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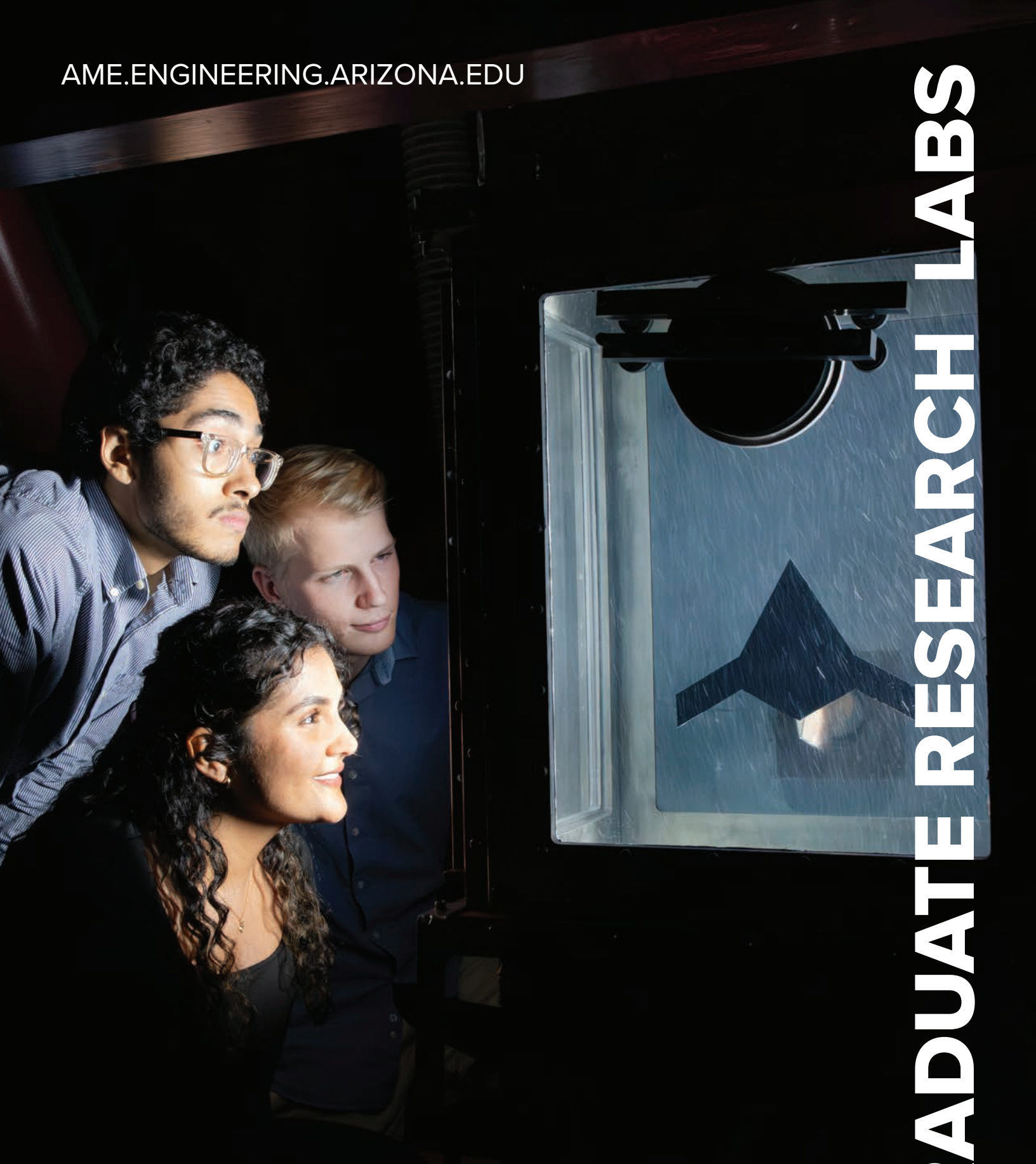

GRADUATE RESEARCH LABS

THE UNIVERSITY OF ARIZONA
COLLEGE OF ENGINEERING
Aerospace &
Mechanical Engineering

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Editor	Rachel Spitz
Creative	Rachel Spitz
Photography	Rachel Spitz, Ryan Hunt and faculty of The University of Arizona Department of Aerospace and Mechanical Engineering

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MESSAGE FROM THE DEPARTMENT HEAD

DEAR STUDENTS,

Welcome to the graduate program in aerospace and mechanical engineering at The University of Arizona. As department head, I'm pleased to introduce you to a place where curiosity drives impact and your ideas can truly take flight.

The Department of Aerospace and Mechanical Engineering (AME) is nationally recognized for its research and teaching excellence. Our department invests $9.2 million annually in research and provides access to world-class facilities, including subsonic and supersonic wind tunnels, water tunnels and advanced fabrication shops.

Our globally-respected faculty push boundaries and advance discovery in areas such as dynamics and control, energy systems, fluid dynamics, solid mechanics and thermosciences while incorporating emerging tools such as AI. Their work is supported by partnerships with leading organizations including NASA, National Science Foundation (NSF), Department of Defense (DOD), Department of Energy (DOE), Air Force Research Laboratory (AFRL), Raytheon, Boeing, Lockheed Martin, Honeywell and Paragon among many. As a graduate student, you'll join these efforts and help shape the future with autonomous systems, space exploration, aerodynamics, renewable energy and more.

You'll be part of a tight-knit academic community with a 4:1 graduate student-to-faculty ratio, personalized mentorship, and abundant opportunities across our 26 research laboratories and through graduate assistantships. Whether you're pursuing a master's or doctoral degree on campus or enrolling in our flexible online master's degree in mechanical engineering, you'll be challenged, supported and inspired every step of the way.

I also encourage you to take full advantage of the opportunities outside the lab. Join design teams, attend campus events, collaborate across disciplines and explore the unique environment of Southern Arizona. The resilience and creativity we see in the desert reflect the values we nurture in our students.

Sincerely,

Farzad Mashayek
Professor and department head,
The University of Arizona Department of
Aerospace and Mechanical Engineering

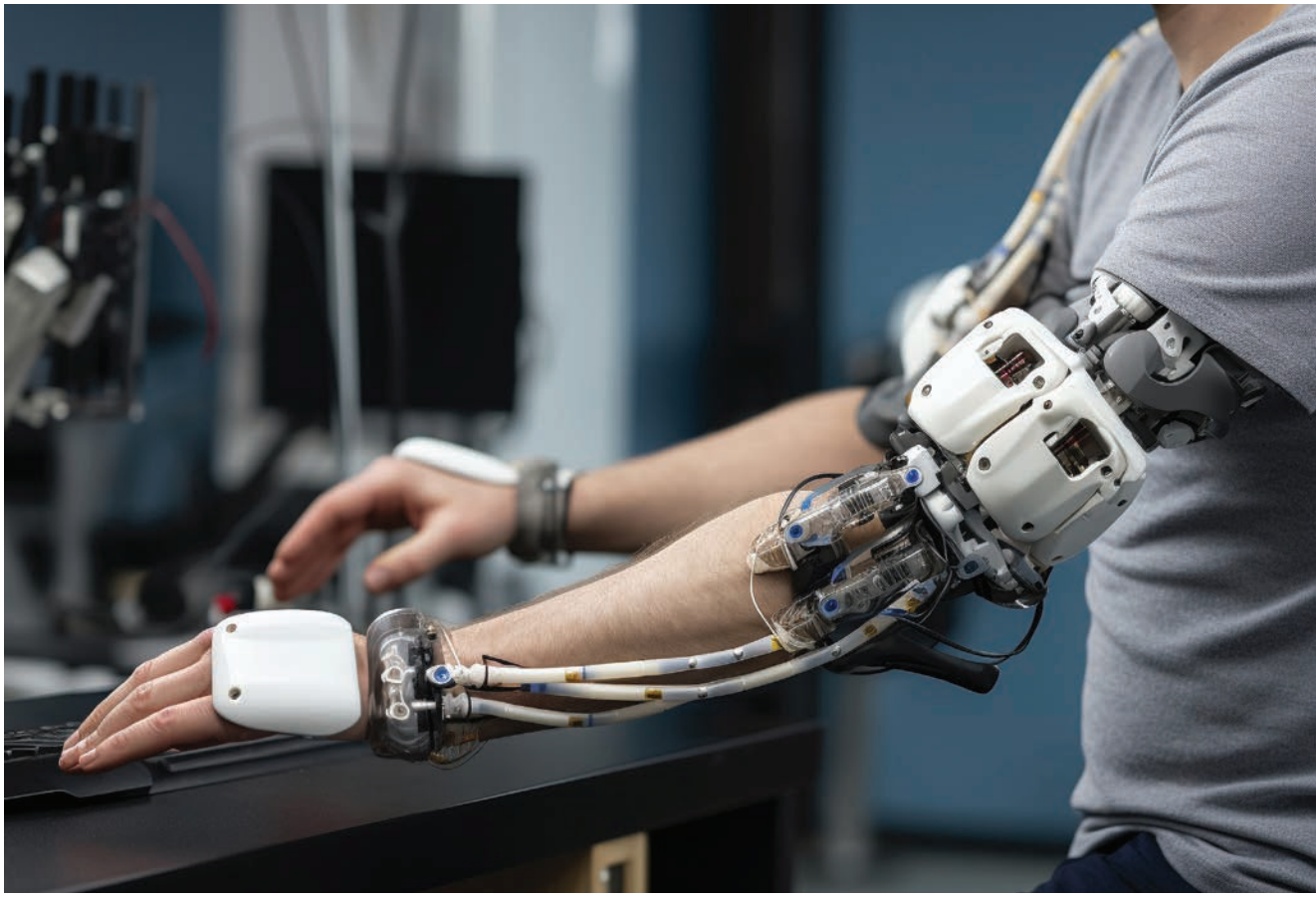
RESEARCH FOCUS AREAS

Dynamics and Control

Energy

Fluid Dynamics

Solid Mechanics



Thermosciences

LABORATORIES

Additive Manufacturing Research Laboratory

AME N441

The Additive Manufacturing Research Laboratory is focused on additive manufacturing in gravity-affected environments. Research includes advanced prototyping, materials testing, computer-aided design (CAD) and coding.

Student researchers use Fused Deposition Modeling 3D printers, composite fabrication tools and tensile testing machines to design and build complex structures.

RESEARCH FOCUS AREAS

Solid mechanics

Advanced Micro and Nanosystems Laboratory

AME N417B

The Advanced Micro and Nanosystems Laboratory develops small sensors and actuators for biomedical and engineering applications. Research focuses on creating devices that sense and control processes at very small scales.

