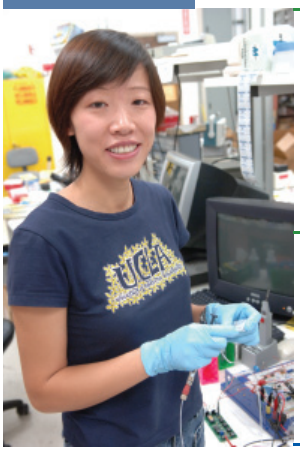
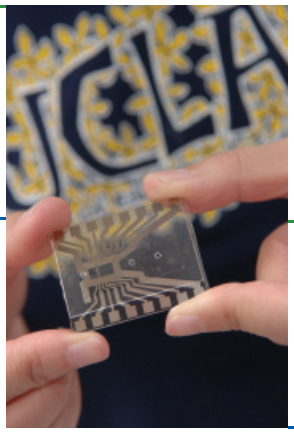
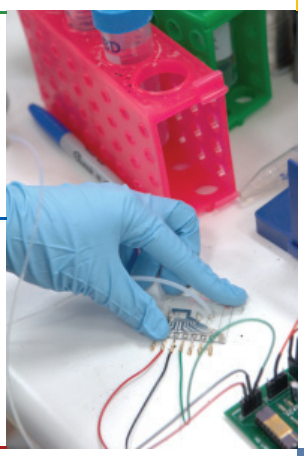
UCLA Mechanical and Aerospace Engineering Department

2005-2006







UCLA

Henry Samueli School of Engineering and Applied Science

2005-2006

Henry Samueli School of Engineering and Applied Science.

From the Department Chair

We are pleased to share with you some of the exciting undertakings and news in the Mechanical and Aerospace Engineering (MAE) Department over the past year. As you look through these pages, it will be obvious that our greatest resource is our people – the faculty, students, and staff who contribute to our research and educational programs.

Our faculty are working on a broad range of research topics that benefit society. In this report you will read about pediatric heart valves, radio frequency identification, and a number of initiatives that involve nanoscale materials and processes. This is only a glimpse of the excitement and breadth of faculty research within our department, from aerospace applications such as unmanned aerial vehicles and supersonic-hypersonic platforms for air launched small missile flight testbeds, to energy initiatives such as air-power-assisted engine technology for direct energy recovery and load-bearing energy harvesting structures, to bioengineering projects relating to biodefense, emerging infectious diseases, and biomimetic corneal constructs.

You will also see in the Overview section (pages 28-29) that our faculty have won many accolades – we have 27 society fellows and nine members of the National Academy of Engineering (three regular faculty, three affiliated faculty, and three emeriti). In the 2005-06 academic year, our faculty had $25 million available to support research, resulting in 173 publications.

Our graduate students are an exceptional group. They gather from around the world to learn from our renowned faculty and each other. Master of Science students come to deepen their understanding of mechanical and aerospace engineering. Doctoral students are the lifeblood of department research as they conduct original, cutting-edge investigations in faculty laboratories. In the 2005-06 academic year, our department granted 23 Ph.D. and 48 M.S. degrees.

We are proud to serve the citizens of California and beyond by providing a world-class education to our undergraduate students, as well. Our undergraduates have excelled in high school and come to us prepared to take advantage of the challenging educational environment we provide. They have the opportunity to study with faculty who enliven their classes by virtue of their research expertise and who invite undergraduates to perform research alongside graduate students. Our undergraduates are also involved in a range of student society activities, some of which you will read about in these pages.

Our staff are the "unsung heroes" who make possible our research and educational programs. We are also fortunate to have strong connections with alumni, industrial affiliates and advisory board, and other friends. They provide guidance, crucial financial support, partnerships on technology initiatives, and jobs for our graduates. We appreciate all of these contributions greatly.

UCLA, the Henry Samueli School of Engineering and Applied Science, and the MAE department value diversity. By bringing the most talented people from all backgrounds and from around the world to the study and practice of engineering, an engineering career will continue to be a means for social mobility. In addition, engineering innovations will continue to benefit our increasingly diverse society. We strive to attract students and faculty who are diverse in all dimensions, including gender, socioeconomic background, race, and ethnicity. We see continued progress but know that we have further to go. I am proud that our faculty and students are involved in initiatives to attract traditionally underrepresented minority students into engineering. So, whatever your background, if you are interested in joining a vibrant department committed to excellence, consider UCLA's Mechanical and Aerospace Engineering Department.

Adrienne Lavine

MAE Prof. Gregory Carman Helps Develop New Heart Valve for Children

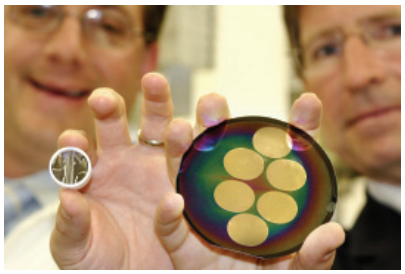
Biomedical Breakthroughs

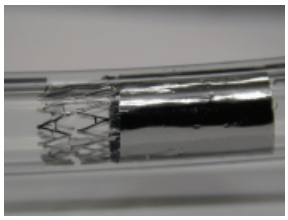
Children with congenital heart defects may soon have an alternative to invasive open heart surgery that will mean less time in the hospital, a quicker recovery and no need to break open the breastbone, thanks to a new collaboration between researchers at the UCLA Henry Samueli School of Engineering and Applied Science and pediatric cardiologists at Mattel Children's Hospital at UCLA.

Using a super-elastic, shape-memory metal alloy called "thin film nitinol," UCLA engineers are developing a collapsible heart valve for children that can be loaded into a catheter, inserted into a vein in the groin area, guided into place and then deployed in a precise location within the heart. As the valve is released from the catheter, it springs back to its original shape and begins to function.

"What is really novel about the valve UCLA Engineering has created is the memory-retaining alloy and butterfly design that opens or hinges from the middle of the valve rather than the edges," said UCLA mechanical and aerospace engineering professor Gregory Carman, who, along with UCLA researcher Lenka Stepan, crafted the valve. "The unobtrusive leaflets within the valve mean there is no obstruction to blood flow. This smaller, low-profile design is well suited for children and, over time, will potentially allow children born with heart valve defects to experience less pain and live much fuller lives."

Photo credits: MISA Photography





Schematics and images of a prototype heart valve meant to help children who have heart problems.

Dr. Daniel Levi, assistant professor of pediatric cardiology at Mattel Children's Hospital at UCLA, designed the valve and joined Carman and Stepan to create and develop the revolutionary new device.

"Using catheters and collapsible valves, heart valves can be replaced without stopping the heart, without cutting the chest open and without long recovery times," Levi said. "This will represent a huge improvement in care for children living with a very difficult condition."

– Melissa Abraham

Radio Frequency Identification (RFID) advances

WINMEC's Wireless Wonders

Led by Mechanical and Aerospace Engineering Professor Rajit Gadh, UCLA Engineering is exploring the use of radio frequency identification technology (RFID) in a variety of innovative applications. Gadh also is the director of WINMEC (Wireless Internet for Mobile Enterprise Consortium), a UCLA-based university, industry, and government collaboration with the objective to advance technological and business research and educate its members on state-of-the art in wireless and mobile industries. The organization, which holds regular consortia, will host an RFID Industry Forum on campus October 26, 2005 to discuss where the technology stands today with respect to actual usage, successes and failures, how RFID projects are justified, and how RFID is actually being implemented.

Gadh predicts that businesses in a few years will be using radio frequency identification (RFID) technology to instantly and surreptitiously find workers anywhere in large plants.

