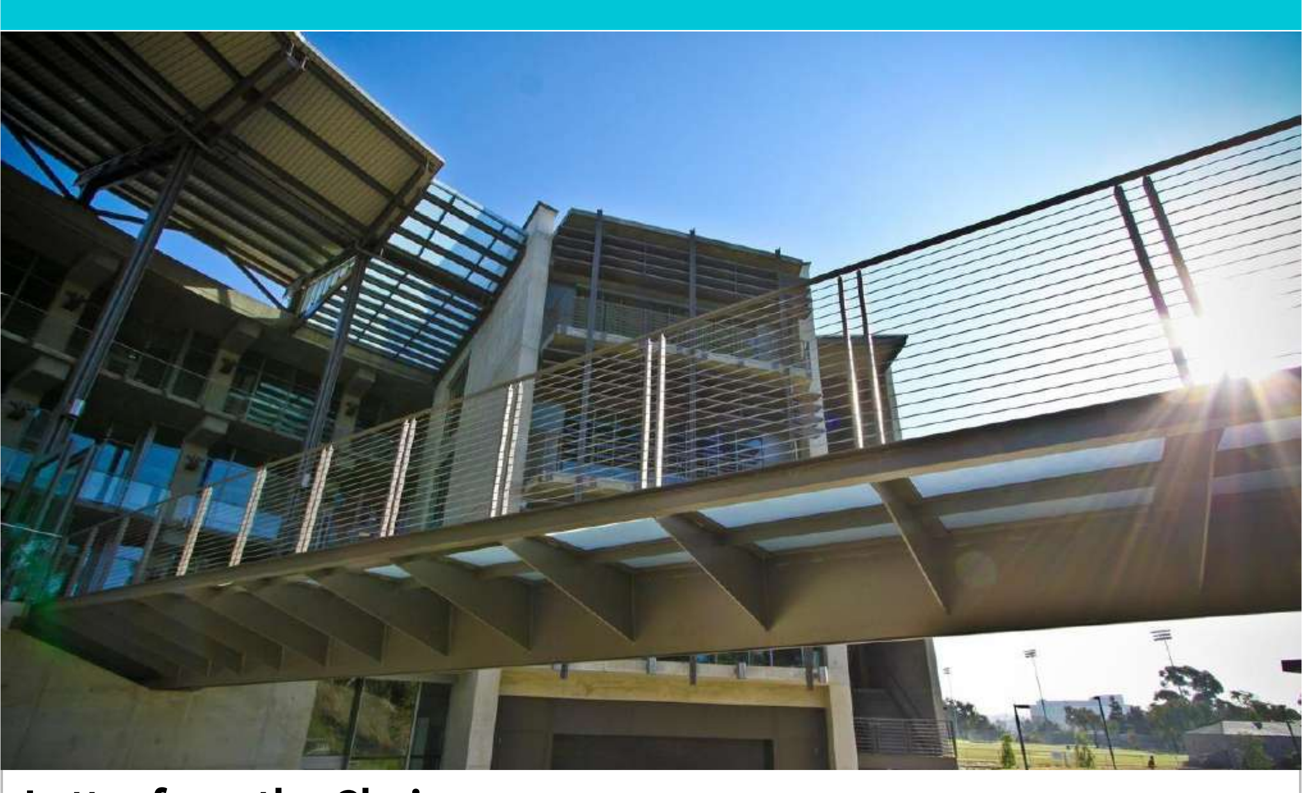
UC San Diego

STRUCTURAL ENGINEERING



Letter from the Chair

Dear Colleagues, Students, and Friends:

Welcome to the Department of Structural Engineering at the University of California San Diego! As the nation's only accredited structural engineering program, you've found a unique academic home. Here you will discover our holistic view of what a 'structure' is…which is just about anything. The phone or computer screen on which you are reading this? That's a structure. The chair on which you are sitting? That's a structure, too. The buildings you are in, the cars you drive, the bridges you drive over, the planes you fly in, the dams that store our water, or the levees that block unwanted water are all structures. Structures even extend down to the nanoscale. Think about that: a structural engineer could be involved with projects that function across twelve orders of magnitude! Read More>>