Student researchers design custom electronics to capture signals and run experiments. Equipment includes microscopes, laser lithography tools, oscilloscopes and spectrophotometers, while software such as AutoCAD and MATLAB supports design and data analysis. Current projects include drug-delivery stents, noninvasive eye pressure monitors and tools to measure cerebrospinal fluid flow.

RESEARCH FOCUS AREAS

Dynamics and control, energy

Accelerating Materials Discovery Laboratory

AME N305 and N319B

The Accelerating Materials Discovery Laboratory for advanced materials, manufacturing and AI-driven discovery brings together student researchers to tackle critical challenges in materials science.

Research focuses on creating and studying advanced materials, especially new, ultra-thin 2D materials that can improve how we store energy. Researchers develop faster ways to discover and test these materials, including using automated, self-guided labs. Their work helps make batteries and supercapacitors more efficient and supports the development of cleaner, more sustainable energy technologies.

RESEARCH FOCUS AREAS

Energy

Autonomous Space Vehicles and Astrodynamics Laboratory (ASVA)

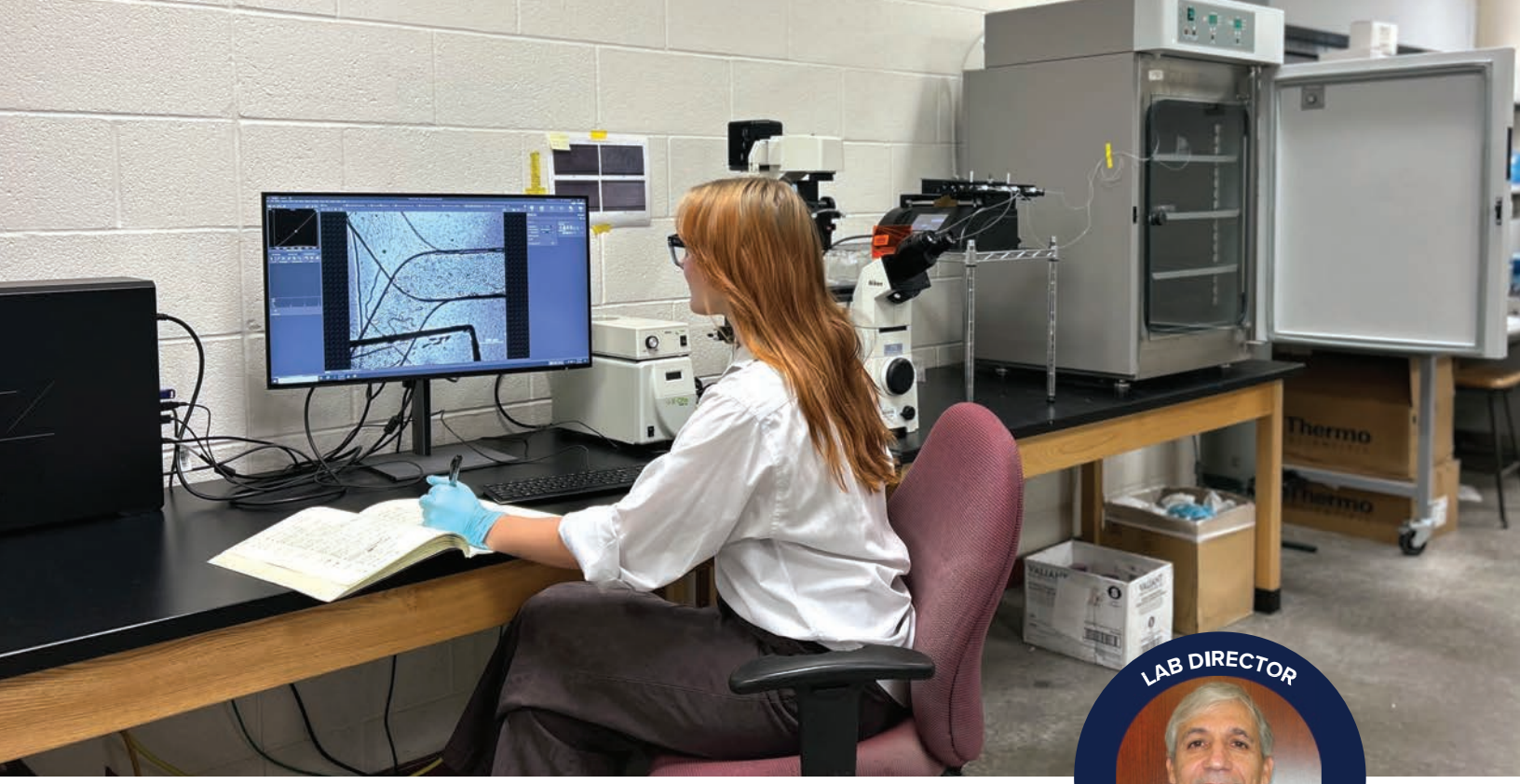
AME N725

ASVA studies spacecraft dynamics, control and navigation. Research includes orbital mechanics, trajectory planning, attitude control and multi-vehicle formation flying.

The lab also investigates complex system behaviors such as time-delayed and chaotic dynamics. Projects range from traveling between earth and the moon to servicing spacecraft in orbit, advancing both control methods and space technologies. Research is supported by the Army Research Office and U.S. Space Force.

RESEARCH FOCUS AREAS

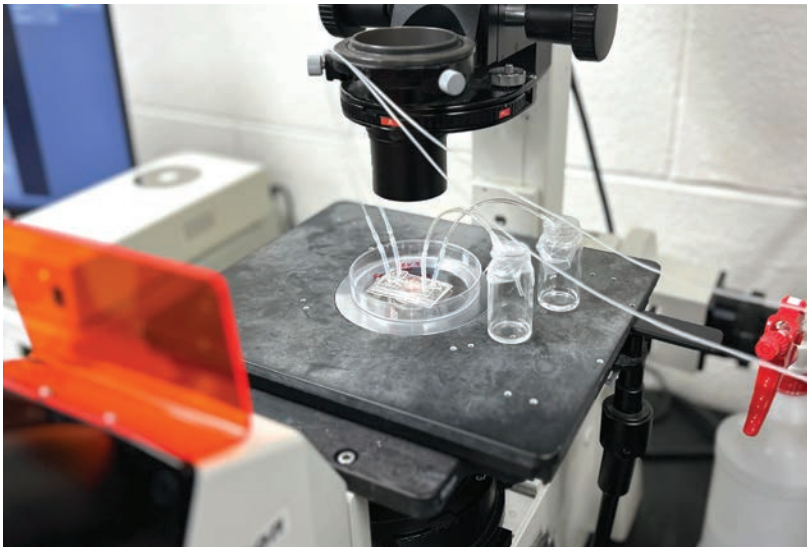
Dynamics and control



BioMicroFluidics Laboratory

AME N405 and N319B

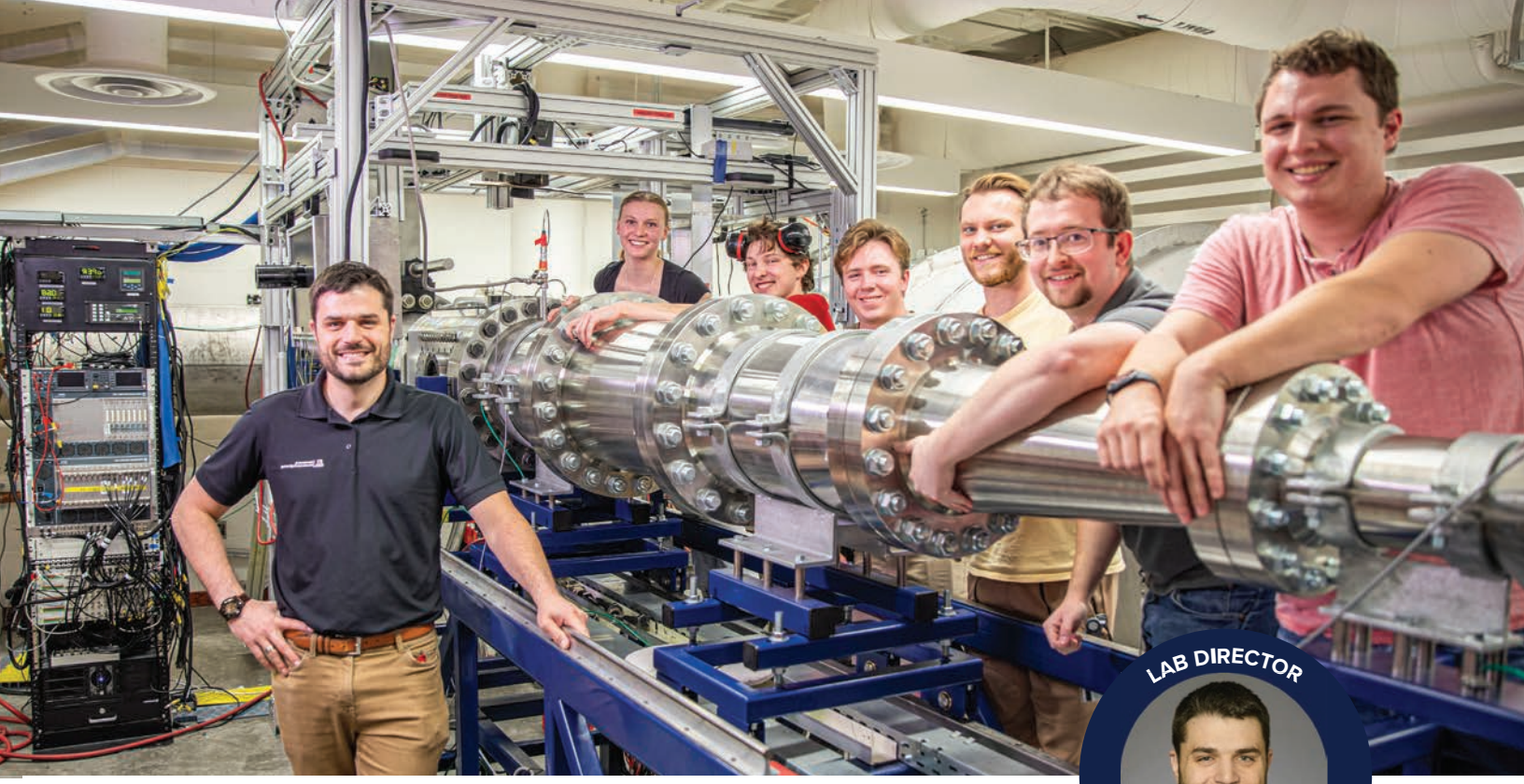
In the BioMicroFluidics Laboratory, microfluidic systems are developed for biomedical applications. The lab focuses on organs-on-chips to model body organs for studying human diseases such as cancer.



