full-time by a company for up to six months, which includes summer and one academic quarter, to supplement education with real-world experiences.

For the pilot program (Summer and Fall Quarter), participating departments and class levels include:

- **Undergraduate:** Computer Science & Engineering, Electrical & Computer Engineering, Mechanical & Aerospace Engineering, Na

PARTICIPATING CO-OP COMPANIES

appfolio
ATA ENGINEERING, INC.
brain corp
GENERAL ATOMICS
Instrumentation Laboratory
A Werfen Company
intuit

TRITON DAY

UC San Diego

Student Organizations

UC San Diego

Faculty Research: Professor Nicholas Boechler

Boechler group overview (est. 2013)

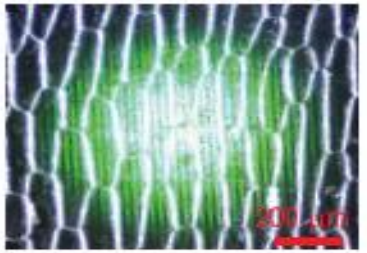
Dynamically responsive materials:

- Role of microstructure → effective properties
- Underlying mechanical phenomena
- Nonlinearity for wave tailoring

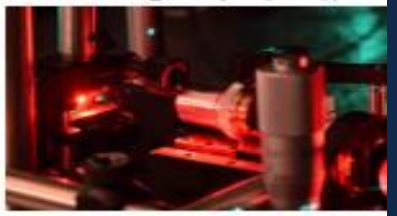
Connect: Design of mesoscale model systems → experiment-driven exploration of self-assembled nanostructured analogs

Microstructure + mechanochemistry interaction
(collab. w/ Boydston, Ganter, Storti, Nelson groups [UW], Craig group [Duke], M. Fermen-Coker [ARL])

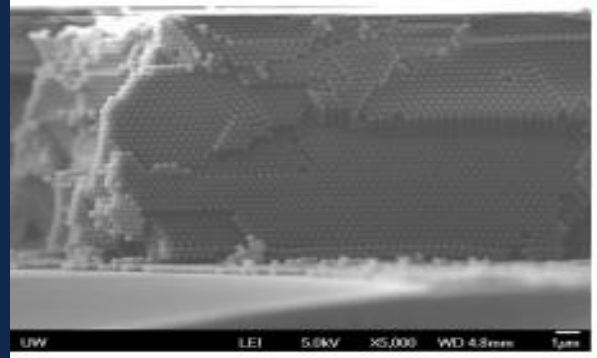
Acoustics of biological structured media
(led by M. Abi Ghanem, collab. w/ T. Dehoux)



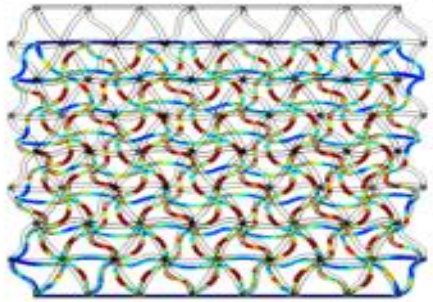
Non-reciprocal materials enabled by photoelasticity
(collab. w/ Deymier, Lucas groups [UA])



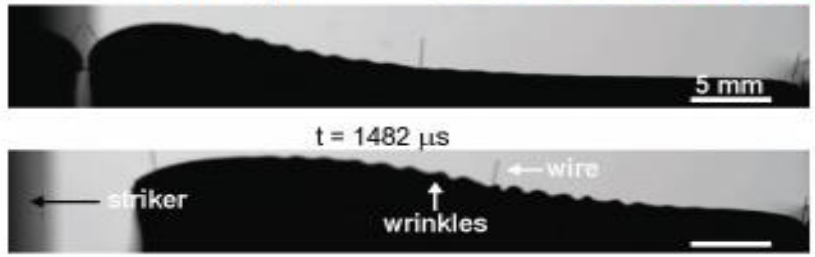
Microscale granular crystals



Materials with tailored nonlinear constitutive laws stemming from microstructural geometry
(collab. w/ Kim group [UCSD])