FACULTY NEWS

CAREER Award Targets Post-Wildfire Debris Flow Impact on Infrastructure and Communities

Associate Professor Ingrid Tomac has been honored with the Faculty Early Career Development (CAREER) Award from the National Science Foundation (NSF) for her groundbreaking research on the devastating impacts of post-wildfire debris flows on civil infrastructures. Read More>>

Figure 1: Post-wildfire debris flow.

Revolutionizing Seismic Engineering: UC San Diego's Shake Table Soil-Structure Interaction Model

Following the successful implementation of the six-degree-of-freedom upgrade to the Large High Performance Outdoor Shake Table (LHPOST6), a series of force vibration tests were conducted to capture the dynamic response of the Shake Table's reaction mass. Led by Professor Jose Restrepo and Professor Joel Conte, the extensive experimental data is currently being utilized to develop a cutting-edge 3D finite element model that accurately represents the reaction mass and soil system. The model will play a pivotal role in estimating the capacity of the reaction mass, defining its operational limits, and studying current modeling techniques in soil-structure-interaction.

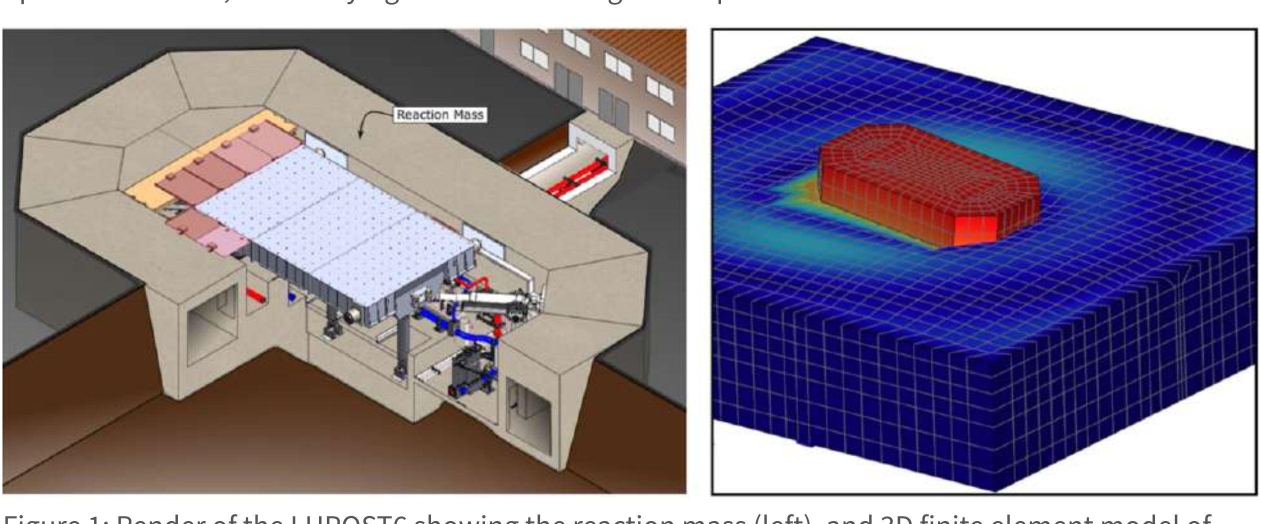


Figure 1: Render of the LHPOST6 showing the reaction mass (left), and 3D finite element model of the reaction mass and soil system (right).

Shaken, But Not Stirred: How Do Baleen Whales Hear?