Equipped with advanced cell culture and imaging, the lab features biosafety cabinets, syringe pumps and fluorescent microscopes for long-term experiments. Student researchers combine engineering and health sciences to advance research in disease modeling and therapeutics.

RESEARCH FOCUS AREAS

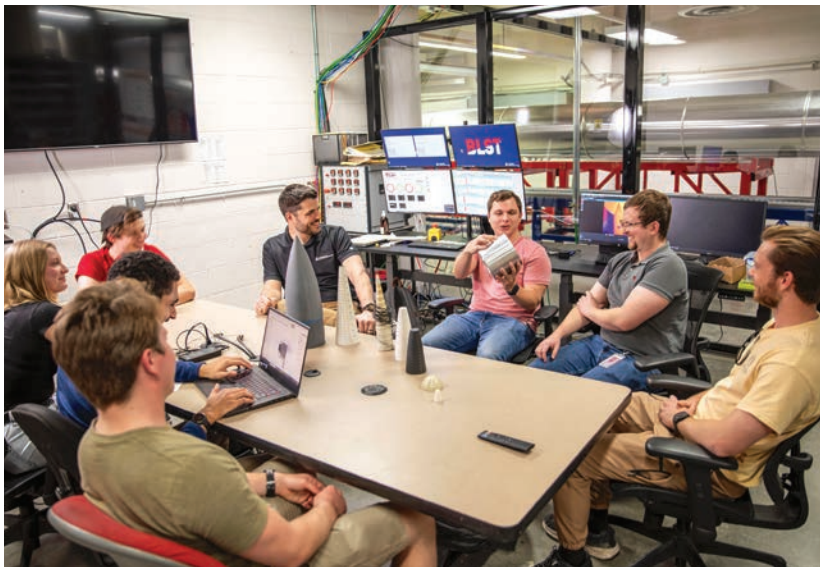
Fluid dynamics



Boundary-Layer Stability and Transition Laboratory (BLST)

AME N341

BLST studies how air flows over vehicles moving at high and hypersonic speeds, focusing on boundary-layer stability, the change from smooth to turbulent flow and aerodynamic heating. BLST advances flight performance with experiments and defense-backed research. Facilities include a Mach 5 quiet Ludwieg tube and the Arizona Low-Speed Wind Tunnel. Research is supported by the DOD, U.S. Air Force, U.S. Navy, Test Resource Management Center, University Consortium for Applied Hypersonics and industry.



RESEARCH FOCUS AREAS

Fluid dynamics

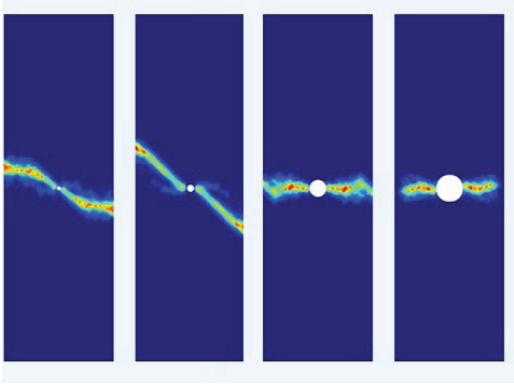
Center for Peridynamics

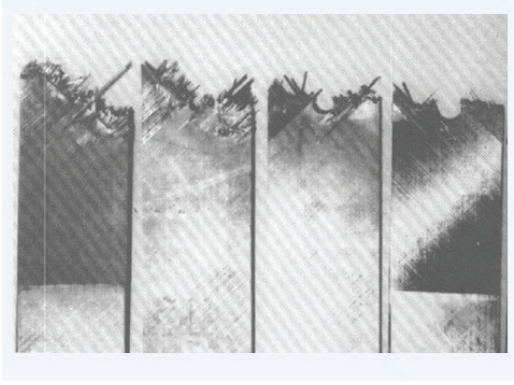
AME N528

Center for Peridynamics studies how and when materials crack so engineers can build safer, longer-lasting designs—using simulations that look beyond just nearby points to a wider network of interactions.

RESEARCH FOCUS AREAS

Solid mechanics





Computational Fluid Dynamics Laboratory (CFDL)

AME N630

CFDL develops simulation tools to investigate fundamental aspects of fluid dynamics and aerodynamics for a wide range of flow speeds, from low-speed (subsonic) to high-speed (supersonic/hypersonic) up to Mach numbers of 14.

In recent years, research has focused on the laminar-turbulent transition process, how smooth airflow becomes turbulent when it passes over aerodynamic surfaces of flight vehicles. For these investigations, student researchers use advanced simulation codes to solve the full Navier–Stokes equations, which model the flow around aircraft. These codes were developed in the lab over many years. This research has helped improve the understanding of surface heating of flight vehicles traveling at hypersonic speeds and of how the airflow behaves around low-speed aircraft.

RESEARCH FOCUS AREAS

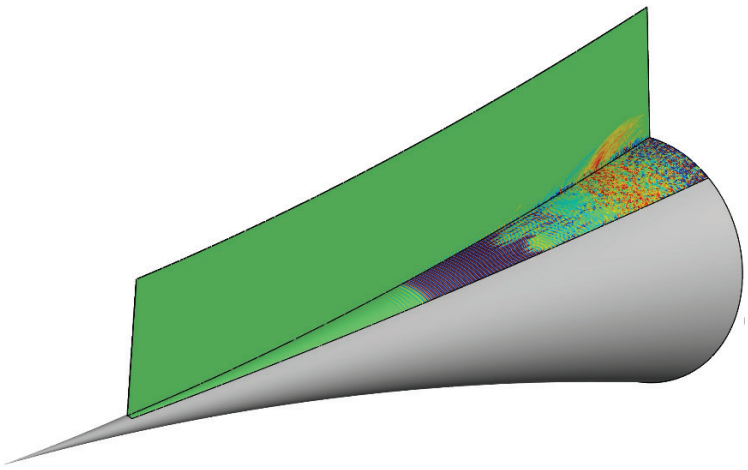
Fluid dynamics

Computational High-Speed Aerodynamics Laboratory

AME N609

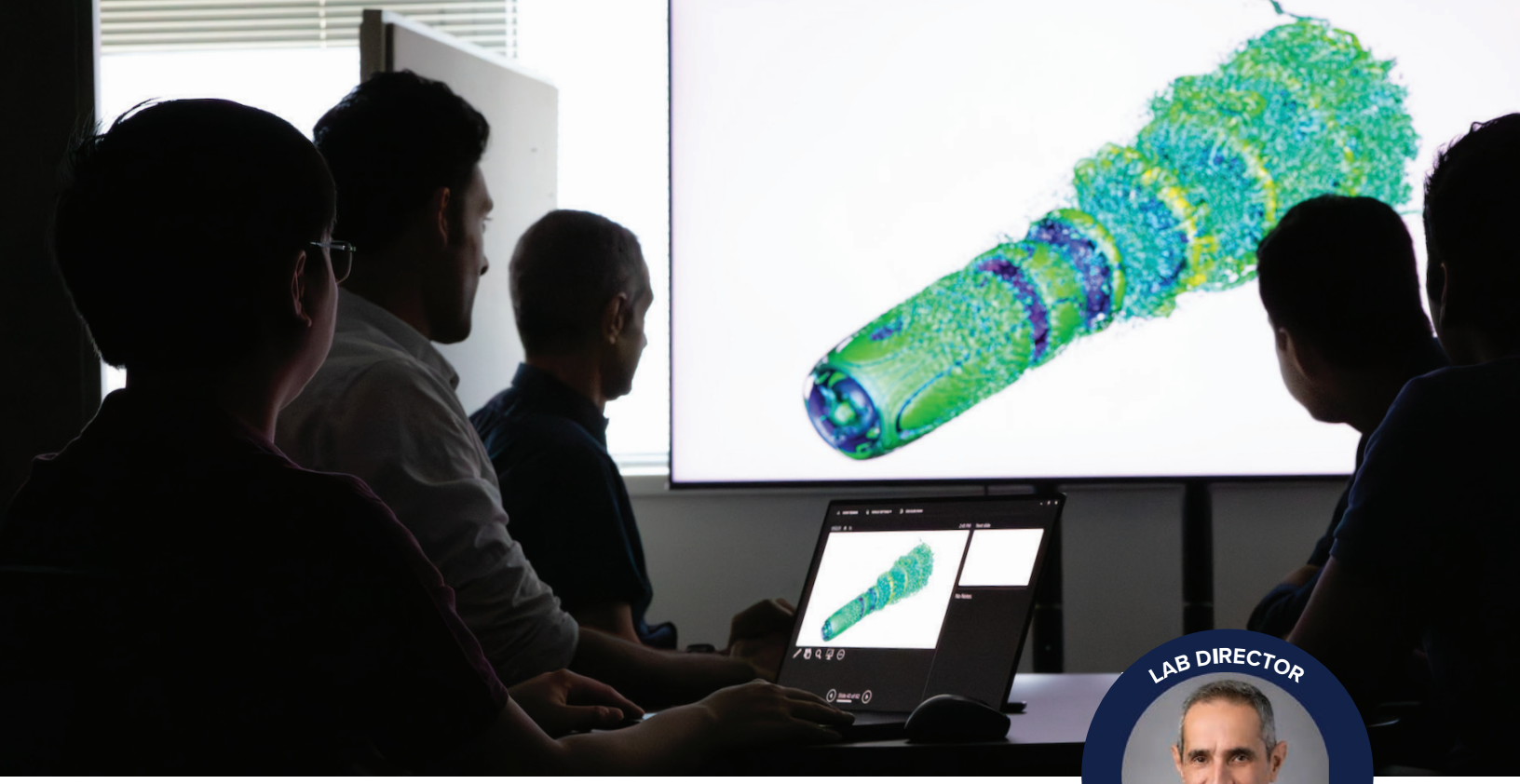
The Computational High-Speed Aerodynamics Laboratory studies airflow in hypersonic flight and atomospheric re-entry, where extreme surface heating poses major challenges.

Using advanced computing and AI, the lab works to better understand airflow in extreme environments to support the design of safer, more efficient vehicles for both hypersonic defense and high-speed travel.



RESEARCH FOCUS AREAS

Fluid dynamics



Computational Multiphase Transport Laboratory (CMTL)

AME N728

The research at CMTL involves mathematical modeling and advanced computer simulations to study complex flows involving turbulence, multiphase, combustion and plasma. The team implements reinforcement learning and machine learning to various applications such as active flow control.