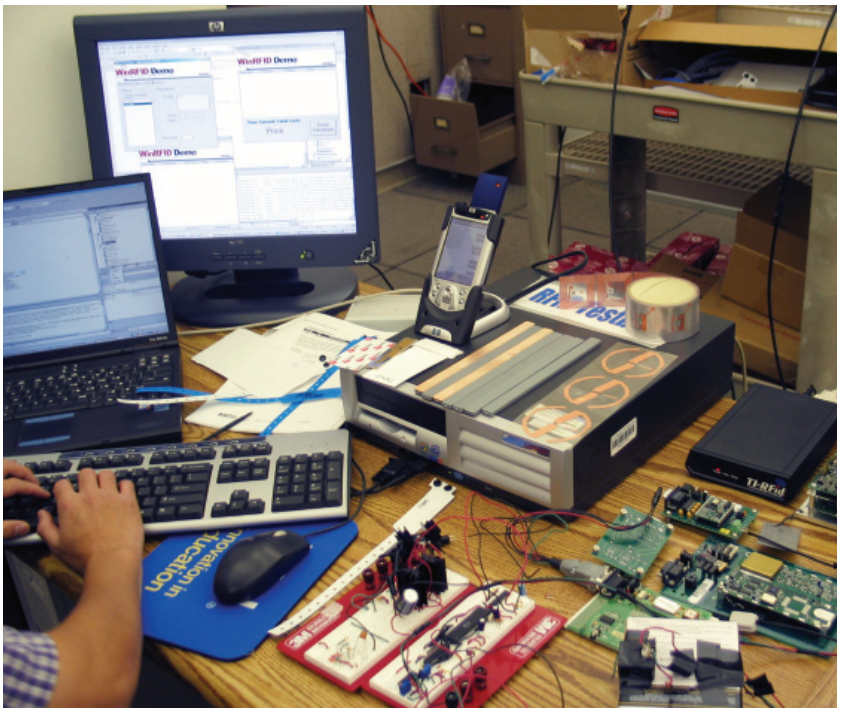
RFID's best-known use today is at Wal-Mart distribution centers, where tiny chip tags on products answer radio signals. Such use provides an easy method for locating pallets of merchandise. Chips broadcasting a worker's location could be installed in a laptop, cell phone or ID badge.

"Hospitals are studying RFID to track their staffs and improve productivity. They could tag every nurse, technician and doctor," Gadh said. "Of course, there can be privacy concerns, but organizations can use RFID to stay connected. The technology can be used for dynamic reconsideration of where and how a company's assets are being used."

Beyond that, he predicted that businesses will use RFID in a few years to instantly identify a worker entering a room and enable him or her to log on to a computer. It's envisioned that the worker's personal computer settings would pop up immediately on any desktop, thereby eliminating the need for carrying around a laptop.

"Literally speaking, an entire laptop could possibly fit on a small chip that's sitting in my pocket communicating with an RFID tag to a screen hanging on a wall, and all there is is just a keyboard sitting in the room and that screen," Gadh said. "There is no end, I think, to how people will keep innovating."

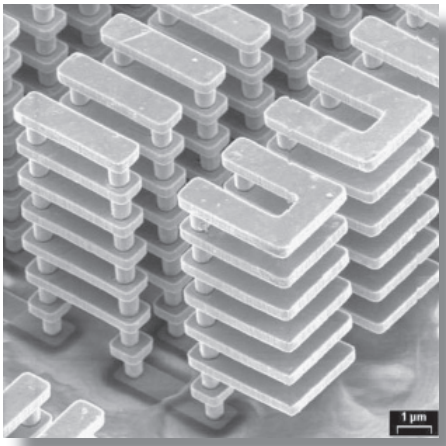
(Quoted from the article "Honing Technical Skills is Required," from the Ventura County Star, December 14, 2005)



RFID's best-known use today is at Wal-Mart distribution centers, where tiny chip tags on products answer radio signals.

Nanoscale Research Team in Quest for New Silicon Chip Materials

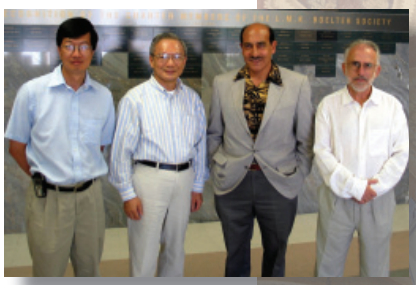
Funded by a $1.3 million grant from the National Science Foundation, mechanical and aerospace engineering professor Nasr Ghoniem, who specializes in advanced computer simulations, is partnering with UCLA materials scientist King-Ning Tu, materials science and engineering professor Jenn-Ming Yang, and Nicholas Kioussis, a professor of physics at California State University, Northridge on three primary project goals: to strengthen copper at the nanoscale, improve its reliability, and create a better insulation material.



SEM image of an eight-level copper interconnect structure. (Courtesy of Dr. Jeffrey Su, Institute of Microelectronics, Singapore.)

The team is working to improve the mechanical properties of copper, which already has very good electrical properties. Copper is commonly used for interconnect wires in transistors, which are only just a fraction of the width of a human hair. When reduced to only 50 nanometers in width, however, gravity causes the copper to sag, creating interference between the wires.

Nano-twinned copper, which is specially treated to add patterned irregularities, is 10 times stronger than untreated copper, while losing none of its electrical conductivity – making it an ideal material for silicon interconnects. To prevent electromigration in the revolutionary material, the researchers will look to advanced computer simulations to explore its properties.



Professors Jenn-Ming Yang, King-Ning Tu, Nasr Ghoniem, and Nicholas Kioussis.

The high currents running through the wires can shift atoms in the copper, changing the atomic structure and possibly creating a void or short. The simulations devised by Ghoniem and Kioussis will help determine the electromigration tendencies of nano-twinned copper and prevent future equipment failures.

– Maryls Amundsen

MAE Prof. Yong Chen Works with CNSI to Advance Polymer-Based Memory Device

The California NanoSystems Institute (CNSI) is a research center run jointly by UCLA and UC Santa Barbara. Established in 2000 by the State of California, its mission is to encourage university collaboration with industry and enable the rapid commercialization of discoveries in nanosystems.

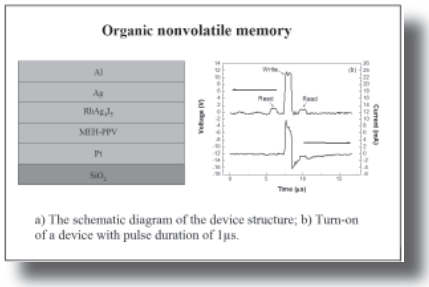


Diagram of organic nonvolatile memory.

CNSI members represent a multidisciplinary team of some of the world's preeminent engineers and scientists in the fields of materials science, molecular electronics, quantum computing, optical networking and molecular medicine.

Among the projects underway in CNSI is the development of organic nonvolatile memory by modifying the electrical properties of a conjugated polymer. Mechanical and aerospace engineering professor Yong Chen is working with chemistry and biochemistry professor Fred Wudl on a new type of polymer-based memory device. A plastic, inorganic layer is sandwiched between two metal electrodes, allowing the conductance to be switched from a low-conductive "off" state to a high-conductive "on" state simply by adding or removing ions from the polymer-based layer.

Such devices can be switched on and off reversibly and repeatedly, and with a pulse duration as small as 1 µs. The ability to turn a polymer device off and on by changing its doping concentration provides a promising approach to making various electrically-configurable devices in the future.

SINAM's Prof. Tsu-Chin Tsao Leads Effort to Build Nano-Precision Multi-Scale Alignment and Positioning System

The Center for Scalable and Integrated Nanomanufacturing (SINAM), housed in the UCLA Henry Samueli School of Engineering and Applied Science, is one of only 16 NSF Nanoscale Science and Engineering Centers in the country. Founded in 2003, SINAM brings together researchers from University of California Los Angeles, University of California Berkeley, Stanford University, University of California San Diego, University of North Carolina at Charlotte, and HP Labs to create the next generation of nanotools and systems, moving cost-effective nanomanufacturing from the lab into industry.

Among SINAM's interdisciplinary research projects is a collaborative effort in designing and building a nano-precision multi-scale alignment and positioning system (MAPS) for nanomanufacturing processes. MAPS, like other projects in SINAM, brings together faculty with a range of expertise to develop new enabling technologies for nanomanufacturing.

UCLA mechanical and aerospace engineering professors Tsu-Chin Tsao (team leader), Yong Chen, Adrienne Lavine, and H. Thomas Hahn, working with Robert J. Hocken at the University of North Carolina, Charlotte, have developed a six-degree-of-freedom nano-precision stage (figure 1, left). To achieve nanometer level precision under operating conditions, the mechanical design process, led by Hocken, has simultaneously considered thermal deformation, the manufacturing process, and the control system. Design parameters have been determined using model-based analyses and pilot experiments. For example, Lavine's thermal deformation analysis (figure 1, right) has determined the temperature control tolerance required for workspace accuracy, while Tsao's repetitive learning control experiment has generated dynamic scan trajectories with positioning errors close to the sensor noise level (figure 2). Chen and Hahn's developments in nano-imprinting materials, pressurization fixture, and imprinting process have resulted in a low-cost nano-imprinting demonstration, generating 30 nanometer lines with 60 nanometer pitch (figure 3).