Engaged in a collaborative research endeavor, Professor Petr Krysl from Structural Engineering, Professor John Hildebrand from the Scripps Institution of Oceanography, and Assistant Professor Ted Cranford from San Diego State University are working together to understand the hearing capabilities of baleen whales. Their investigation recently put to the test the hypothesis that these majestic creatures hear by perceiving the vibrations of their skull as the sound waves interact with it underwater. This examination took place at the Navy Transdec Acoustic Pool, where accelerations at various key points of a gray whale's skull, including the intricacies of the middle ear bones, were meticulously measured and compared with computational predictions. This pioneering research is supported by the Office of Naval Research (ONR).

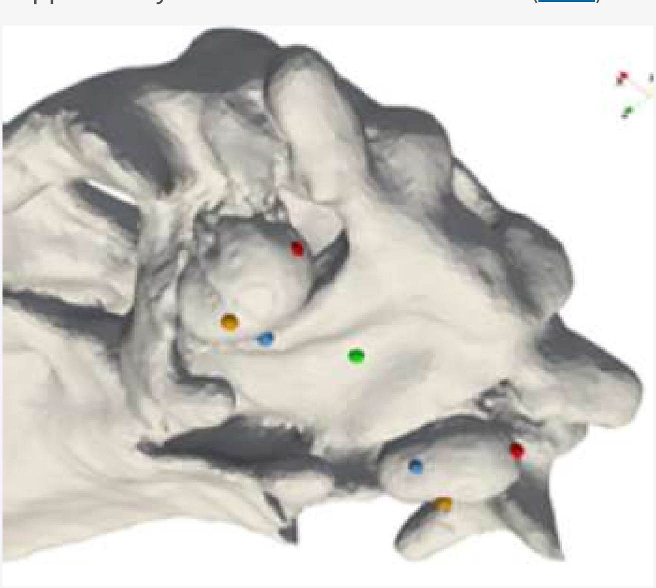


Figure 1: 3D finite element model of whale skull.

Using Machine Learning and Experiments for Advanced Modeling of Complex Materials

The microstructure of complex synthetic and natural materials (for example, geological and composite materials) determine their overall properties and performance in engineering applications. Assistant Professor Semnani's research group develops advanced techniques to incorporate the effects of the microstructure of materials into computational models using machine learning and experimental material characterization techniques. The goal of this work is to enable fast and accurate simulations of engineering systems made of complex materials and to develop advanced tools for efficient material discovery and design.