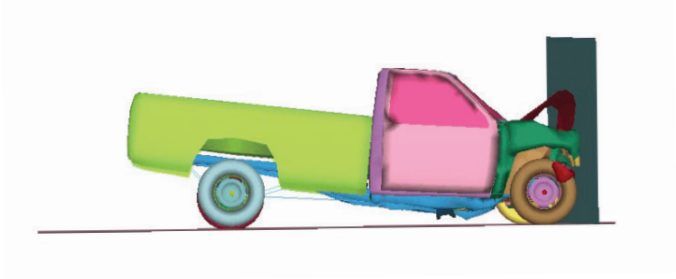
Student researchers leverage supercomputing to conduct advanced simulations and implement AI to predict complex fluid behaviors with greater accuracy, driving breakthroughs in science and industry.

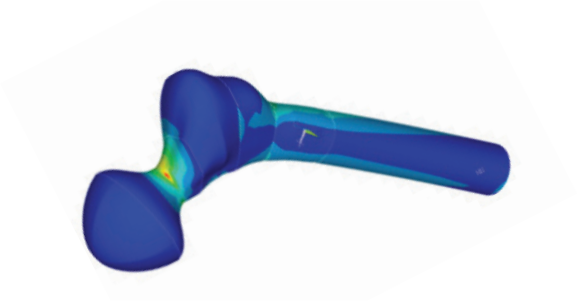
RESEARCH FOCUS AREAS

Energy, fluid dynamics, thermosciences

Computational Optimal Design of Engineering Systems Laboratory (CODES)

AME N732

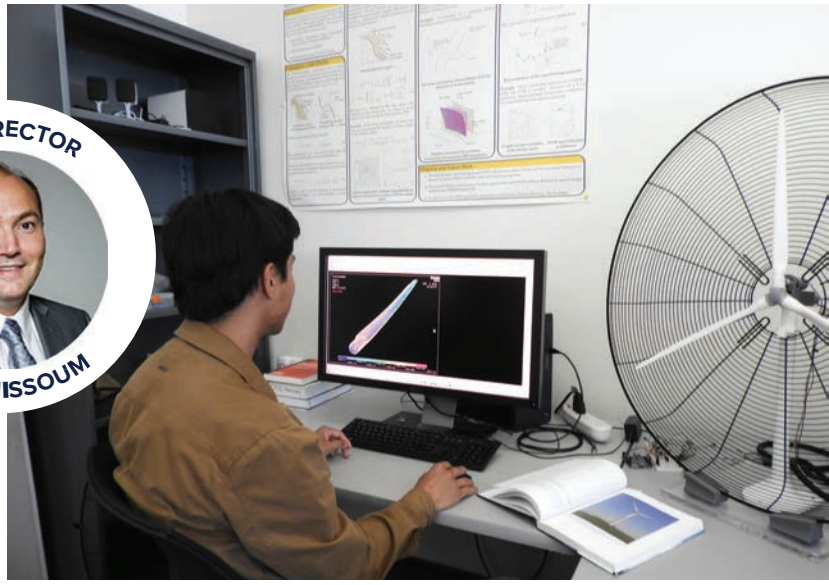


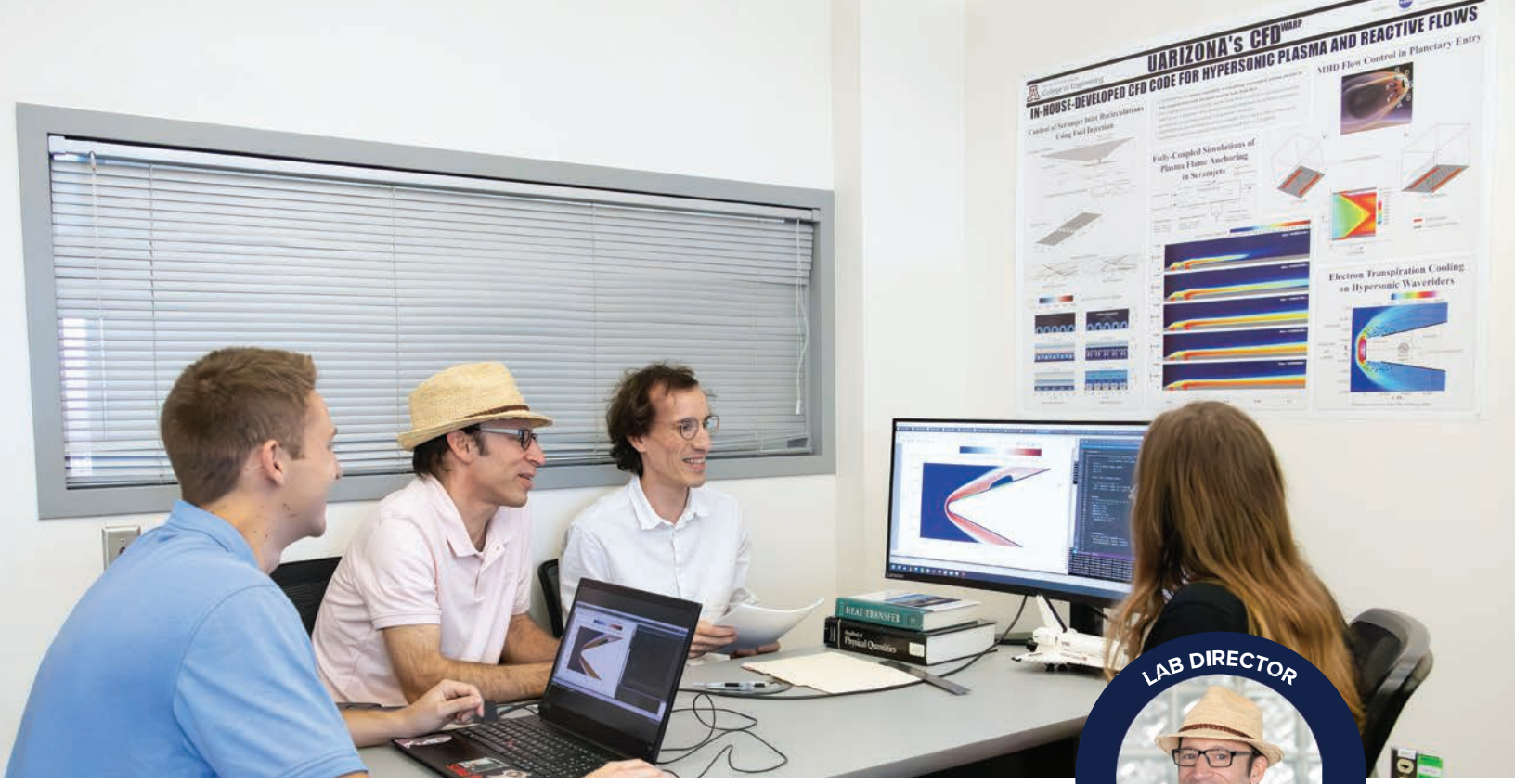


The CODES Laboratory develops advanced computational tools that enable engineers to design more efficient complex systems and make better predictions under uncertainty. These state-of-the-art tools draw on machine learning, statistics and advanced finite element modeling. They have been applied to a wide range of high-impact areas, including crashworthiness, aeroelasticity, wind turbine design, head and hip injury prediction and even the design of musical instruments.

RESEARCH FOCUS AREAS

Dynamics and control, energy, solid mechanics





Computational Plasma and Reactive Flow Laboratory

AME N532

The Computational Plasma and Reactive Flow Laboratory develops advanced computer programs to study how gases and plasmas (charged particles) behave.

Using its own special software called Computational Fluid Dynamics, Waves, Reactions, Plasmas (CFDWARP) and a large computer system with 640 processors, the lab tackles tough problems like spacecraft re-entry, high-speed flight, efficient engines and advanced manufacturing.

RESEARCH FOCUS AREAS

Fluid dynamics, thermosciences

Energy and Fuel Cell Laboratory

AME N417C

The Energy and Fuel Cell Laboratory works on new ways to make renewable energy more efficient and practical.

Student researchers study how to store energy, move heat and produce hydrogen fuel. Projects include harnessing solar power with special heat-storing fluids, improving systems that turn seawater into fresh water and making batteries and fuel cells work better. The team also explores how to generate hydrogen fuel for vehicles and other applications.

By combining hands-on experiments with computer modeling, the lab helps create cleaner, more reliable energy technologies for the future.

RESEARCH FOCUS AREAS

Energy, thermosciences

Experimental Fluid Mechanics and Instability Laboratory

AME N217

The Experimental Fluid Mechanics and Instability Laboratory studies what happens when fluids of different densities mix under extreme conditions, such as sudden shocks or rapid acceleration. These fluid behaviors (instabilities) are important for understanding stars and galaxies, cleaner combustion and the development of fusion energy.

Student researchers use specialized equipment such as shock tubes and drop towers to recreate and observe these complex flows. They work alongside faculty on hands-on experiments, making contributions that connect fundamental science to real-world challenges in aerospace, fusion and high-energy physics.

RESEARCH FOCUS AREAS

Fluid dynamics

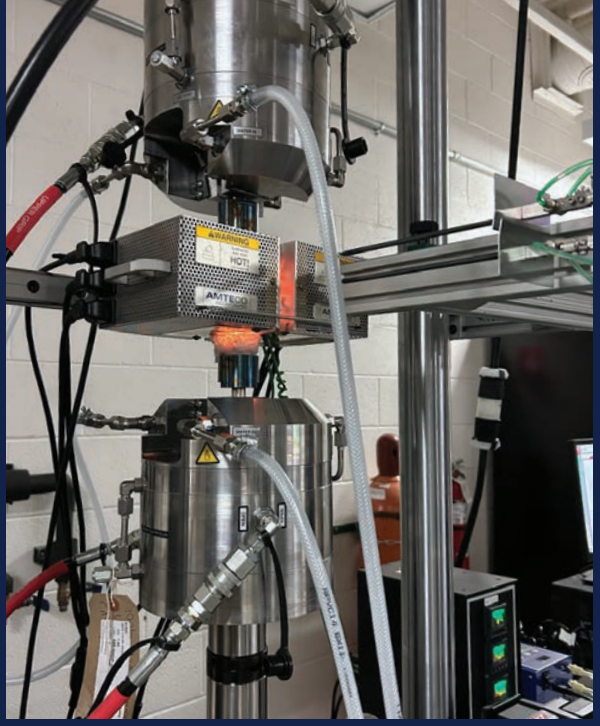
Flight Research Laboratory (FRL)

AME S414

The FRL investigates complex aerodynamic phenomena using subscale unmanned aerial vehicles in free-flight experiments. Scaled models, including a 1/5 scale Aeromot 200S, a 1/3 scale Cirrus SR72 and a 1/3 scale X-56A are used to study phenomena, such as laminar-turbulent flow transition and separation. This research has been supported by NASA and the U.S. Air Force Office of Scientific Research (AFOSR). For these flight experiments, advanced instrumentation is employed, for example, infrared cameras and sensors that measure the air movement and pressure over the wings of the aircraft.