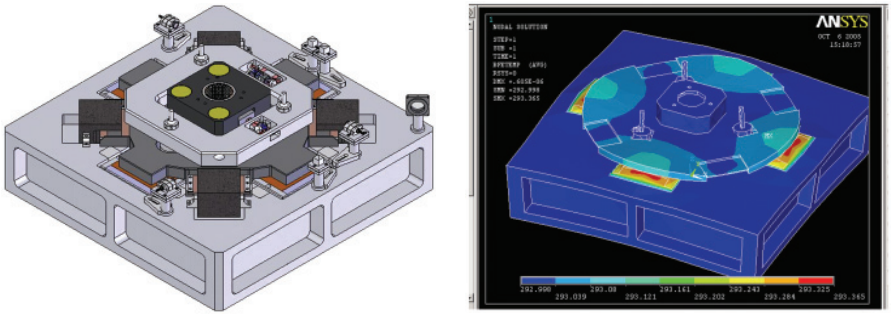


Figure 1. 6-DOF Nano-precision stage for nanomanufacturing

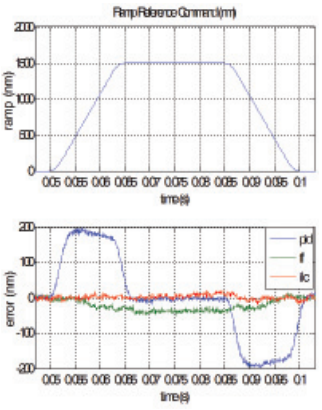


Figure 2. Experiment on Nano-Scanning Motion Control. Top: Step-and-scan Trajectory. Bottom: Tracking Error of PID (blue), Feedforward (green), and Repetitive Learning Control (red).

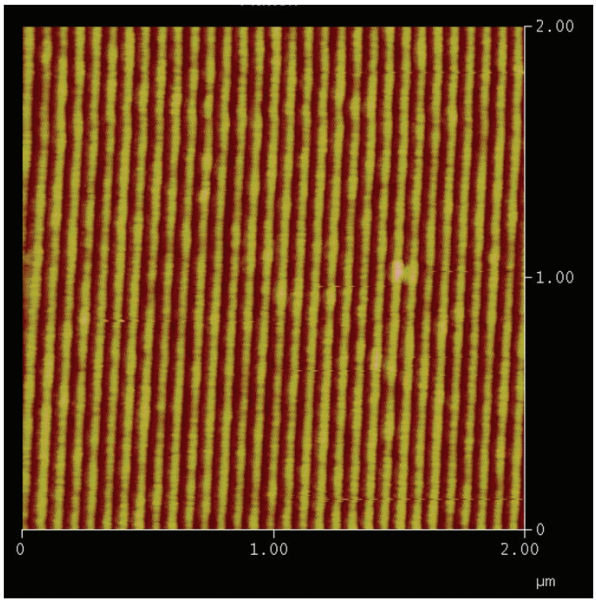
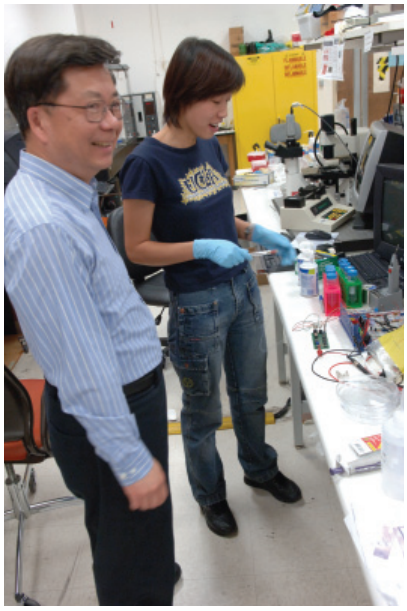


Figure 3. An AFM image of 30-nm lines generated using the UV-NIL module.

CMISE Research Advances Bio-Nano-Information Technology

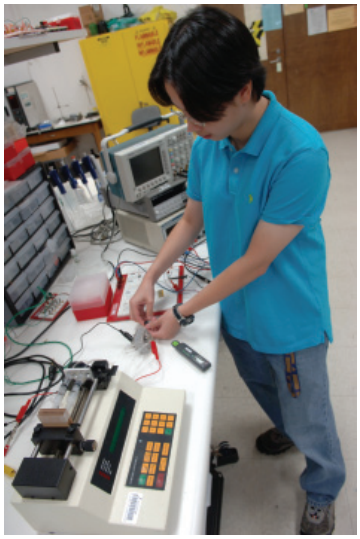
The Institute for Cell Mimetic Space Exploration (CMISE) is one of only four NASA-funded University Research, Engineering and Technology Institutes in the country. Directed by Professor Chih-Ming Ho, CMISE brings together faculty and students from five universities to develop new ways of advancing bio-nano-information fusion technologies.

The realization of systems based upon the fusion of biology, nanotechnology and informatics will result in devices that combine sensors and actuators to respond to specific stimuli. Ultimately, the comprehensive understanding gleaned from the simulation of intricate biosystems will enable scientists and engineers to transition from solely mimetic systems to a revolutionary vision of complex system control and the ability to induce desired traits in biosystems and beyond.



Professor Chih-Ming Ho and Nan Li.

Among the projects housed in CMISE is the development of a lab-on-a-chip blood test for monitoring astronauts' health on manned space flights. Current blood testing systems are too bulky for space travel, so astronauts have to take samples while still in space and bring them back to Earth for analysis. The size of a cell phone or PDA, the fully-automated testing system under development will require only a drop of blood and provide real-time clinical analysis. The collaborative research effort includes scientists from UCLA, the California Institute of Technology, and IRIS International, Inc. The UCLA researchers are developing tools to measure the distribution of white blood cells in humans as a way to gauge the health of astronauts during space travel, while Caltech is developing microfluidic devices to separate red cells from white cells. Kasdan is leading the IRIS team on system components and applying the company's expertise to assemble the devices into a single working system.



Charlotte Kwong

During the past few years, CMISE has made phenomenal progress in research and education, and has disseminated its advances around the world. Fifty archival papers have been published, with many in high impact journals such as Nature, Science, and the Proceedings of the National Academy of Sciences. Nine patent disclosures have been filed, facilitating the transfer of new technology to industry. Ten students have accepted faculty positions at first-rate research universities, including two with chaired professorships: Dr. Tony Jun Huang at Pennsylvania State University and Dr. Aaron Wheeler at the University of Toronto. These new academics will pass on knowledge gained within CMISE to the next generation of researchers and practitioners.

Prof. Ann Karagozian chairs Air Force Scientific Advisory Board Studies

Professor Ann Karagozian and Deputy Assistant Secretary of the Air Force for Science, Technology and Engineering, Mr. Terry Jaggers, during a briefing on fuel efficiency held at UCLA.

Mechanical and Aerospace Engineering Professor Ann Karagozian recently finished chairing two major Air Force Scientific Advisory Board studies. One study, completed in mid-2005, dealt with "Persistence at Near Space Altitudes," and was presented as a briefing by Prof. Karagozian to the Secretary and the Chief of Staff of the Air Force as well as to leadership in the Office of the Secretary of Defense, DARPA, and the National Reconnaissance Office.

In the Spring of 2006, Karagozian completed her chairmanship of another Air Force Scientific Advisory Board study, this one commissioned by the White House through the Office of the Secretary of the Air Force. The study focused on "Technology Options for Improved Air Vehicle Fuel Efficiency," and was presented to the Secretary and Undersecretary of the Air Force, to the Deputy Undersecretary of Defense for Science and Technology, to the NASA Associate Administrator for Aeronautics, and to various DOD, National Academy, and other advisory boards. Among the study's major recommendations was an exploration of alternative fuels (derived from non-crude oil sources) as potential aviation fuel replacements. This recommendation resulted in a series of flight tests during September, 2006, in which B-52 aircraft utilized Fischer-Tropsch liquid fuels derived from natural gas; the tests took place at Edwards AFB.

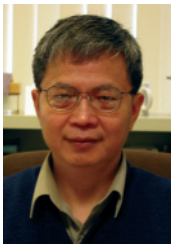
Professor Karagozian was appointed the Vice Chair of the Air Force Scientific Advisory Board in October, 2005.

PERFECT to build 2 'Virtual Reactors'

Professor Nasr M. Ghoniem has been selected to be one of five members of the International Advisory Oversight Committee for the European Project "PERFECT: for Prediction of Irradiation Damage Effects on Reactor Components." In nuclear power reactors, materials may undergo degradation due to severe irradiation conditions that limit their operation life. Continuous progress in the physical understanding of the phenomena involved and in computer sciences has made possible the development of multi-scale numerical tools able to simulate the effects of irradiation on mechanical and corrosion properties of materials.