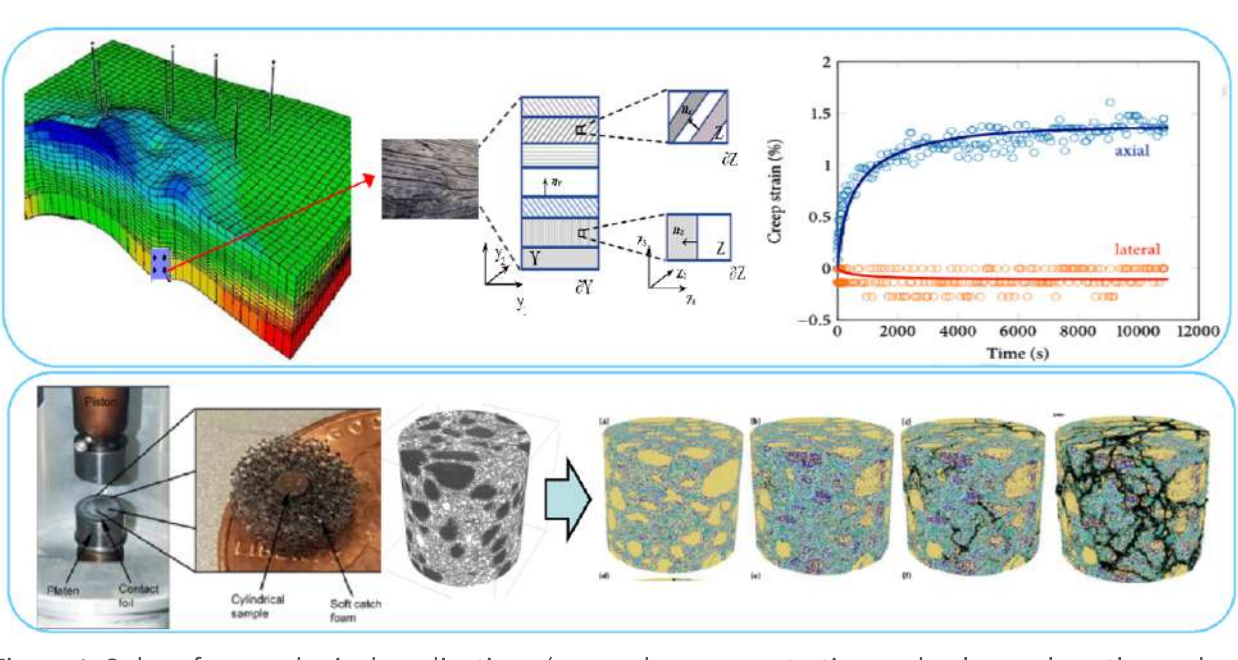


Figure 1: Subsurface geological applications (e.g. carbon sequestration and enhanced geothermal systems) benefit from advanced multiscale modeling techniques (top).
Figure 2: Microstructure evolution and damage progression of ultra-high-performance concrete is captured under compression test (bottom).

Practical Design, Automated Manufacturing, Simulation, and Experimental Characterization of Friction-Based Force-Limiting Connections for Seismic Resilience in Buildings

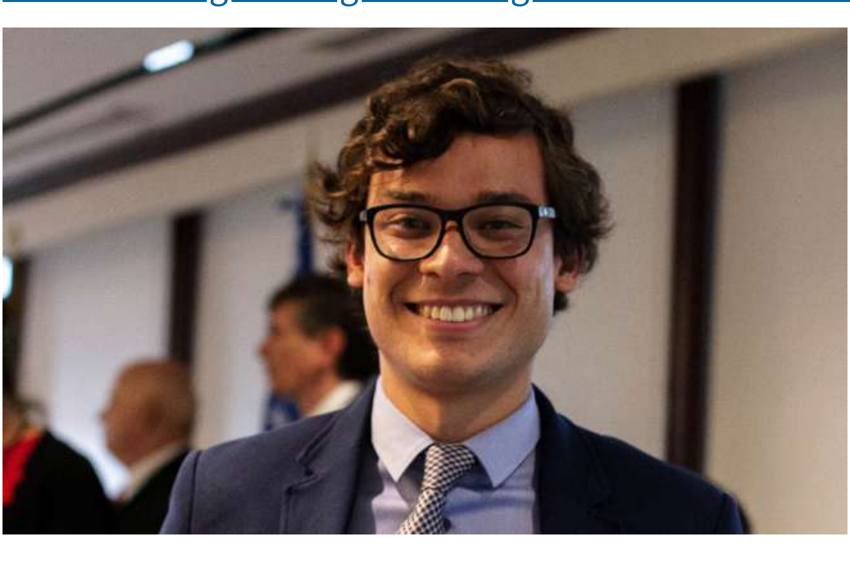
Assistant Professor Georgios Tsampras and Structural Engineering Ph.D. student Kaixin Chen are conducting research that focuses on the development of friction-based force-limiting connections for enhancing the seismic resilience of buildings. Their aim is to create connections that are not only simple to manufacture and assemble but also exhibit reliable long-term frictional behavior, with an added focus on the ease of repairability. These friction-based connections play a pivotal role in restraining seismic-induced inertia forces and mitigating the higher mode seismic responses of structures. The study explores practical design methodologies for connections utilized in buildings equipped with seismic force-resisting systems such as reinforced-concrete planar walls or core-walls, precast reinforced concrete controlled rocking walls, and self-centering controlled rocking steel braced frames.