RESEARCH FOCUS AREAS

Fluid dynamics



Hazeli Research Group

AME N431

The Hazeli Research Group works on two main areas: advanced materials and mechanics; biomedical devices.

In materials research, student researchers study how to design multifunctional materials to enhance the performance of engineering systems.

In health care, they create smart, camera-based devices that use 3D imaging, AI and cloud technology to track movement. These tools can help doctors to assess joint function, human movement and meaureable treatment outcomes.

RESEARCH FOCUS AREAS

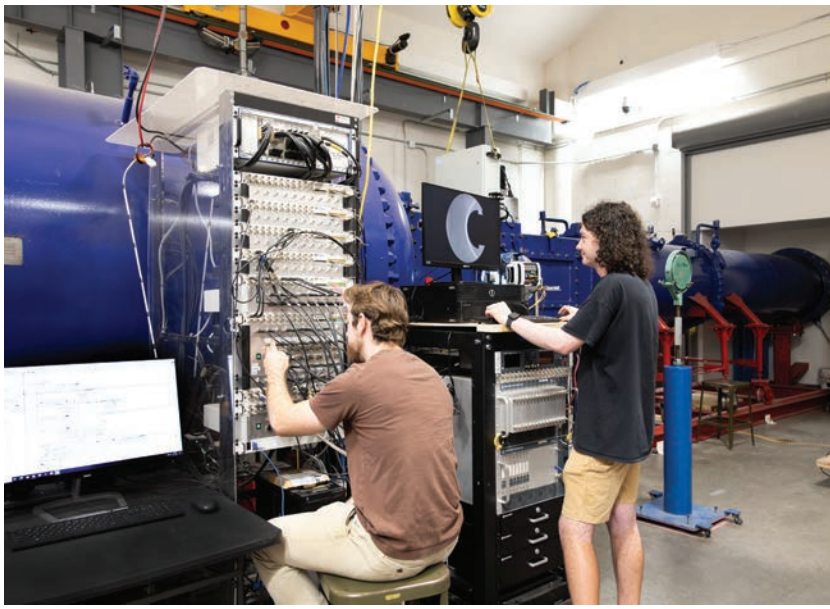
Solid mechanics

High-Speed Aerodynamics, Unsteadiness, and Flow Control Laboratory (HAUC)

AME N229 and N225

HAUC studies how air moves at high-speed, spanning subsonic and hypersonic regimes.

Student researchers focus on a variety of flow structures, using advanced tools like high-speed cameras, infrared sensors and pressure sensitive paints. Graduate students run experiments that improve our understanding of fluid dynamics and ways to control airflow.



RESEARCH FOCUS AREAS

Fluid dynamics

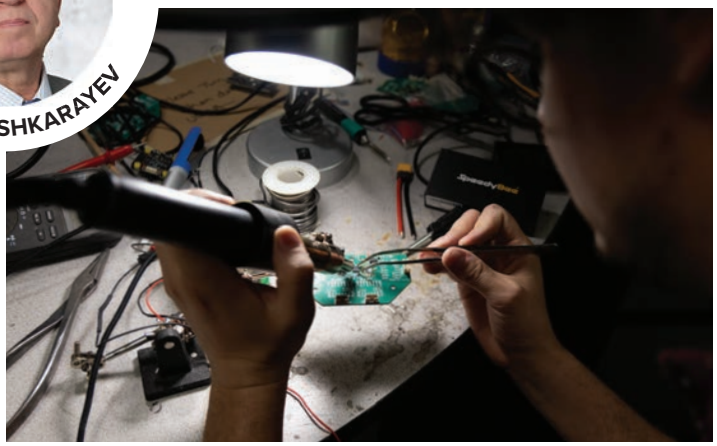
Laser-Based Diagnostics Laboratory

AME N417D

The Laser-Based Diagnostics Laboratory develops laser-based methods for the physicochemical characterization of materials and processes, from combustion and plasmas to high-speed flows. By studying the interaction of light and matter, student researchers can analyze solids, liquids, gases, aerosols and plasmas. With advanced tools such as ultrafast lasers, spectrometers, and high-speed cameras, the lab drives progress in plasma physics, laser-based analytical chemistry, laser directed energy applications and biomedical diagnostics, while giving undergraduate and graduate students hands-on experience with cutting-edge research.

RESEARCH FOCUS AREAS

Thermosciences



Micro Air Vehicles Laboratory (MAV)

AME N305

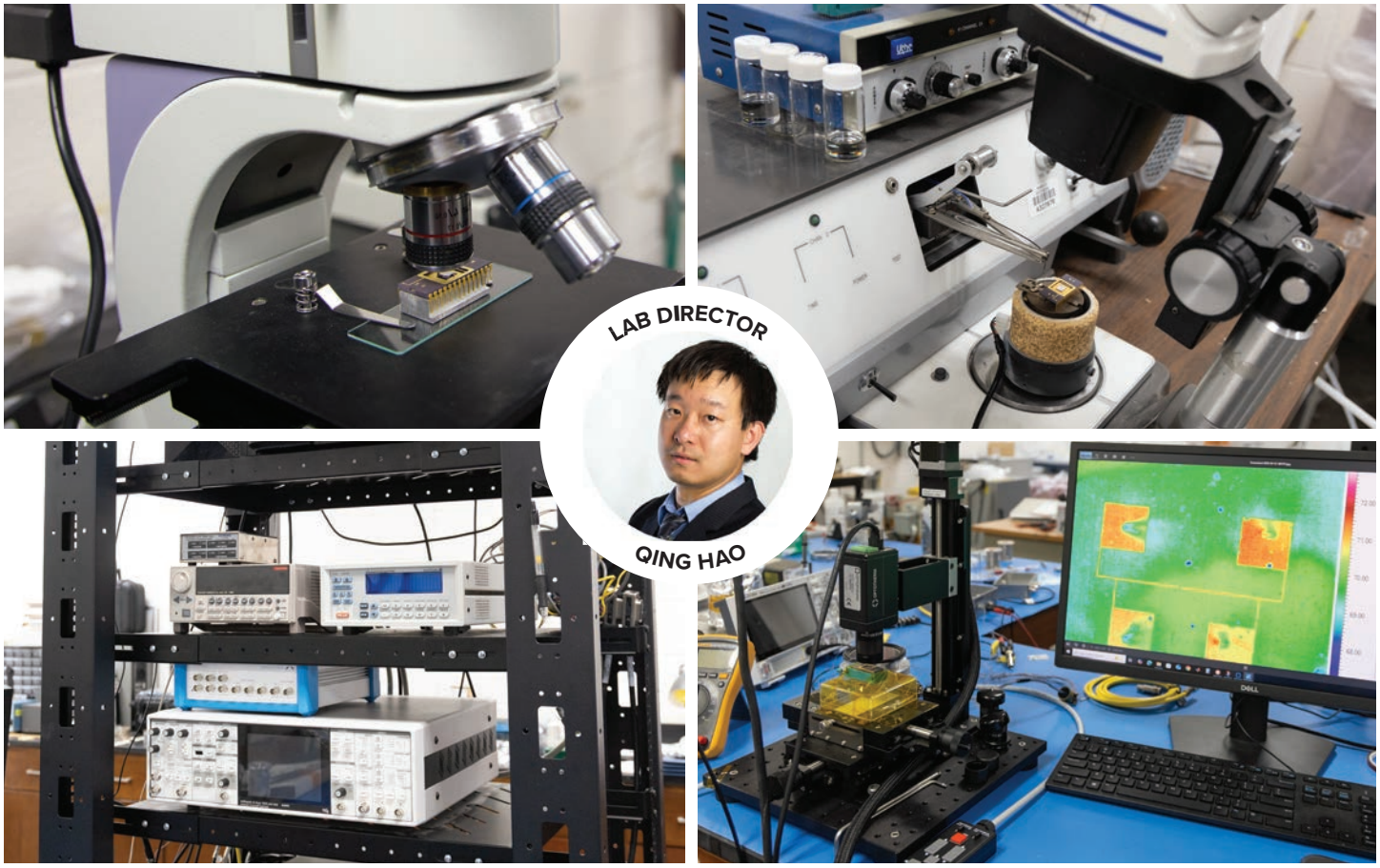
MAV supports research in the design, fabrication and testing of small autonomous aircraft. Student researchers explore aircraft structures, propulsion, navigation and control systems.

The lab features a high-performance wind tunnel, composite manufacturing tools, test stands and advanced sensors, allowing studies on flight performance and innovative vehicle designs.

Projects have produced adaptive-wing aircraft, flapping-wing vehicles and autonomous ornithopters. Graduate students gain hands-on experience with autonomous aerial systems.

RESEARCH FOCUS AREAS

Fluid dynamics, solid mechanics



Nano-Electronics and Advanced Materials Research Laboratory (NEAM)

AME N429

NEAM explores how energy transports at the nanoscale and how this knowledge can improve materials and electronic devices. Research includes analysis of advanced materials like graphene, energy-efficient electronics and thermal management in semiconductors.

The lab is equipped with tools for simulation, nanofabrication, materials synthesis and property measurements. Student research advances energy-efficient technologies and practical applications, such as waste water treatment and harvesting.

RESEARCH FOCUS AREAS

Energy, thermosciences

Professor Zhupanska's Laboratory

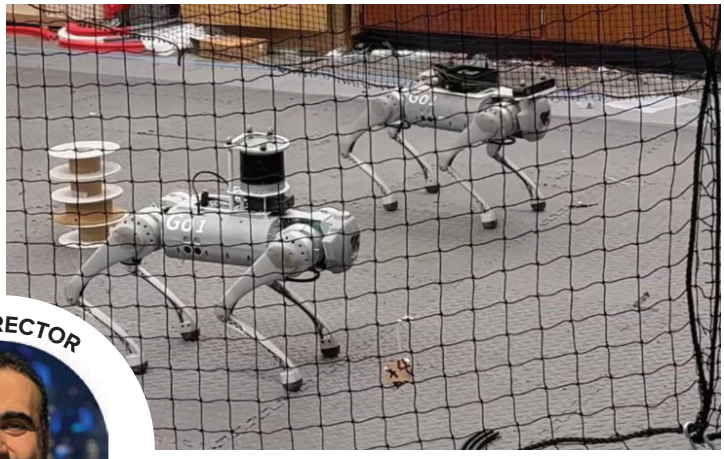
AME N431

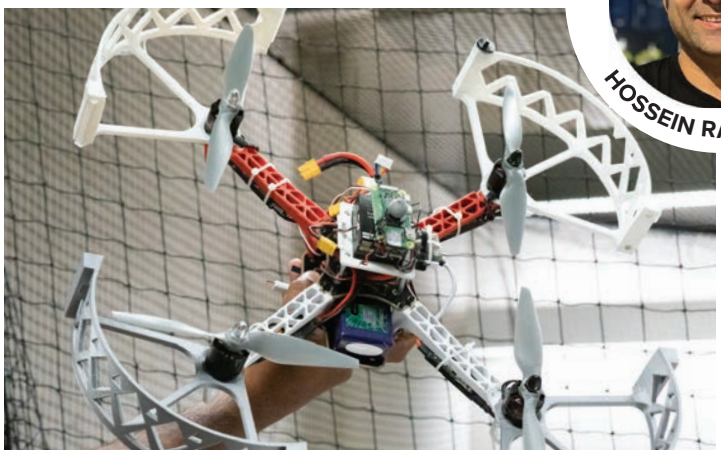
Professor Zhupanska's Laboratory studies the mechanics of composite materials, with emphasis on structural composites in extreme mechanical, thermal and electromagnetic environments. Research includes mechanical behavior, degradation, and failure of composite materials at extreme temperatures, due to lightning strike, electromagnetic field exposures, and impact. Recent projects have focused on the development of machine learning methods for composite materials characterization.