PERFECT aims at developing such predictive tools for reactor pressure vessels and internal structures.The main objective of PERFECT is to build two "Virtual Reactors" simulating the effect of irradiation on reactor pressure vessels and on internal structures.

MAE Partners with Autodesk on Modeling and Design



The UCLA Mechanical and Aerospace Engineering Department (MAE) has formed a new partnership with Autodesk, a global leader in software for 3D modeling and design. Through this new collaboration, Autodesk will donate CAD software and services to MAE for at least three years, providing the department's students and faculty with critical solid modeling tools.

"We are pleased to establish this new partnership with Autodesk, and grateful for their generous gift," noted chair Adrienne Lavine. "I want to thank Professor Daniel Yang and Dr. Robert Shaefer who worked closely with Mark Sturges, director of Autodesk, to form this new alliance."

The software is valued at $1.4 million, and includes Autodesk's Inventor, which contains ANSYS Finite Element Analysis software as well as piping and wire harness capabilities. It is considered to be one of the most comprehensive and easy to learn mechanical solid modeling design solutions available.

MAE Hosts NCMI Meeting

The MAE Department hosted the National Coalition for Manufacturing Innovation (NCMI) meeting, which was attended by representatives from a number of universities. The meeting took place in the Rice Room on Thursday, Feb. 23, 2006, from 8am-5pm. Dean Dhir welcomed the attendees.

NCMI Attendees with Professor Thomas Hahn

KAIST-UCLA MAE Joint Workshops

The 2nd KAIST-UCLA MAE Joint Workshop was held on Sept. 8-9, 2005 at KAIST, Korea. Participating in the Workshop were 14 KAIST and 7 UCLA faculty members. The workshop covered various topics ranging from biomechanics, to controls, to design and manufacturing. Discussions on research collaboration and personnel exchange followed technical sessions, and the Workshop concluded with a laboratory tour.

The 3rd KAIST-UCLA MAE Joint Workshop was held on Jan. 19-20, 2006 at UCLA's MAE Department. Participating in the Workshop were 26 students and 4 faculty from KAIST. The workshop covered a variety of topics, including pattern generation, biotechnology, lithography, microfabrication, and thermosciences.

3rd KAIST-UCLA MAE Joint Workshop attendees visiting the Huntington Museum

MAE Adds Talented New Faculty Member P.Y. Chiou

Assistant Professor Eric P.Y. Chiou has joined the Mechanical and Aerospace Engineering Department at UCLA. He received his MS from UCLA in electrical engineering in 2004, and his PhD at the University of California, Berkeley in 2005.

His research interests include bio- and nanophotonics, microfluidics, and lab-on-a-chip systems. His invention of optoelectronic tweezers (OET) has enabled a new way to manipulate fluids, cells, and biomolecules using direct optical images.

UCLA MAE Department Boasts Two Authors of Heat Transfer Textbooks

Professor Adrienne Lavine has become a co-author of the textbooks *Fundamentals of Heat and Mass Transfer* and *Introduction to Heat Transfer*, along with Professors Frank Incropera, David DeWitt (deceased), and Theodore Bergman. The new editions came out in the winter. In the Forward to the Preface, Frank Incropera explains that he and Dave DeWitt decided on a succession plan involving additional co-authors: "In establishing desired attributes of potential candidates, we placed high priority on the following: a record of success in teaching heat and mass transfer, active involvement with research in the field, a history of service to the heat transfer community, and the ability to sustain an effective collaborative relationship." Ted and Adrienne felt extremely honored to have been asked to join the author team. Since Professor Anthony Mills is already an author of a heat and mass transfer textbook series, the MAE Department now boasts authors of two distinct heat transfer textbooks. It is probably the only department in the country with this distinction.

Student Activities

UCLA AIAA – Design/Build/Fly project

UCLA AIAA's Design/Build/Fly (DBF) team and their contest airplane, The Dodo Should Fly, placed 24th overall at the DBF competition last April in Wichita, Kansas.

In the Design/Build/Fly, an annual undergraduate student competition, teams design and manufacture an airplane to accomplish tasks prescribed by contest judges. Teams then fly their aircraft at the contest to compete against universities from across the globe in completing the given missions. Hosted by the American Institute of Aeronautics and Astronautics (AIAA) and sponsored by Cessna Corp. and the Office of Naval Research, the competition thus allows student engineers to apply classroom knowledge to real-world design challenges.

This year's contest rules required students to design an airplane capable of carrying each of three payloads: two two-liter bottles full of water, 48 tennis balls, and an eight-pound block of wood. Other design constraints provided additional challenges, for example, the disassembled aircraft needed to fit within a 4' x 2' x 1.25' box.

– Gerald Toribio

Jerry Huang, Kevin Archibald, and Gerard Toribio of AIAA.

Boat Competition is Excellent Learning Experience

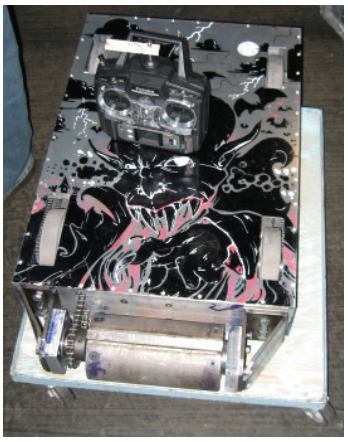
Every year, students in the Fluid Mechanics and Aerodynamics Laboratory (157A) design and build a boat to accomplish a given task, and compete with their boats at the end of the quarter. This year, the competition involved six groups and their self-submersible "James Bond" boats. The race was held in a 20' x 10' pool of water and the objective was for the boats to reach the end and return back the entire length of the pool. The challenging aspect of the race required all submersibles to invert their main hulls into the water upon reaching the end of the tank. Then, without turning, all boats had to travel backwards with their hulls below water level to finish the second leg of the race. All of the student teams participated enthusiastically. It was also a good learning experience for everyone to realize their boats did not perform according to design. Despite the setbacks, the teams resolved the problems and all of the boats finished the race.

Supermileage Vehicle

On June 8th and 9th the UCLA Supermileage Vehicle team attended their first ever Society of Automotive Engineers Supermileage competition in Marshall, Michigan. Held at the Eaton proving grounds, the event featured 22 teams in the collegiate division, each with the goal of obtaining the highest possible fuel efficiency from their vehicles. Each car is completely student designed and built, running on a 3.5 hp Briggs and Stratton engine.

The 2006 UCLA entry was built completely from scratch and featured a carbon fiber fairing and a welded aluminum tube chassis. Six undergraduate engineering students made the 36 hour journey to Michigan and easily passed safety inspection on the first day. Unfortunately, a major failure occurred in the rear wheel the night before the final runs, severely limiting the ability to coast and cutting into the overall efficiency of the vehicle. Despite the difficulties, the UCLA team finished with a fuel efficiency of 248 mpg and finished 15th overall.

Robot Death Matches



The death match is a tradition that has been around for millennia. It all started with two homo-sapiens battling for the alpha male title or perhaps a particularly large piece of food, from which it evolved into the mighty roman gladiators, until very recently it evolved into robot death matches.

DracUCLA, a mighty 110 lb killing machine, lies five inches off the ground at its tallest point. It is completely invertible, is made out of solidly fastened steel and aluminum, and has a twenty-five pound spinning steel "drum" weapon in the front. As with ancient warriors, its armor is decorated with images to strike fear into the hearts of challengers.

The Battlebots team competed DracUCLA in Robogames in the summer of 2006. It won its first bout and lost its second to the eventual tournament champion. The robot left the arena in pieces but is now mostly repaired. They will be building at least one more Battlebot in 2006-07.

– Jeff O'Donohue

Mini-Baja Competition

The 2006 Society of Automotive Engineers Mini-Baja competition went well. UCLA – which placed 38th out of the 80-plus teams that competed -- recorded its best overall finish yet.

The UCLA chapter has been participating in the Mini-Baja project for seven years, and continually improves its sophistication and organization. Each team designs, manufactures, and tests an off-road buggy, which is then unveiled to judges by careening over desert dunes or flying through twisty motocross tracks.

This was the best year yet for the UCLA team; we were more prepared mentally and mechanically than ever before. This resulted from the most focused engineering and testing efforts ever put forth by the team. We're excited to build on this year's experience and success, and know that next year we'll do even better!