Surface instabilities in soft materials
(collab. w/ Cai group [UCSD])



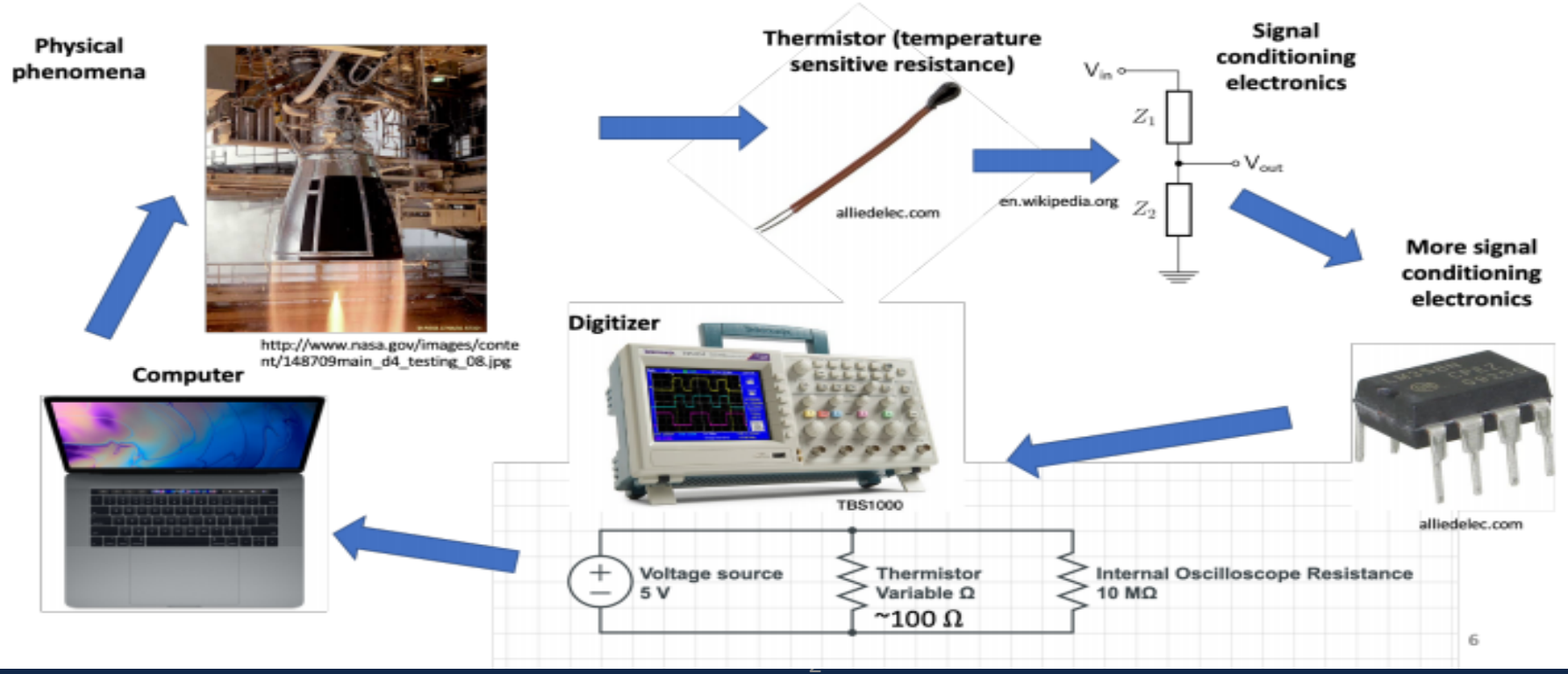
RITON DAY

UC San Diego

Faculty Research: Professor Nicholas Boechler

MAE170: Experimental Techniques

Description (typically taken end of 3rd year): Principles and practice of measurement and control and the design and conduct of experiments. Technical report writing. Lectures relate to dimensional analysis, error analysis, signal-to-noise problems, filtering, data acquisition and data reduction, as well as background of experiments and statistical analysis. Experiments relate to the use of electronic devices and sensors.