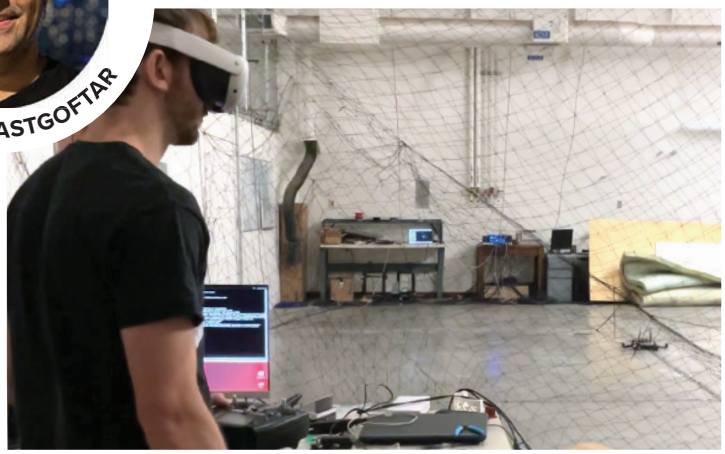
Student researchers gain experience with analytical, experimental and computational methods, contributing to the development of high-performance composites for aerospace, defense and energy applications.

RESEARCH FOCUS AREAS

Solid mechanics







Scalable Move And Resilient Traversability Laboratory (SMART)

AME N319A

SMART works to improve the safety, resilience and efficiency of large scale autonomous systems.

Research includes decision-making, human-robot interaction, swarm robotics and traffic management for autonomous aircraft and intelligent transportation systems. Student researchers use the mobile-agent swarm testbed to investigate multi-robot coordination and system deployment in real time.

These projects support the development of autonomous systems, making them more reliable and adaptable in real-world conditions. Research has been support by the DOD and NSF.

RESEARCH FOCUS AREAS

Dynamics and control

Space and Terrestrial Robotic Exploration Laboratory (SpaceTREx)

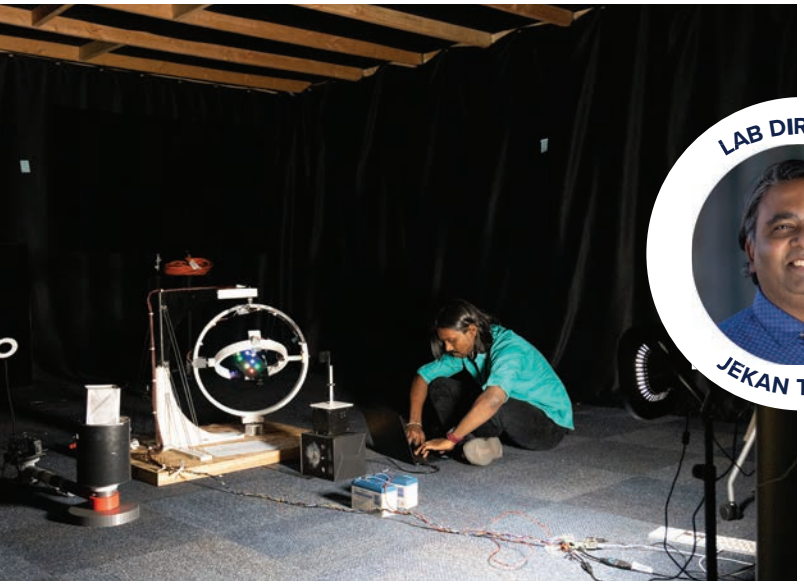
AME N635

SpaceTREx researches and develops in-space robotics, spacecraft swarms, autonomous guidance, navigation and control systems. It also creates flexible, shape-changing structures for use in space missions, satellite technology and planetary exploration.

The lab hosts a design studio where student researchers help create and test new space mission concepts, in addition to providing hands-on training to graduate and undergraduate students. The lab uses 3D printing and Computer Numerical Control (CNC) milling technology extensively to prototype, build and test space technology hardware.

RESEARCH FOCUS AREAS

Dynamics and control



The Laboratory for Intelligent Systems, Control, and Autonomy (LISCA)

AME N319D

LISCA develops smarter ways for autonomous systems to plan, make decisions and understand their surroundings. Student researchers create adaptive methods that account for resource contraints like memory, processing power and communication capacity. The team uses high-performance computers and real-world robotics to run AI and control algorithms in real time.

RESEARCH FOCUS AREAS

Dynamics and control

Thermal-Electrochemical Energy Storage Laboratory

AME N331

The Thermal-Electrochemical Energy Storage Laboratory performs experimental investigation, multiphysics modeling, machine learning to improve the safety and performance of energy storage systems. Research focuses on challenges such as rechargeable battery overheating and failure.

The lab's tools, including environmental chambers, battery performance testers and fiber-optic sensors, supports innovations for electric vehicles, aerospace and other applications.

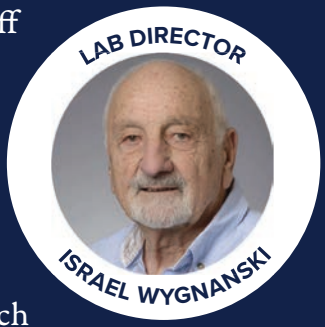
RESEARCH FOCUS AREAS

Energy, thermosciences

Turbulence and Active Flow Control Laboratory

AME N237

The Turbulence and Active Flow Control Laboratory investgates the flow over aircraft wings and develops techniques to control it. The lab explores the possibility of vertical take-off and landing airplanes that can cruze at high subsonic speeds.



The lab includes three wind tunnels and associated modern diagnostics tools such as particle image velocimetry, pressure-sensitive paints and high-speed cameras. Graduate students gain hands-on experience in designing and testing next generation of aircraft wings.

RESEARCH FOCUS AREAS

Fluid dynamics

RESOURCES

Chione Pless, machinist II/lab instructor, in the AME machine shop.

Inside the Anechoic Chamber of the Applied Research Building (ARB).

AME Machine Shop

1130 N. Mountain Ave.
Tucson, Ariz. 85721

The AME machine shop is located on the ground floor of the north side of the AME building. The shop supports student design and fabrication with advanced equipment. It has four work areas: research shop; student shop; composites layup room; front room. It features CNC lathes, mills, a wire electrical discharge machine, welding and inspection tools and uses MasterCAM software for precise programming. The shop provides manufacturing experience, making it ideal for students' senior design and club projects.

ame.engineering.arizona.edu/ame-machine-shop

AME Robotics Laboratory

1130 N. Mountain Ave.
Tucson, Ariz. 85721

The AME robotics lab is located in room N221 of the AME building and open to all engineering students. It provides students a space to design, build and test robotic systems using advanced tools, a high-precision motion capture system and programmable platforms. It supports projects from basic automation to complex autonomous machines and promotes skills in robotics, coding and teamwork.

ame.engineering.arizona.edu/robotics-lab

Applied Research Building (ARB)

1420 East Helen St.
Tucson, Ariz. 85719

The 89,000-square-foot ARB is a unique facility that combines advanced research capabilities with cutting-edge technology. It brings together multiple interdisciplinary university programs to support research in optics, manufacturing and space exploration. The building offers unique regional resources that support collaborations with industry partners and advance manufacturing. It turns research and discovery into practical solutions with real-world impact.

research.arizona.edu/facilities-units/applied-research-building

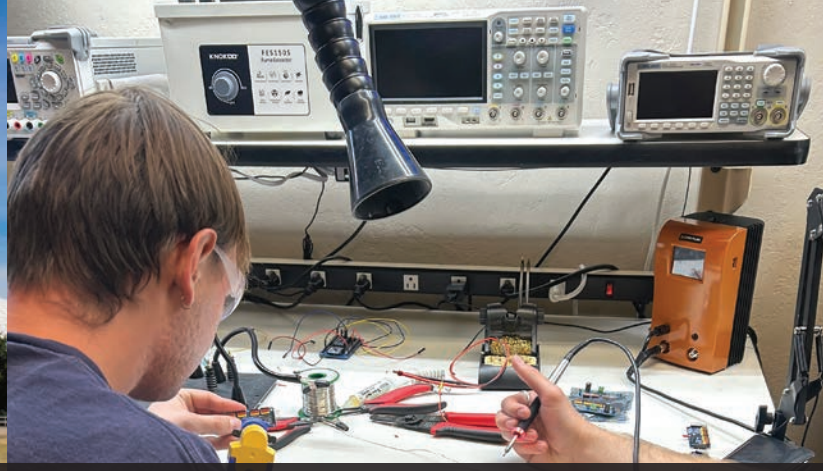
BIO5 Institute

1657 E Helen St.
Tucson, Ariz. 85719

BIO5 Institute was founded in 2001 and brings together researchers from agriculture, engineering, medicine, pharmacy and science to tackle major challenges in health, the environment and food security. The institute's faculty spans across 19 colleges and 84 departments. Together, they develop creative solutions for complex challenges and problems facing Arizona and beyond.

bio5.org

Biomes at Biosphere 2.



Students working on a design project in the Engineering Design Center (EDC).