– Nick Herron

Youthful Vigor vs. Life Experience

Twice a year, the ASME student members challenge the faculty, staff, and alumni to a tug-of-war in a symbolic struggle pitting youthful vigor against life experience to see who really reigns (or who's heavier!). Look for the plaque in the winner's display case: EIV 4th floor, faculty bookcase or ASME students' display board, depending on who won last! The tally of past wins and losses tells a tale of youthful vigor, persistence, and brawn eventually prevailing.

Tug-of-War Tally

Fall 2004 Faculty Staff Alumni Win! (Decisively!)

Spring 2005 Faculty Staff Alumni Win!

Fall 2005 Faculty Staff Alumni Win!

Spring 2006 Students Win – Finally!

– Marianne So

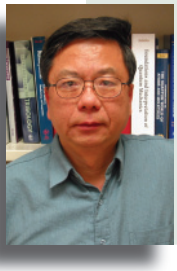
NAE

National Academy of Engineering Members

Vijay Dhir

Vijay K. Dhir, Dean of the UCLA Henry Samueli School of Engineering and Applied Science and professor of mechanical and aerospace engineering, has been newly elected into the National Academy of Engineering (NAE), the highest professional honor accorded to an American engineer. Honored for his work on boiling heat transfer and nuclear reactor thermal hydraulics and safety, Dhir joins five other UCLA mechanical and aerospace engineering faculty who are NAE members. Dhir has been a faculty member at UCLA since 1974, and leads the Boiling Heat Transfer Lab, which conducts pioneering work in fundamental and applied research in phase change heat transfer. A central concern of Dhir's program has been to understand boiling – one of the most complex processes providing an efficient means of cooling. Dhir has worked to design cooling systems for spacecraft as well as for systems on earth. In 2004, Dhir was named the recipient of the prestigious Max Jakob Memorial Award. Bestowed annually to recognize eminent achievement and distinguished service in the area of heat transfer, the award was established by the American Society of Mechanical Engineers and the American Society of Chemical Engineers to honor Max Jakob, a pioneer in the science of heat transfer.

Chih-Ming Ho



Professor Chih-Ming Ho, director of the Institute for Cell Mimetic Space Exploration, was elected in 1997 for his contributions to the understanding and control of turbulent flows. He joined UCLA to lead research in microelectromechanical system (MEMS) in 1991, and served as the founding director of the Center for Micro Systems. UCLA's MEMS program has been recognized as one of the top three programs worldwide..

Jason Speyer

Professor Speyer was elected to the National Academy of Engineering in 2005 for "the development and application of advanced techniques for optimal navigation and control of a wide range of aerospace vehicles." He has pioneered new optimal deterministic and stochastic control, team and differential game strategies, estimation, and model-based fault detection.

Affiliated Professors

Kuo-Nan Liou

Professor Kuo-Nan Liou, who holds a joint appointment in mechanical and aerospace engineering, was elected in 1999 for contributions in the theories of radiation transfer and light scattering, with applications to remote sensing technology and climate modeling.

Joseph Miller

Adjunct Professor Joseph Miller was elected to the NAE in 1991 in recognition of his record of personal technical contributions to the design and development of high power lasers and optical systems.

Raymond Viskanta

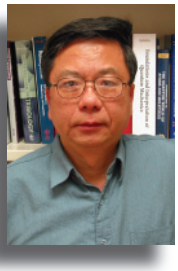
Adjunct Professor Raymond Viskanta was elected in 1987 for pioneering contributions to thermal radiation transport and general heat transfer engineering.

Endowed Chairs

H.Thomas Hahn - Raytheon Company Manufacturing Engineering Chair

Professor H. Thomas Hahn holds the Raytheon Company Chair in Manufacturing Engineering, established to support a renewed focus on manufacturing engineering at UCLA, and to recognize excellence in research and education in this field. Hahn joined the UCLA faculty in 1992, coming from Pennsylvania State University where he was the Harry and Arlene Schell Professor. He also held a professorship at Washington University in St. Louis and research positions at the Lawrence Livermore National Laboratory and the Air Force Materials Laboratory. Hahn's research interests cover a wide spectrum of composites technology ranging from design and analysis to processing and manufacturing. Hahn served as chair of the UCLA Mechanical and Aerospace Engineering Department from 2002 to 2006.

Chih-Ming Ho - Ben Rich Lockheed Martin Aeronautics Chair



Professor Chih-Ming Ho holds the Ben Rich-Lockheed Martin Chair in Aeronautics, which honors the late Ben R. Rich (MS '50), one of the world's leading aircraft engineering pioneers. The chair was established to recognize a faculty member conducting advanced research in aeronautics, including microelectromechanical systems. Ho is the Director of the NASA-funded Institute for Cell Mimetic Space Exploration at UCLA, an interdisciplinary center focused on identifying, developing, and commercializing nano-, bio-, and information technologies for space exploration. He is an internationally renowned researcher in bio-nano technology, micro/nano fluidics, and turbulence. Ho was elected a member of the National Academy of Engineering and an Academician of Academia Sinica which honors scholars of Chinese origin with exceptional achievements in liberal arts and sciences.

John Kim - Rockwell International Engineering Chair

Professor J. John Kim holds the Rockwell International Chair in Engineering, which was established to support exceptional research and educational accomplishments in aerospace and aeronautical engineering. Kim's primary research interest is numerical simulation of transitional and turbulent flows, physics and control of turbulent flows, and numerical algorithms for computational science. He has been a pioneer in developing direct numerical simulations and large eddy simulations as a reliable and respected tool for studying physics of turbulence. Kim has been at the forefront of the application of a new cutting-edge approach to flow control. Kim is a Fellow of the American Physical Society, and received a NASA Medal for Exceptional Scientific Achievement in 1985, the H. Julien Allen Award from NASA Ames Research Center in 1994, the Otto Laporte Award from the American Physical Society in 2001, and the Ho-Am Prize in Engineering from the Ho-Am Foundation in 2002.

Awards

FACULTY AWARDS

Greg P. Carman was appointed as a member of the National Research Council (NRC) panel providing guidance for future Civil Aeronautics. Carman will be serving NRC Panel C: Materials and Structures. This is one of five panels supporting the NRC Steering Committee for the Decadal Survey of Civil Aeronautics. The main purpose of the effort is for the group to develop a set of key challenges in aeronautics and then discuss the technological and scientific advances and R&D investments necessary in various technical areas to meet those key challenges.

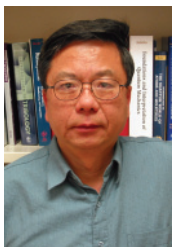
Jeff Eldredge received the 2005-2006 Susan and Henry Samueli MAE Teaching Award. From the press release: "Professor Jeff Eldredge joined UCLA in the Fall of 2003. During the subsequent three years, as an assistant professor in the Mechanical and Aerospace Engineering Department at UCLA, he taught seven courses: MAE 103, 150A, 153A, 157, 250A, 250E, and 259A. Without exception, he developed an excellent rapport with the students that enabled a friendly and collegial atmosphere in the classroom."

Vijay Dhir, Dean of the UCLA Henry Samueli School of Engineering and Applied Science and professor of mechanical and aerospace engineering, has been newly elected into the National Academy of Engineering (NAE), the highest professional honor accorded to an American engineer.

Nasr Ghoniem has been selected as a member of the International Advisory Oversight Committee for the European Project "PERFECT" (Prediction of Irradiation Damage Effects on Reactor Components) to develop predictive tools for reactor pressure vessels and internal structures.

Vijay Gupta was elected as a Fellow of the American Society of Mechanical Engineers, an honor that recognizes exceptional engineering achievements and contributions for the engineering profession.

Thomas Hahn was designated as a Centennial Fellow of the Department of Engineering Science & Mechanics at Pennsylvania State University at the recent Centennial Celebration of the Department on June 2, 2006. The designation recognizes his distinguished achievements that bring honor to the Department. He was also elected President of the International Committee on Composite Materials (ICCM) for a two-year term (05-07). In addition, he won the 2006 Faculty/Staff Partnership Award from the UCLA Staff Assembly.



Chih-Ming Ho was elected to the Johns Hopkins Society of Scholars which inducts former postdoctoral fellows and junior or visiting faculty at Johns Hopkins who have gained marked distinction in their field.

Awards

FACULTY AWARDS

Ann Karagozian was appointed the Vice Chair of the Air Force Scientific Advisory Board by the Secretary and Chief of Staff of the Air Force. During 2005-06 she chaired two Air Force SAB studies, one on Persistence at Near Space Altitudes, and one on the subject of Technology Options for Improved Air Vehicle Fuel Efficiency.