TRITON DAY

UC San Diego

Faculty Research: Professor Nicholas Boechler

Undergraduate research

- Opportunities are widely available, either during the academic year or the summer (start searching winter of 1st year)
- Stipend, academic credit, volunteer, or fellowship
  - NSF REU / REM
  - UCSD fellowships: https://students.ucsd.edu/sponsor/urs/index.html, https://aep.ucsd.edu/opportunities/academic-year/trels/index.html
- Massively helpful for job search or graduate school applications (experience, recommendations, track record)
- As a student, undergraduate research was one of the most transformative experiences of my life

RITON DAY

UC San Diego
JACOBS SCHOOL OF ENGINEERING
Mechanical and Aerospace Engineering

Multifidelity Modeling & Uncertainty Quantification

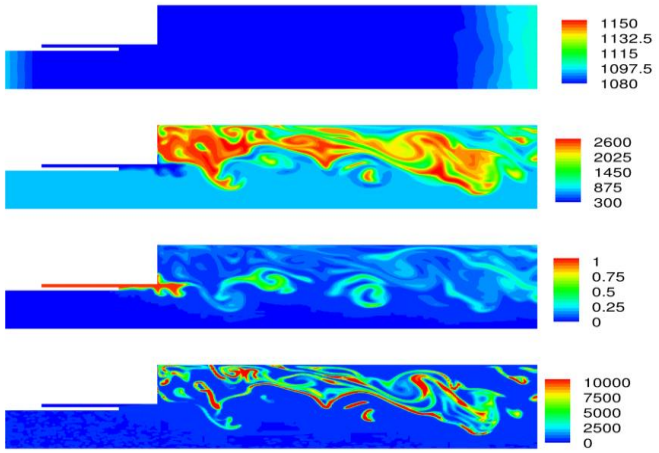
Boris Kramer
Assistant Professor
Dynamics, Systems and Controls & Fluids

Model-based Systems Engineering

- Allows for fast prototyping and optimization
- No need to build products early in design stage
- Requires cheap computational models

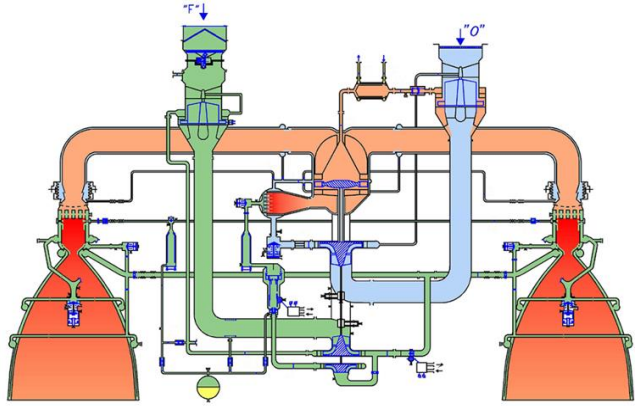
Prediction

- Long-time prediction provides valuable system insight
- Expensive and time-consuming when physics are complex



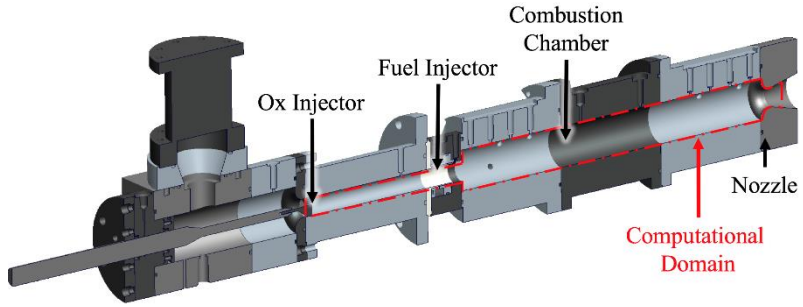
Uncertainty Quantification (UQ)

- Uncertain parameters lead to uncertain system responses
- Brings statistics into engineering design



Design

- Exploration of high-dimensional design space
- How can we design under uncertainty?