Biosphere 2

32540 South Biosphere Rd.
Oracle, Ariz. 85623

Biosphere 2 is a 3.14-acre Earth systems research facility owned by the University of Arizona (U of A). Built between 1987 and 1991, it simulates Earth's ecosystems within five enclosed biomes, including rainforest and desert. The facility serves as a living lab for studying environmental change, sustainability and ecosystem conservation.

biosphere2.org

CATalyst Studios

1510 East University Blvd.
Tucson, Ariz. 85721

CATalyst Studios is located at U of A's Main Library. The makerspace offers 3D printers, laser cutters, CNC machines and more. It's open to students, faculty, staff and the community. The space provides workshops, certifications and project support. Users can reserve spaces like the sound and virtual reality studios for projects and classes.

lib.arizona.edu/catalyst

Engineering Design Center (EDC)

715 North Park Ave., 2nd floor
Tucson, Ariz. 85719

EDC is a makerspace that offers 3D printers, an electronics room, a machine room and sewing machines. It also provides tools for circuit building, soldering, wood and metal fabrication and more. With 24/7 U of A CatCard access for engineering students who complete an orientation with a technician.

edc.engineering.arizona.edu

Microscopy Shared Resource (MSR)

1515 North Campbell Ave.
Tucson, Ariz. 85724

MSR at the U of A's Cancer Center offers advanced imaging services for biomedical and translational researchers. It features six Nikon microscopes with confocal, super-resolution, live cell, multiphoton and intravital imaging. The facility also provides image analysis and slide scanning capabilities. The facility hosts workshops and seminars to support campus-wide imaging collaboration.

cancercenter.arizona.edu/researchers/ccsg-supported-shared-resources/microscopy

LABORATORY DIRECTORS

Additive Manufacturing Research Laboratory
Center For Peridynamics
Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

Erdogan Madenci is a professor of AME at the U of A and a leading expert in how materials and structures break and hold together. He earned his PhD in engineering mechanics from the University of California and is recognized as a fellow of the American Society of Mechanical Engineers (ASME) and an associate fellow of the American Institute of Aeronautics and Astronautics (AIAA). Madenci has published extensively on predicting material failure, combining computer models for stronger designs, and using machine learning to better understand how structures perform. In 2023, he received the Institute of Electrical and Electronics Engineers' Outstanding Sustained Technical Contribution Award.

Advanced Micro and Nanosystems Laboratory
Professor of Aerospace and Mechanical Engineering
Member of BIO5 Institute
Member of the Graduate Faculty

Eniko T. Enikov is a professor of AME at the U of A and also serves at the BIO5 Institute. He earned his PhD in mechanical engineering from the University of Illinois Chicago (UIC) in 1998. His research centers on tiny mechanical and electronic systems, such as sensors, actuators, and medical devices and he has published more than 120 papers. Enikov is a 2013 fellow of the U of A College of Engineering da Vinci Circle, recognizing 21st-century innovation in science and engineering. He also created hands-on mechatronic kits for students and was recognized in 2014 as AME's most helpful senior faculty member. Enikov teaches courses on control theory, micro-technology and robotics.

Accelerating Materials Discovery Laboratory
Associate Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

Majid Beidaghi is an associate professor of AME at the U of A and specializes in advanced materials. He earned his PhD in materials engineering from Florida International University and previously taught at Auburn University. His research focuses on new materials called MXenes, which can be used for energy storage and sensors. MXene-based aerogels improves battery performance and sensors that track carbon dioxide and human breathing. Beidaghi has published widely in leading journals, including Diamond and Related Materials and Advanced Materials.

Autonomous Space Vehicles and Astrodynamics Laboratory (ASVA)
Professor of Aerospace and Mechanical Engineering
Professor of Electrical and Computer Engineering
Professor of Applied Mathematics Graduate Interdisciplinary Program
Member of the Graduate Faculty

Eric Butcher is a professor of AME at the U of A, with additional roles in electrical and computer engineering and applied mathematics. He earned his PhD in mechanical engineering from Auburn University and previously taught at New Mexico State University and University of Alaska Fairbanks. His research explores fuel-efficient spacecraft pathways and advanced systems that improve guidance and navigation. Butcher has received multiple fellowships from AFRL and received a Fulbright Scholar award in 2020–2021. He has also co-authored award-winning papers on innovative approaches to system dynamics and control.

BioMicroFluidics Laboratory
Professor of Aerospace and Mechanical Engineering
Member of BIO5 Institute
Member of Arizona Cancer Center
Member of the Graduate Faculty

Yitshak Zohar is a professor of AME at the U of A, with additional roles at the BIO5 Institute and Arizona Cancer Center. He earned his PhD from the University of Southern California in 1990. Before joining Arizona in 2004, he helped establish the Micro Fabrication Center as a founding faculty member at the Hong Kong University of Science and Technology. His research focuses on how fluids and heat behave in micro-scale systems for biomedical applications. Zohar is a fellow of ASME and a former editor of the Journal of Microelectromechanical Systems and Microfluidics and Nanofluidics journal.

Boundary-Layer Stability and Transition Laboratory (BLST)
Associate Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

Stuart "Alex" Craig is an associate professor of AME at the U of A. He earned a bachelor's in mechanical engineering from the University of Illinois at Urbana-Champaign in 2009 and a PhD in aerospace engineering from Texas A&M University in 2015. After a postdoctoral fellowship at Los Alamos National Laboratory, he joined the U of A in 2016. His research studies how fluids behave in extreme conditions, including high-speed flight and aerodynamic heating. Craig received the Office of Naval Research (ONR) Young Investigator Program (YIP) Award in 2018 and associate fellow of AIAA.

Computational Fluid Dynamics Laboratory (CFDL)
Flight Research Laboratory (FRL)
Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

Hermann F. Fasel is a professor of AME at the U of A and a member of the Graduate Interdisciplinary Program in applied mathematics. He earned his PhD in aerospace engineering from the University of Stuttgart in 1974. His research focuses on computational methods for solving the Navier–Stokes equations that govern the air flow around objects. This includes the effects of heat generation and the stability of the flow as it is transitioning from the laminar to the turbulent state. Fasel has received numerous awards, including the AIAA Fluid Dynamics Award in 2019, the Ludwig Prandtl Ring from The German Society for Air and Space Travel in 2018 and fellow of AIAA in 2021. He also has two recent patents for flow control in hypersonic flight.

Computational High-Speed Aerodynamics Laboratory
Assistant Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

Christoph Hader is an assistant professor of AME at the U of A. He earned his undergraduate degree from the University of Stuttgart and his master's and PhD in aerospace engineering, with a minor in applied mathematics from the U of A. During his PhD he spent a year at NASA's Advanced Supercomputing Division. His research studies how air flows around objects at high speeds, including the transition from smooth to turbulent airflow and ways to control it. Hader has authored over 70 papers on high-speed aerodynamics.

Computational Multiphase Transport Laboratory (CMTL)
Department Head of Aerospace and Mechanical Engineering
Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

Farzad Mashayek is the department head and professor of the AME Department at the U of A. He completed his bachelor's and master's degrees at Sharif University of Technology and earned his PhD degree in mechanical engineering from the State University of New York at Buffalo. His research covers turbulent multiphase flows, high-speed and plasma flows, electrostatic atomization, solid-ion batteries using mathematical modelling, computer simulations and AI to solve engineering problems. Mashayek has published extensively and received the NSF CAREER Award and the ONR YIP Award. He is a fellow of ASME and associate fellow of AIAA.

Computational Optimal Design of Engineering Systems Laboratory (CODES)
Professor of Aerospace and Mechanical Engineering
Associate Department Head for Aerospace and Mechanical Engineering Graduate Studies
Professor of Statistics and Data Science Graduate Interdisciplinary Program
Member of the Graduate Faculty

Samy Missoum is a professor of AME at the U of A. He earned his PhD in mechanical engineering from the National Institute of Applied Sciences in Toulouse, France and was a postdoctoral associate in aerospace and ocean engineering at Virginia Tech. With over 25 years of experience, he uses computer simulations to develop methods that improve the safety, reliability, and performance of complex systems such as structural impacts, vibrations and aerodynamics. He is an AIAA associate fellow and associate editor for ASME Journal of Computing and Information Science. His research has been supported by AFOSR, NSF, National Institutes of Health, U.S. Department of Energy (DOE), DOD and industry.

Computational Plasma and Reactive Flow Laboratory
Associate Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

Bernard Parent is an associate professor of AME at the U of A, where he leads research on high-speed airflows and using plasma to control engines and combustion. He earned his bachelor's in mechanical engineering from McGill University in 1996 and a PhD in aerospace engineering from the University of Toronto in 2002, where he developed computational tools for advanced scramjet engines. After research positions at Princeton, Tokyo Institute of Technology, and Pusan National University, Parent was named an AIAA associate fellow in 2023 and received the Physics of Fluids Editor's Pick award in 2022 and the AIAA Best Paper of the Year Award in 2021.

Energy and Fuel Cell Laboratory
Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

Peiwen "Perry" Li is a professor of AME at the U of A. He earned his PhD in thermal science for energy and power engineering from Xi'an Jiaotong University in 1995. His research focuses on renewable energy technologies, including fuel cells, hydrogen production and thermal energy storage. Li has published over 130 peer reviewed journal papers, one book, holds five U.S. patents and has secured about $9 million in research funding. Li has served as associate editor for journals including Solar Energy, Solar Energy Engineering and more. He is a member of ASME and teaches thermodynamics, heat transfer, fluid mechanics and renewable energy systems.

Experimental Fluid Mechanics and Instability Laboratory
Elwin G. Wood Distinguished Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

Jeffrey W. Jacobs is the Elwin G. Wood distinguished professor of AME at the U of A and has been with the department for over 35 years. He earned his PhD in mechanical engineering from the University of California, Los Angeles. Jacobs served as the AME department head from 2009 to 2017. His research studies how fluids of different densities mix under extreme conditions. Jacobs has published numerous highly cited articles and his research is supported by DOE's National Nuclear Security Administration. He has received support and has collaborated with Lawrence Livermore National Laboratory for over 30 years. He teaches courses in gas dynamics and propulsion.

Hazeli Research Group
Associate Professor of Aerospace and Mechanical Engineering
Associate Professor of Biomedical Engineering
Associate Professor of Optical Sciences
Member of the Graduate Faculty

Kavan Hazeli is an associate professor of AME at the U of A, with additional roles in biomedical engineering and optical sciences. He earned his master's and PhD in mechanical engineering and mechanics from Drexel University and previously worked at Johns Hopkins University and the University of Alabama in Huntsville. His research focuses on advanced materials made with 3D printing and AI-powered camera systems that monitor human movement. Hazeli received a NSF CAREER Award in 2020 and leads projects funded by the ARO, NSF and NASA. He also teaches courses in design materials selection, fracture mechanics, and mechanics of materials.

High-Speed Aerodynamics, Unsteadiness, and Flow Control Laboratory (HAUC)
Assistant Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

James Threadgill is an assistant professor of AME at the U of A. He earned his PhD in aerospace engineering from Imperial College London. His research focuses on high-speed airflow, including shock waves and boundary-layer effects, at supersonic and hypersonic speeds. Threadgill has published extensively and collaborates on advancements in aerodynamics, heat transfer and hypersonic testing. He also provides undergraduate research opportunities applying tools like MATLAB, LabView, SolidWorks, and TecPlot to analyze wind tunnel test data.