Neil Morley was selected by the Fusion Power Associates Board of Directors to receive its 2005 Excellence in Fusion Engineering Award. In selecting Dr. Morley, the Board recognized his outstanding technical contributions to fusion development in areas such as high heat flux components, liquid walls and MHD fluid flow and heat transfer. The Board also recognizes his leadership qualities in such areas as the US program for the ITER Test Blanket Module and the liquid surface divertor module on the NSTX facility at the Princeton Plasma Physics Laboratory.

Laurent Pilon was selected for the Northrop Grumman Excellence in Teaching Award which acknowledges outstanding instructors who influence curriculum and research.

Jeff Shamma was elected as a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) "for contributions to feedback control and systems theory."

Jason Speyer was named a member of the Jet Propulsion Laboratory Advisory Council (JPLAC), which provides JPL leadership with independent and candid assessments of JPL's work and capabilities, and future plans.

Shih-Hsi Tong received the Professional Development Award for Non-Senate Faculty Members.

Best Paper Awards

The American Society of Mechanical Engineer's Journal of Heat Transfer has awarded **Dean Vijay K. Dhir** and mechanical engineering graduate researcher **Abhijit Mukherjee** a 2006 Best Paper Award for their "Study of Lateral Merger of Vapor Bubbles during Nucleate Pool Boiling," published in Volume 126 of the Journal.

Graduate students O. Choi (MSE) and S. Gilje (Chem. & Biochem.) together with **Profs. H. Thomas Hahn** and R. Kaner (Chem. & Biochem) have won the 3rd Place Outstanding Technical Paper award for their paper "Graphite Nanoplatelet Reinforced Epoxy Composites: The Effect of Exfoliation and Surface Treatment."

Awards

Student Awards

Juliett Davitian has won a three year NASA Graduate Student Research Program Fellowship, commencing in the Fall of 2005. Juliett just completed her first year of grad school and has been working in Prof. Ann Karagozian's research group on active jet control experiments.

UCLA team **KABOOM** won first place in the "Undergraduate Team Space — Mission to Rendezvous with and Divert an Incoming Asteroid" Competition. Led by MAE Lecturer Lisa Hill, KABOOM members Chris Covell, Natasha Barra, Patrick Greene, Cassandra Guess, Kenneth Parker, and Harshil Shah, designed a space system that was to rendezvous with an asteroid threatening earth in a timely manner, inspect it, and remove the hazard to Earth by changing its orbit and/or destroying it.

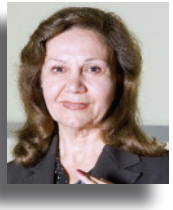
Audrey Pool O'Neal, Ph.D. Candidate in Mechanical Engineering, received the UCLA Henry Samueli School of Engineering & Applied Science Center for Excellence in Engineering & Diversity (CEED) Leadership Award, at the 22nd Annual CEED Scholarship & Recognition Banquet, on November 18, 2005.

Enrique Ainsworth (CEED Director), Audrey Pool O'Neal, Dr. Stephen E. Jacobsen, (Assoc. Dean of Academic and Student Affairs HSSEAS).

MAE Awards Reception

The student award winners at the MAE Awards Reception on June 9, 2006 were **Smitha Prabhuswamy** (BS), **Kevin Patrick Archibald** (BS), **Brenda Chang** (BS), **Mariann Meiking** (BS), **Stephanie Jean Neuman** (BS), **Hesham Azizgolshani** (BS), **Marcus Ryun George** (MS), **Pradeep Singh Rawat** (MS), **Leonardo Santos De Brito Alves** (PhD), **De-Sheng Meng** (PhD), and **Brian Ethan Shedd** (PhD).

Alumni Awards



JULIA ASFIA

Mechanical and aerospace engineering lecturer and alumna Julia Asfia (PhD '95) has received the 2005 Woman of Achievement Award from the Amelia Earhart Society of the Boeing Company. The award is presented to women who have proven track records of significant achievements and accomplishments.

VINCENT GAU

Dr. Vincent Gau has been selected as the winner of the 2005 Distinguished Young Alumnus Award by the Henry Samueli School of Engineering and Applied Science. Dr. Gau received his Ph.D. in Biomedical Engineering with Prof. Chih-Ming Ho as his advisor and currently serves on our Alumni Advisory Board. He is Founder and CEO of GeneFluidics, Inc.

TZUNG HSIAI

Prof. Chih-Ming Ho's former student, alumni Tzung K. Hsiai, has been selected by the Biomedical Engineering Department at the University of Southern California to be the first holder of the Robert G. and Mary G. Lane Early Career Chair. The Early Career Chairs are awarded only to the most outstanding of USC Engineering assistant professors.

Industrial Advisory Board

MAE's Industrial Advisory Board met in the Rice Room on February 10, 2006, to discuss MAE's plans for the next five years. Attending from industry were John Armenian (TechFinity), Chris Cox (Raytheon Company), Gregory Davis (NASA Jet Propulsion Laboratory), Gary Ervin (Northrop Grumman), Jason Hatakeyama (The Boeing Company), Alvar Kabe (The Aerospace Corporation), Asad Madni (BEI Techonologies, Inc.), Webb Marner (NASA Jet Propulsion Laboratory), Roger Murry (Honeywell Engines, Systems & Services), James Paulsen (Pratt & Whitney Rocketdyne, Inc.), Kevin Petersen (NASA Dryden Flight Research Center), Shawn Phillips (Air Force Research Laboratory/Propulsion Space Engine), Carl Rhodes (RAND Corporation), Sandeep Sane (Assembly Technology Development Intel), and Munir Sindir (Rocketdyne Propulsion & Power), Chair of the Board.

IAB members and MAE Chair Hahn

CURRENT PARTNERSHIPS

- Aerospace Corporation
- BEI Technologies
- Boeing
- Capstone Turbine
- Conoco Philips
- Honeywell Engines
- Intel
- JPL
- Lockheed Martin
- NASA
- Northrop Grumman
- Pratt & Whitney
- RAND Corporation
- Raytheon
- TechFinity
- USAF

Alumni Advisory Board

The MAE Alumni Advisory Board, which is a group of about 15 committed alumni, meets twice a year to advise the department on curriculum and alumni issues. This year they provided many helpful comments and suggestions on the mechanical and aerospace curricula in preparation for the ABET accreditation process. Since many of the board members are recent alumni, their comments on specific courses have been helpful to the chair and vice chair for undergraduate studies. They also provided feedback on the new on-line MS degree, with respect to how it may be relevant to their own careers, and their companies' support for it. Several members also updated the board on activities with the AIAA, ASME, and SAE student groups.

William R. Goodin, Chair, Department Liaison, UCLA Engineering Alumni Association

Enrique Baez, Jr., Design Engineer, Jet Propulsion Laboratory

Myles Baker, President, M-4 Engineering

Karen Baumgartner, Mechanical Engineer, Raytheon Space and Airborne Systems

Jennifer Bursch, The Boeing Company

Garett Chang, Project Engineer, Southland Industries

Alejandro R. Diaz, Engineer/Scientist Specialist, Extravehicular & Crew Systems, The Boeing Company

Vincent Gau, Founder and CEO, GeneFluidics

Nathan Kwok, MAE Graduate Student, UCLA

David E. Lee, Mechanical Engineer, Northrop Grumman Space Technology

Alfredo Lopez, Engineer, Boeing

Pedram Pourmand, Engineer, ExxonMobil

Charisse Pua, Boeing Rocketdyne Propulsion & Power

Shara Senior, Project Engineer, Product Engineering Investigations, Nissan North America

Kirk A. Williams, Senior Manager, Accenture Financial Services

Simon E. Yao, Plant Performance Analyst, Control Components Incorporated

Michelle Yi, Mechanical Engineer, Raytheon Space and Airborne Systems

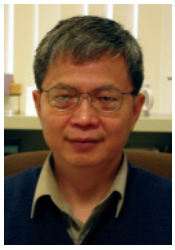
Faculty

DYNAMICS

Oddvar O. Bendiksen

Classical and computational aeroelasticity, structural dynamics and unsteady aerodynamics.

Associate Fellow, AIAA, 1995



Daniel C. H. Yang

Robotics and mechanisms; CAD/CAM systems, computer controlled machines.

Emilio Frazzoli

Algorithmic, computational and geometric approaches to design and development of decision and control architectures for complex networked and autonomous systems.

FLUID MECHANICS

Jeff. D Eldredge

Fluid mechanics and acoustics, interaction of fluid flow and sound, control of acoustically-driven instabilities, and fluid particle-based computational techniques.