Model Reduction for Nonlinear Multi-Scale Systems

Reduced-order modeling

- ROM can predict behaviors in complex systems w/o doing the direct simulation of the high-fidelity model.
- Developing advanced computational methods to achieve that

PDE $\frac{\partial s}{\partial t} = f(s) + \mathcal{B}\mathbf{u}$

FEM/FVM/FD

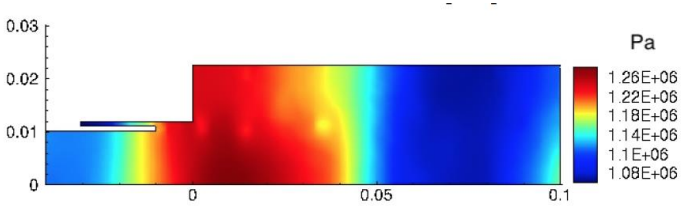
N-dim. ODE

$$\dot{\mathbf{s}} = \mathbf{f}(\mathbf{s}, t) + \mathbf{B}\mathbf{u}$$

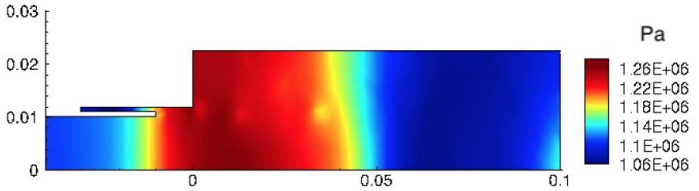
Model Reduction

n-dim. ODE (n<<N)

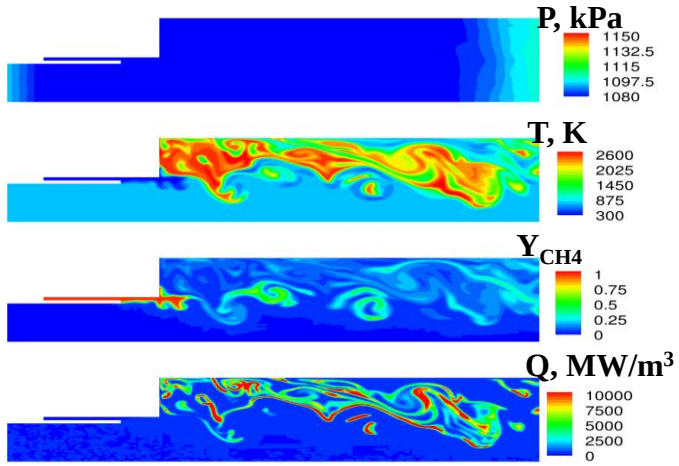
$$\dot{\hat{\mathbf{s}}} = \hat{\mathbf{f}}(\hat{\mathbf{s}}, t) + \hat{\mathbf{B}}\mathbf{u}$$



True pressure.

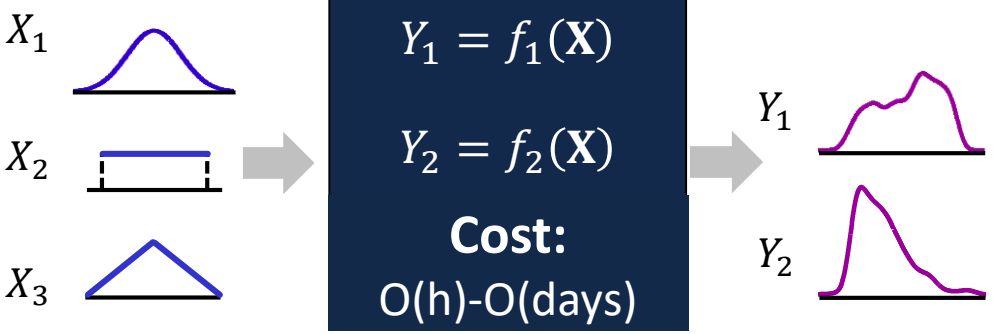


DDROM Predicted pressure.