Laser-Based Diagnostics Laboratory
Craig M. Berge Dean, College of Engineering
Professor and Eminent Scholar of Aerospace and Mechanical Engineering
Professor of BIO5 Institute
Member of the Graduate Faculty

David W. Hahn is the Craig M. Berge Dean of the College of Engineering, professor and eminent scholar of AME and professor at the BIO5 Institute at the U of A. He earned his PhD in mechanical engineering from Louisiana State University (LSU) and previously worked at FDA, Sandia National Laboratories, and The University of Florida (UF). He has more than 25 years of experience in higher education and national agencies and laboratories. His research focuses on thermal sciences, conduction heat transfer, laser-based diagnostics, renewable energy and biophotonics. Hahn has published over 100 papers, holds 10 patents and co-authored a textbook. He is a fellow of ASME, Optica, and the Society for Applied Spectroscopy and received honors from LSU, UF and the Society of Women Engineers.

Micro Air Vehicles Laboratory (MAV)
Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

Sergey V. Shkarayev is a professor of AME at the U of A. He earned his PhD in aerospace engineering from the National Aerospace University in Kharkiv, Ukraine. His research focuses on autonomous aircraft, flight systems, and aerodynamics, especially for small drones and micro air vehicles. Shkarayev teaches aircraft design and aerodynamics, has authored numerous publications, is a senior member of AIAA, and has consulted on multiple defense and aerospace projects.

Nano-Electronics and Advanced Materials Research Laboratory (NEAM)
Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

Qing Hao is a professor of AME at the U of A. He leads research on how energy moves at the nanoscale, improving heat management in electronics and developing advanced materials for energy conversion. Hao earned his PhD in mechanical engineering from Massachusetts Institute of Technology (MIT) in 2009 and has published over 80 papers. Qing received the AFOSR YIP Award in 2015 and a NSF CAREER Award in 2017. His work has been funded by the DOE, AFOSR and NSF. He teaches courses on heat transfer and nanoscale energy transport.

Professor Zhupanska's Laboratory
Professor of Aerospace and Mechanical Engineering
Professor of Applied Mathematics Graduate Interdisciplinary Program
Member of the Graduate Faculty

Olesya Zhupanska is a professor of AME at the U of A. She earned her PhD in solid mechanics and applied math from the Taras Shevchenko National University of Kyiv, Ukraine. Zhupanska is an expert in mechanics of composites with a particular emphasis on structural composites in extreme environments. She is the recipient of the Defense Advanced Research Projects Agency (DARPA) Young Faculty Award, Elsevier Young Composites Researcher Award from American Society for Composites (ASC), ASME/Boeing Structures & Materials Award, ASC Best Paper Awards, two National Research Council Senior Research Associateship Awards and multiple Air Force Summer Faculty Fellowships. She is a fellow of ASME, associate fellow of AIAA and president of ASC. Her research has been supported by DARPA, AFOSR, AFRL, NASA and NSF. Zhupanska's graduate students have been recipients of numerous awards including: DOD's SMART Scholarship; NASA Education Aeronautics Scholarship and Advanced STEM Training and Research Fellowship; Lockheed Martin Student Paper Award in Structures; ASC PhD Reseach Scholarship Award.

Scalable Move And Resilient Traversability Laboratory (SMART)
Assistant Professor of Aerospace and Mechanical Engineering
Assistant Professor of Electrical and Computer Engineering
Member of the Graduate Faculty

Hossein Rastgoftar is an assistant professor of AME at the U of A. He leads research on coordinating multiple autonomous vehicles and drones, including swarm robotics. In 2015 Rastgoftar earned his PhD in mechanical engineering from the University of Michigan, Ann Arbor. Prior to joining AME, he was post-doctoral research fellow, adjunct research faculty and assitant professor at the University of Michigan. His research has been funded by the DOD and NSF.

Space and Terrestrial Robotic Exploration Laboratory (SpaceTREx)
Associate Professor of Aerospace and Mechanical Engineering
Associate Professor of Electrical and Computer Engineering
Member of the Graduate Faculty

Jekan Thanga is an associate professor of AME at the U of A. He earned his PhD in space robotics from the University of Toronto in 2008 and is an associate fellow of AIAA. Thanga's research focuses on space robotics, swarm systems, AI/machine learning for autonomous systems and robotics in extreme environments. SpaceTREx researches and develops robotic technologies for planetary cave exploration, lunar construction and maintenance of lunar bases. Its work extends to planetary defense, in-space servicing, asteroid mining, and future in-space habitation and cryopreservation. Thanga was formerly employed at MDA Space and contributed to the development of the Canadarm, Canadarm 2, and Dextre on the International Space Station. He and his team have contributed to several university-led, NASA and Air Force small satellite missions.

The Laboratory for Intelligent Systems, Control, and Autonomy (LISCA)
Assistant Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

Daniel Larsson is an assistant professor of AME at the U of A. He earned his bachelor's and master's in aerospace engineering from Arizona State University and his PhD in aerospace engineering from Georgia Tech. His research focuses on autonomous systems, decision-making under uncertainty, path planning and efficient control for resource-limited agents. His work has resulted in multiple papers and a patent. Larsson teaches courses on aerospace vehicle stability and advanced control theory.

Thermal-Electrochemical Energy Storage Laboratory
Assistant Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

Vitaliy Yurkiv is an assistant professor of AME at the U of A. He earned his PhD in mechanical engineering from the Heidelberg University and previously worked as a research professor at the UIC. His research focuses on thermal-electrochemical rechargeable battery investigations, modeling, simulations and machine learning. His work is supported by the NSF and DOD and resulted in over 100 papers and two patents. Yurkiv teaches thermodynamics, heat transfer, energy systems and engineering analysis.

Turbulence and Active Flow Control Laboratory
Professor of Aerospace and Mechanical Engineering
Member of the Graduate Faculty

Since 1985, Israel Wygnanski has been a professor of AME at the U of A and is professor emeritus at Tel Aviv University. He earned his bachelor's, master's, and PhD in mechanical engineering from McGill University in Montreal, Canada, where he received the British Association Medal (1961–1962). Wygnanski was a senior research scientist at Boeing Scientific Research Laboratories and served as Lazarus Professor of Aerodynamics, department head and dean at Tel Aviv University from 1972 to 2003. He has published over 300 papers, holds five U.S. patents, and has been cited more than 18,000 times. He has mentored over 50 graduate students who went on to leadership roles in academia and industry. Wygnanski is a fellow of AIAA and APS and has been a member of the National Academy of Engineering for over 35 years. He led two major university-initiated programs culminating in successful manned flight tests: a DARPA-sponsored XV-15 tiltrotor project and a NASA–Boeing program demonstrated on a Boeing 757 after wind tunnel testing at NASA Ames.

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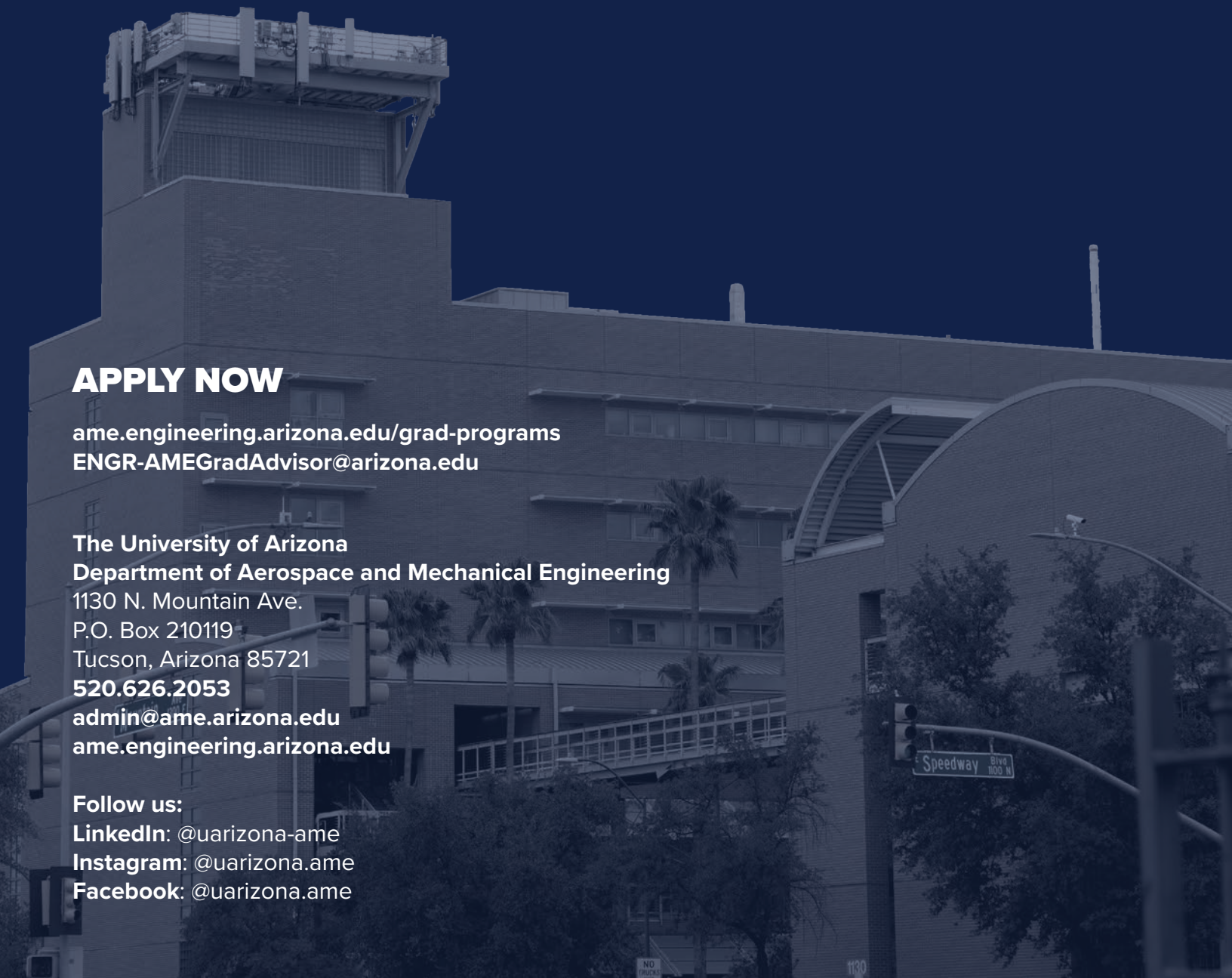

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