John Kim

Numerical simulation of transitional and turbulent flows, turbulence and heat-transfer control, numerical algorithms for computational physics.

Fellow, American Physical Society, 1989

Ann R. Karagozian

Fluid mechanics of combustion systems, with emphasis on acoustically controlled reacting flows, detonation phenomena, high speed combustion systems, and microgravity combustion.

Fellow, AIAA, 2004

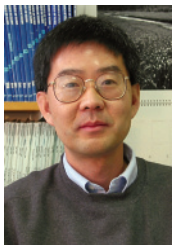
Fellow, American Physical Society, 2004

Owen I. Smith

Combustion and combustion-generated air pollutants, hydrodynamics and chemical kinetics of combustion systems, semi-conductor chemical vapor deposition.

H. Pirouz Kavehpour

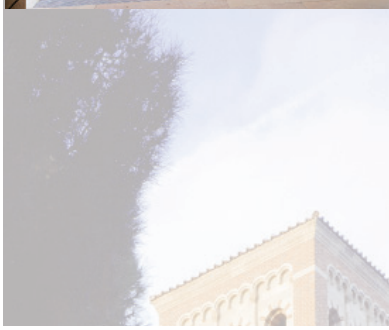
Microfluidics and biofluidics, biofuel cells, cardiovascular flow, complex fluids, interfacial physics, micro-tribology, non-isothermal flows, drug delivery systems, and artificial organs.

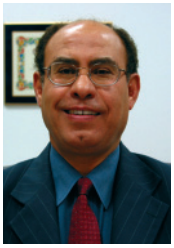


Xiaolin Zhong

Computational fluid dynamics, hypersonic flow, hypersonic boundary layer stability and transition, numerical simulation of transient hypersonic flow with nonequilibrium real gas effects, numerical simulation of micro two-phase flow, MHD control of hypersonic boundary layers, high-order numerical methods for flow simulation.

Associate Fellow, AIAA, 2004





Mohamed A. Abdou

Fusion, nuclear, and mechanical engineering design, testing, and system analysis; thermomechanics; thermal hydraulics; neutronics, plasma-material interactions; blankets and high heat flux components; experiments, modeling and analysis.

Fellow, American Nuclear Society, 1990
Associate Fellow, TWAS, 1989

Ivan Catton

Heat transfer and fluid mechanics, transport phenomena in porous media, nucleonics heat transfer and thermal hydraulics, natural and forced convection, thermal/hydrodynamic stability, turbulence.

Fellow, ASME, 1989

Vijay K Dhir

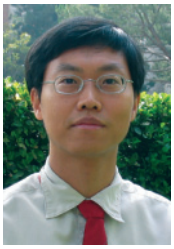
Two-phase heat transfer, boiling and condensation, thermal and hydrodynamic stability, thermal hydraulics of nuclear reactors, microgravity heat transfer, soil remediation.

Member, National Academy of Engineering, 2006

Adrienne Lavine

Thermal control of nanoscale manufacturing, thermomechanical behavior of shape memory alloys, thermal aspects of manufacturing processes including machining and plasma thermal spray, natural and mixed convection heat transfer.

Fellow, ASME, 1999



Y. Sungtaek Ju

Micro- and nanoscale thermosciences, energy, bioMEMS/NEMS, nanofabrication.

Anthony F. Mills

Convective heat and mass transfer, condensation heat transfer, turbulent flows, ablation and transpiration cooling, perforated plate heat exchangers.

H. Pirouz Kavehpour

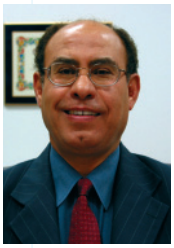
Microfluidics and biofluidics, biofuel cells, cardiovascular flow, complex fluids, interfacial physics, micro-tribology, non-isothermal flows, drug delivery systems, and artificial organs.

Laurent G. Pilon

Radiation transfer, biomedical optics, photobiological hydrogen production, energy conversion, foam, nanoporous media.

Faculty

MANUFACTURING AND DESIGN



Mohamed A. Abdou

Fusion, nuclear, and mechanical engineering design, testing, and system analysis; thermomechanics; thermal hydraulics; neutronics, plasma-material interactions; blankets and high heat flux components; experiments, modeling and analysis.

Fellow, American Nuclear Society, 1990
Associate Fellow, TWAS, 1989

Gregory P. Carman

Electromagnetoelasticity models, piezoelectric ceramics, magnetostrictive composites, characterizing thin film shape memory alloys, fiber optic sensors, design of damage detection systems for structures.

Fellow, ASME, 2003

Rajit Gadh

Radio frequency identification (RFID), middleware for RFID networks, wireless internet of artifacts, RFID in supply chain/logistics/manufacturing, reconfigurable wireless network sensors, wireless internet architectures for enterprise, wireless multimedia - video/imaging/graphics, digital rights management for multimedia content, CAD/visualization.

Nasr M. Ghoniem

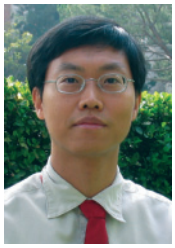
Damage and failure of materials in mechanical design; mechanics and physics of material defects (point defects, dislocations, voids and cracks); material degradation in severe environments (e.g. nuclear, fusion, rocket engines, etc.); plasma and laser processing; materials non-equilibrium, pattern formation and instability phenomena; radiation interaction with materials (neutrons, electrons, particles, laser & photons).

Fellow, American Nuclear Society, 1994
Fellow, ASME, 2006

H. Thomas Hahn

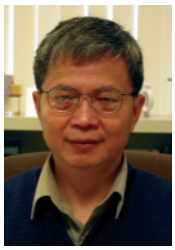
Nanocomposites, multifunctional composites, nanomechanics, rapid prototyping, information systems, nanolithography, energy harvesting/storage structures.

Fellow, ASME, 1993
Fellow, American Society for Composites 1996



Y. Sungtaek Ju

Micro- and nanoscale thermosciences, energy, bioMEMS/NEMS, nanofabrication.



Daniel C. H. Yang

Robotics and mechanisms; CAD/CAM systems, computer controlled machines.

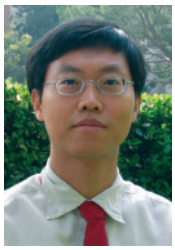
Gregory P. Carman

Electromagnetoelasticity models, piezoelectric ceramics, magnetostrictive composites, characterizing thin film shape memory alloys, fiber optic sensors, design of damage detection systems for structures.

Fellow, ASME, 2003

Yong Chen

Nanofabrication, nanoscale electronic materials and devices, micro-nano electronic/optical/bio/mechanical systems, ultra-scale spatial and temporal characterization.



Y. Sungtaek Ju

Micro- and nanoscale thermosciences, energy, bioMEMS/NEMS, nanofabrication.

Pei-Yu Chiou

Biophotonics, nanophotonics, BioMEMS/NEMS, electrokinetics, microfluidics and biofluidics, guided self-assembly, high throughput single cell analysis.

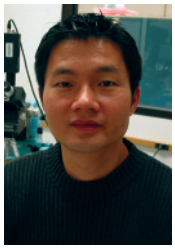
H. Pirouz Kavehpour

Microfluidics and biofluidics, biofuel cells, cardiovascular flow, complex fluids, interfacial physics, micro-tribology, non-isothermal flows, drug delivery systems, and artificial organs.

Vijay Gupta

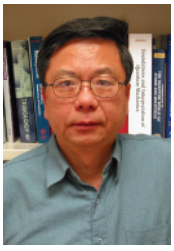
Experimental mechanics, fracture of engineering solids, mechanics of thin films and interfaces, failure mechanisms and characterization of composite materials, ice mechanics.

Fellow, ASME, 2005



Chang-Jin Kim

Microelectromechanical systems (MEMS), surface-tension-based microactuation, nanotechnology for surface control, microdevices including microfluidic applications, full spectrum of micromachining technologies.



Chih-Ming Ho

Molecular fluidic phenomena, nano/micro-electro-mechanical-systems, direct handling of macro molecules, bio-nano technologies, DNA based micro sensors.

Member, National Academy of Engineering, 1997

Fellow, American Physical Society, 1989

Fellow, AIAA, 1994

Laurent G. Pilon

Radiation transfer, biomedical optics, photobiological hydrogen production, energy conversion, foam, nanoporous media.

Faculty

STRUCTURAL AND SOLID MECHANICS

Oddvar O. Bendiksen

Classical and computational aeroelasticity, structural dynamics and unsteady aerodynamics.