Uncertainty Quantification & Design under Uncertainty

Input Parameters **Model** **Evaluate Quantities of Interest**

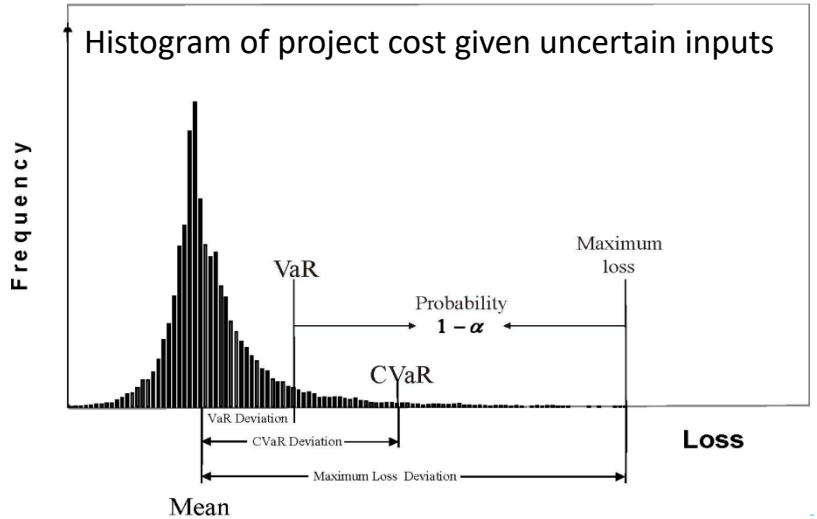


Quantify Uncertainty

- Failure Probability
- Output distribution
- Sensitivity Analysis
- Rare events

Development of multi-fidelity methods for UQ

Tail-probabilities are very important in design



UC San Diego

Undergraduate Students: Daniel Ho

Hello, I am Daniel Ho

About me:

About Me:

- 5th Year (3rd Year Transfer)
- Earl Warren College
- Transferred from a Community College in Sacramento, CA

Experience:

- College Ambassador
- RA - Village
- Intern
  - DAV Energy
  - Industrial Environmental Association

- I switched from Environmental Engineering to Mechanical Engineering last Winter but have always been passionate about environmental issues. I work with them to this day.

TRITON DAY

UC San Diego

Undergraduate Students: Jonathan Rodriguez

Hello, I am Jonathan Rodriguez

About me:

- Aerospace Engineering 3rd Year Transfer
- Muir College

Experience:

- 2018 – UTC Aerospace Systems, R&D Mechanical Eng. Intern

Studied compressible flow in aircraft ducts

- 2019 – Collins Aerospace, R&D Mechanical Eng. Intern

Researched current tooling issues, investigated potential solutions

- During my last year at UCSD I have been able to take many classes regarding composite aerostructures. Upon graduation, I hope to be able to progress in the field of composites for years to come.

TRITON DAY

UC San Diego

Undergraduate Students: Claire Stones

Hello, I am Claire Stones

About me:

- Major: Mechanical Engineering
- Specialization in Renewable Energy and Environmental Flows
- Minor: Climate Change Studies
- Fourth year, graduating in Winter 2021
- Eleanor Roosevelt College

Experience:

- Member of Engineers for a Sustainable World (ESW) for 3 years
- Project Lead of CommUnity Garden, an ESW project that works to increase food security for low-income high school students and to inspire them to pursue STEM in college, for 1.5 years

•I switched my major twice, from Biology to Environmental Engineering to Mechanical Engineering.
•I am passionate about sustainability and combating climate change. My career interests are renewable energy and sustainable building design.

TRITON DAY

UC San Diego

Panel Questions

Faculty

- How can undergraduates benefit from the top-notch research at UCSD?
- What drew you to UCSD?

Students

- What extracurricular activities have you or your classmates been engaged in (internships, student orgs, etc..)?
- How has MAE prepared you for your future career?
- What advice would you like to give prospective students still deciding on a school?

TRITON DAY

UC San Diego

VISIT OUR TRITON DAY Q&A DOCUMENT FOR A LIST OF QUESTIONS & ANSWERS FROM THE EVENT!

TRITON DAY


UC San Diego