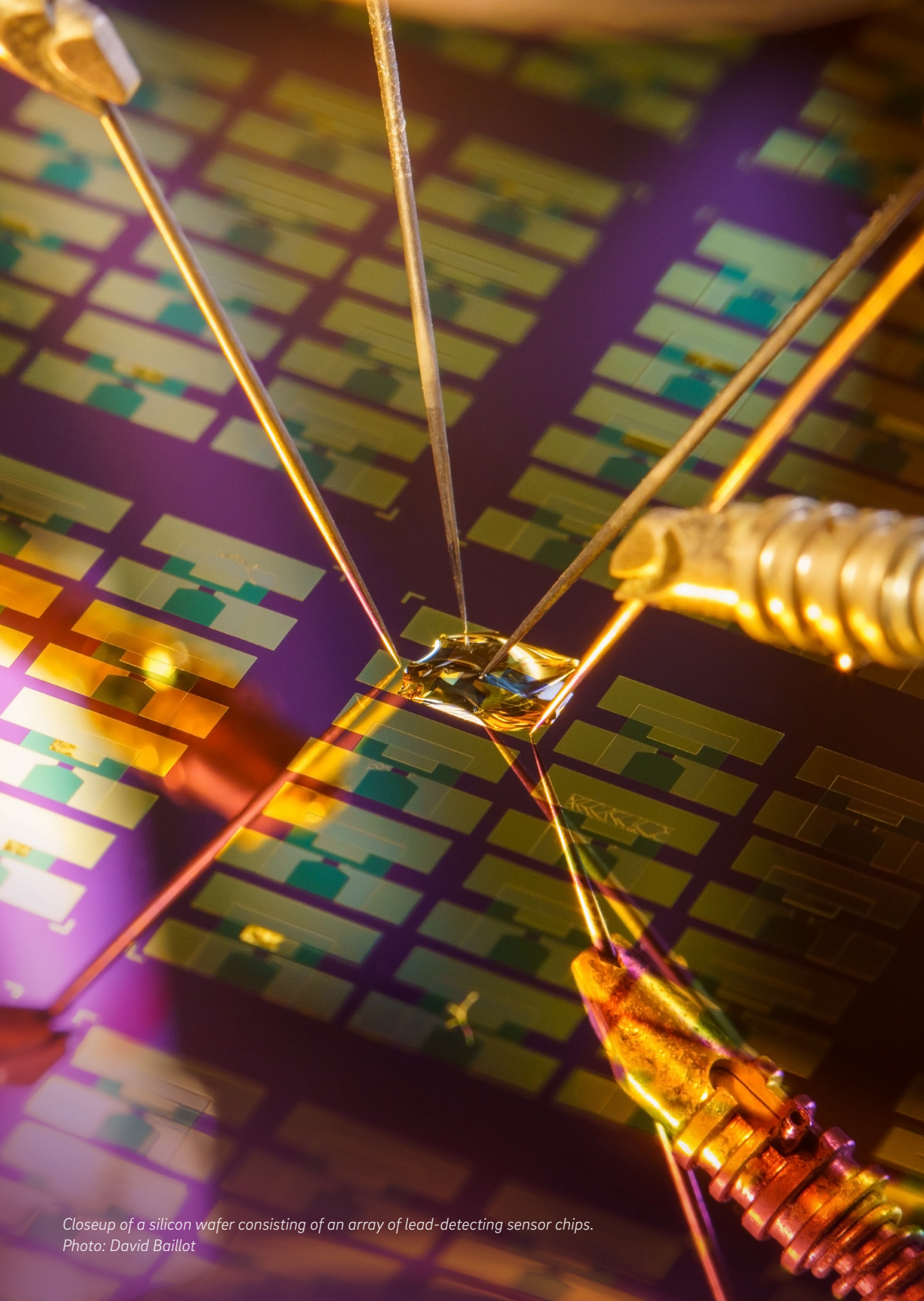
UC San Diego

JACOBS SCHOOL OF ENGINEERING

# DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING



*Closeup of a silicon wafer consisting of an array of lead-detecting sensor chips.*
*Photo: David Baillot*

# PROOF FOR INSPIRING FUTURES

**The Department of Mechanical and Aerospace Engineering (MAE) at Jacobs School of Engineering** is quintessentially interdisciplinary, with faculty focused on resolving questions central to the performance, effectiveness and safety of society's fundamental systems. With a track record of designing solutions for transportation, energy and exploration across our planet and beyond, MAE discovery connects foundational principles to critical applications, emphasizing rigorous understanding that equips stakeholders in industry and government to plan, adapt and advance.

At the heart of our distinction is an integrated approach to discovery itself — MAE undergraduates and graduate students are more than a pipeline for the engineering workforce, they learn from engineering scientists who prioritize mastery in advancing theory over simply competence in following protocols. New directions are catalyzed by high-risk, high-reward research — tackling fundamental questions that unlock a variety of applications. This is the kind of thinking that is crucial for transformational solutions, whether configuring new manufacturing infrastructure for greater adaptability or constructing dynamic energy grids integrating multiple sources of generation. Space is an important context for MAE discovery, focusing on the underlying concepts and technologies that create the intellectual framework for profoundly productive and creative experimentation.

Visionary philanthropy will support MAE faculty as they pursue curiosity-driven research into unresolved questions as the foundation for a better functioning future — safer transit, sustainable energy, bountiful production and an ever-expansive horizon.