The research incorporates automated manufacturing techniques, advanced simulation, and experimental characterization in order to facilitate the creation of connections that not only meet performance standards but also offer simplified fabrication and assembly, thus contributing to the overall resilience and longevity of structural systems in the face of seismic events.

Figure 1: Practical Design, automated manufacturing, simulation, and experimental characterization of friction-based force-limiting connections for seismic resilience in buildings.

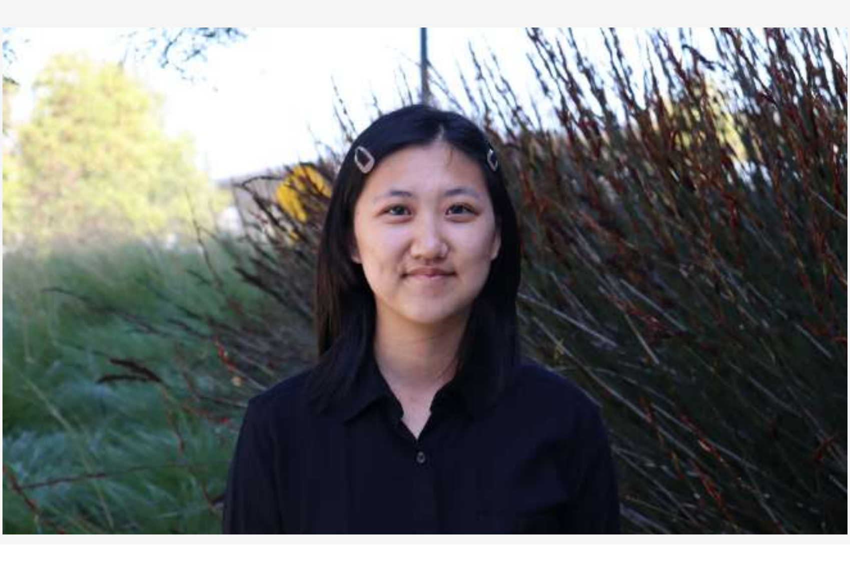
STUDENT NEWS

Structural Engineering Ph.D. Sergio Godinez Awarded 2023-2024 ACI Fellowship



Sergio Godinez, a Structural Engineering Ph.D. student, recently received the prestigious Darrell F. Elliott Louisiana Fellowship from the ACI (American Concrete Institute) Foundation. The foundation is dedicated to advancing progress, fostering innovation, and encouraging collaboration in the concrete industry. Read More>>

Structural Engineering Undergraduate Liana Wong Wins 2023 ACEC Scholarship



Liana Wong, a dedicated fourth-year student majoring in Structural Engineering with a specialization in Civil Structures, has been honored with the prestigious 2023 American Council of Engineering Companies (ACEC) Scholarship. Read More>>

ALUMNI NEWS

Interview with an Alumnus: Saul Chaplin, SpaceX Engineer (B.S.)

Saul Chaplin's decision to enroll in UC San Diego's Structural Engineering program was driven by a desire for exposure to aerospace structures and structural health monitoring, among other subjects. Today, Saul is thriving as a Structures Engineer at SpaceX. Read More>>

Interview with an Alumna: Jessica Chan, NASA Aerospace Engineer (B.S. & M.S.)

Jessica's journey in UC San Diego's Structural Engineering program began with her involvement in Triton UAS, fostering her passion for aerospace composite structure design. Now, as an Aerospace Engineer at NASA Glenn, she conducts structural dynamics testing for various projects, including those for SpaceX and Sierra Space. Read More>>

Ph.D. Alumnus Wins Distinguished Performance Award at Los Alamos National Laboratory

UC San Diego Structural Engineering 2010 Ph.D. alumnus Eric Flynn, who worked under the guidance of Distinguished Professor Mike Todd, has been honored with the 2022 Distinguished Performance Award at the Los Alamos National Laboratory. Read More>>