# HISTORY AND DISTINCTION


**Mechanical and aerospace engineering as specializations date back to 1964**, when the campus established the Department of Aeronautical and Mechanical Engineering Sciences (AMES) covering areas in aerospace and mechanical engineering such as fluid mechanics and solid mechanics, which later grew to develop bioengineering, materials and more. Significantly, the university's status as a bachelor's degree institution was preceded by the presence of Scripps Institution of Oceanography, which was incorporated into the University of California in 1960 and became the fulcrum of the new research-intensive campus. MAE engineers have partnered closely with oceanographers from the very start. Climate and environmental exploration continue to be a strong focus at UC San Diego and Scripps Institution of Oceanography. No other university in the nation has this combination of oceanography leadership, a massive engineering footprint, and the scale of a public research enterprise.

MAE faculty are enterprising leaders in cross-campus initiatives. Notable examples include the CaliBaja Center for Resilient Materials, the Center for Energy Research, and the Applied Ocean Sciences Program. Faculty have received numerous awards and accolades, including nine members of the National Academy of Engineering (NAE) and four fellows of the NAE-equivalents in Germany, Spain, Australia and the United Kingdom. More than half of our professors are fellows of their respective professional societies, and often of several. As a whole, the department has achieved notable recognition in the 2023 Academic Ranking of World University (ARWU) Global Ranking of Academic Subjects, securing a position among the top five nationally and top 20 globally.

# PHILANTHROPIC OPPORTUNITIES

## EDUCATION

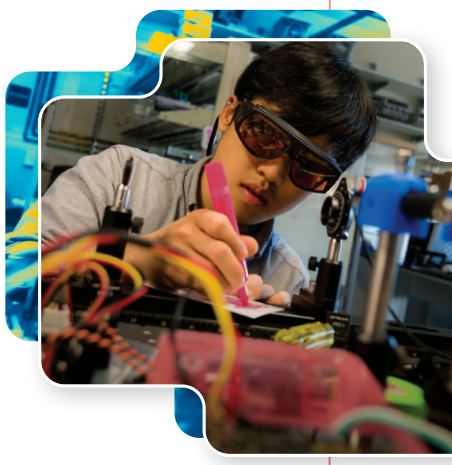
### *Graduate Fellowships*

Graduate students hold dual roles: the subjects of MAE's top-tier education and the active agents of our research. Philanthropic support of graduate fellowships improves MAE's capacity to enroll promising graduate students, and, with higher numbers, bolster our research program commensurately — compounding the impact of fellowship contributions as increased research capacity qualifies us for more research funding.

One example among many is work on the certification of jet engines, which needed a process for deciding that the jet engine and its control system are suitably safe for flight — a step beyond the scope of the NSF grant funding the research. Through fellowship funding and manufacturer engagement, students and faculty explored the underlying mathematical problems. Ultimately the research made the case for the FAA to change certification rules. One doctoral student eventually became the lead control design engineer at the company and continues to be a technology leader in the industry.

## RESEARCH

Funding for speculative research has a multiplier effect, as discoveries arising from work outside the scope of narrow project boundaries serves as fuel for multimillion dollar agency awards. Cutting-edge research in the fundamental areas of mechanical and aerospace engineering underpins the innovative applications. This includes fluid mechanics, solid mechanics, and material science and control theory. Your support of MAE research advances outstanding mid-career faculty by creating a resource bridge from the earliest years of self-directed research to their qualification for high-stakes grants and contracts.



### *Climate, Energy and Environment*

MAE faculty participates in the logistics of the energy transition through activities like partnership with the California Independent System Operator, making strong connections to specific realizable technologies. Ongoing partnerships with faculty at Scripps Institution of Oceanography ensures access to precision data on Earth and its changing conditions. Leadership in fusion energy (such as the campus-wide Fusion Initiative) and energy distribution systems is crucial as climate change advances, threatening geopolitical stability, national and international economic flows, and the health and safety of populations everywhere. Rigorous, academic research leading to new technologies and energy systems enables us to reduce dependence on fossil fuels and explore the future energy strategies.

### *Space*

A leading impetus for UC San Diego was the enthusiasm for Space Race discovery, with engineering faculty and students parlaying investment inspired by this strategic focus into more durable exploratory and commercial infrastructure. Notably, our alumni include the founders of Viasat, a leading satellite communications company. UC San Diego's participation in space discovery continues strong, and exploration into different conditions than Earth's atmosphere — microgravity — increases opportunities for new technologies and solutions. MAE faculty focus on the core engineering science questions whose answers enable safer, more reliable and ultimately less costly exploration.

### *Robotics*

While the image of robotics might be of charismatic, ambulatory machines, the movement and function of robots is defined by their role in larger systems. Research led by MAE faculty is critical for advancing autonomy in all kinds of environments and at all scales. The performance and safety of flying, soft and surgical robots will be important for innovations in logistics, advancing health care and environmental systems utilizing swarms for observation. Already this is being realized in the prediction of forest fire behavior linking observational drones, computational methods and weather forecasts, as well as collaborative applied research involving multiple partners such as, notably, UC San Diego's San Diego Supercomputer Center.

To learn more about supporting the Department of Mechanical and Aerospace Engineering, please contact the Jacobs School of Engineering Development Office at **de-devasst@ucsd.edu**.

At UC San Diego, we believe that what we don't know today will forever change our tomorrows. Empowered by generosity and fueled by curiosity, we are unafraid to chase the unknown — to ask the questions no one has asked before and to push the boundaries of possibility.

Together with your gift in support of the Department of Mechanical and Aerospace Engineering at Jacobs School of Engineering, we will unite diverse people and unconventional perspectives to propel limitless impact. **Because we know that when we come together, nothing is beyond us.**

---

Department of Mechanical and Aerospace Engineering
Jacobs School of Engineering
University of California San Diego
9500 Gilman Drive # 0411
La Jolla, CA 92093-0411

**mae.ucsd.edu/giving**

UC San Diego
**JACOBS SCHOOL OF ENGINEERING**
Department of Mechanical and Aerospace Engineering