Associate Fellow, AIAA, 1995

Gregory P. Carman

Electromagnetoelasticity models, piezoelectric ceramics, magnetostrictive composites, characterizing thin film shape memory alloys, fiber optic sensors, design of damage detection systems for structures.

Fellow, ASME, 2003

Nasr M. Ghoniem

Damage and failure of naterials in mechanical design; mechanics and physics of material defects (point defects, dislocations, voids and cracks); material degradation in severe environments (e.g. nuclear, fusion, rocket engines, etc.); plasma and laser processing; materials non-equilibrium, pattern formation and instability phenomena; radiation interaction with materials (neutrons, electrons, particles, laser & photons).

Fellow, American Nuclear Society, 1994

Fellow, ASME, 2006

Vijay Gupta

Experimental mechanics, fracture of engineering solids, mechanics of thin films and interfaces, failure mechanisms and characterization of composite materials, ice mechanics.

Fellow, ASME, 2005

H. Thomas Hahn

Nanocomposites, multifunctional composites, nanomechanics, rapid prototyping, information systems, nanolithography, energy harvesting/storage structures.

Fellow, ASME, 1993

Fellow, American Society for Composites

William Klug

Computational structural and solid mechanics, computational biomechanics, and micro/nanomechanics of biological systems.

Ajit K. Mal

Mechanics of solids, fractures and failure, wave propagation, nondestructive evaluation, composite materials, structural health monitoring, biomechanics.

Fellow, ASME, 1994

Fellow, American Academy of Mechanics, 1994

Fellow, International Society for Optical Engineering, 2005

JOINT APPOINTMENTS

Albert Carnesale
Kuo-Nan Liou

ADJUNCT PROFESSORS

Gang Chen
Les Lackman
Joseph Miller
Neil Morley
Robert S. Shaefer
Raymond Viskanta
Xiang Zhang

PROFESSORS EMERITI

Andrew F. Charwat
Peretz P. Friedmann
Walter C. Hurty
Robert E. Kelly
Cornelius T. Leondes
Michel A. Melkanoff
D. Lewis Mingori
Peter A. Monkewitz
Philip F. O'Brien
David Okrent
Russell R. O'Neill
Alex Samson
Lucien A. Schmit, Jr.
Chauncey Starr
Richard Stern
Russell A. Westmann

Emilio Frazzoli

Algorithmic, computational and geometric approaches to design and development of decision and control architectures for complex networked and autonomous systems.

James S. Gibson

Control and identification of dynamical systems. Optimal and adaptive control of distributed systems, including flexible structures and fluid flows. Adaptive filtering, identification, and noise cancellation.

Robert T. M'Closkey

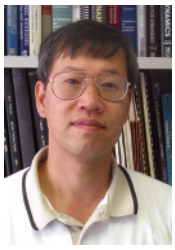
Nonlinear control theory and design with application to mechanical and aerospace systems, real-time implementation.

Jeff S. Shamma

Feedback control and systems theory.
Fellow, IEEE, 2006

Jason Speyer

Stochastic and deterministic optimal control and estimation with application to aerospace systems; guidance, flight control, and flight mechanics.
Member, National Academy of Engineering, 2005
Life Fellow, IEEE, 2004
Fellow, AIAA, 1985



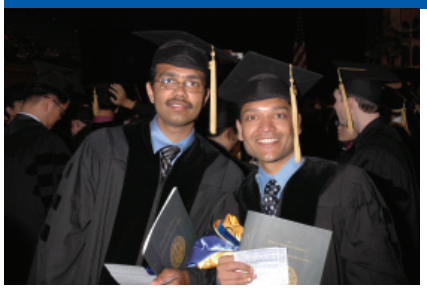
Tsu-Chin Tsao

Modeling and control of dynamic systems with applications in mechanical systems, manufacturing processes, automotive systems, and energy systems, digital control; repetitive and learning control, adaptive and optimal control, mechatronics.

STAFF

Abdalla, Laila	Fund Manager
Bedig, Janice	Management Services Officer
Bulhoes, Lili	Staff Personnel/Payroll
Castillo, Angie	Student Affairs Officer
Castro, Coral	Purchasing and Reimbursements
Cooper, Dale	Associate Development Engineer
Dang, Duy	Fund Manager
Duffy, Alex	Web and Publications Manager
Tran, Mai	Administrative Assistant
Lebon, Abel	Student Affairs Officer
Lozano, Miguel	Senior Laboratory Mechanician
Padilla, Alicia	Fund Manager
Shatto, David	Administrative Assistant
Terranova, Marcia	Academic Personnel/Payroll

Graduates 2005-2006 DOCTOR OF PHILOSOPHY



Commencement, June 2006.

Leonardo Santos De Brito Alves: "Transverse Jet Shear-Layer Instabilities: Linear Stability Analysis and Numerical Simulations" [Profs. A.R. Karagozian and R.E. Kelly, Advisors]

Rihui He: "Porous Thin Films for Mems On-Wafer Packaging" [Prof. C.J. Kim, Advisor]

Qiyang Hu: "Multiscale Modelling of Self-Organized Mono-Layer Surface Atomic Clusters" [Prof. N.M. Ghoniem, Advisor]

Po-Hao Huang: "The Micro Pulsed-Jet as a Micro-Electro-Mechanical Systems Combustion Engine and Miniaturization Technologies for Aerospace Engineering" [Prof. C.M. Ho, Advisor]

Shao-Ching Huang: "Numerical Simulation and Feedback Control of Separated Flows" [Prof. J. Kim, Advisor]

Krishnamoorthy Kalyanam, : "Advanced Motion Control Applied to Hard Disk Drives and Fast Tool Servos" [Prof. T.C. Tsao, Advisor]

Sung Kang, : "Skin-Friction Drag Reduction in Laminar and Turbulent Boundary Layers" [Prof. J. Speyer, Advisor]

Dennis Kim: "System Identification and Dynamic Tuning of a Tunneling Accelerometer and MEMS Vibratory Gyroscope" [Prof. R. M'Closkey, Advisor]

Ching Kong, : "Advanced Interpolation Technologies for Complete Profile Motion Control-Theory and Implementation" [Prof. D.C.H. Yang, Advisor]

Ding Li: "Numerical Study of Single Bubble Dynamics During Flow Boiling" [Prof. V. Dhir, Advisor]

Kahn Lim: "Low Noise Uhf Baw Quartz Resonator and Oscillator" [Prof. R. M'Closkey, Advisor]

Zhaowei Liu: "Far-Field Superlens for Optical Imaging Beyond Diffraction Limit and Other Nano-Plasmonic Devices" [Prof. X. Zhang, Advisor]

Xiaoyong Luo: "Modeling for Free Surface Flow with Phase Change and Its Application To Fusion Technology" [Prof. M.A. Abdou, Advisor]

De-Sheng Meng: "Manipulation of Microscopic Gas Bubbles By Using Surface Tension: Capturing, Venting and Pumping" [Prof. C.J. Kim, Advisor]

Deepanjan Mitra: "Fluid-Elastic Instability in Tube Arrays Subjected to Air-Water and Steam-Water Cross-Flow" [Prof. V. Dhir, Advisor]

Hyejin Moon: "Electrowetting-On-Dielectric Microfluidics: Modeling, Physics, and Maldi Application" [Prof. C.J. Kim, Advisor]

Bo Shi: "Molecular Dynamics Simulation of the Surface Tension and Contact Angle of Argon and Water" [Prof. V. Dhir, Advisor]

Kai-Hung Su: "From Nano-Plasmonic Optics Toward Molecules Bio-Sensing" [Prof. X. Zhang, Advisor]

Abarajith Hari Subramanian: "Numerical Prediction and Experimental Validation of Pool Nucleate Boiling Heat Flux, Under Variable Gravity Conditions" [Prof. V. Dhir, Advisor]

Ruth Tieck: "Frequency Rectification Applied to Piezoelectric Energy Harvesting and Improving Available Power of Piezoelectric Motors" [Prof. G.P. Carman, Advisor]

Ming Wen: "Kinetic Monte Carlo Simulations of Defect Nano-Mechanics with Applications to Dislocation Dynamics in Irradiated Alpha-Iron" [Prof. N.M. Ghoniem, Advisor]

Pak Wong: "Control of Cellular Signal Transduction Networks Using a Stochastic Search Algorithm" [Prof. C.M. Ho, Advisor]

Dongmin Wu: "Micro Fabrication of 3D Structures and Characterization of Molecular Machines" [Prof. X. Zhang, Advisor]

Graduates 2005-2006 MASTER OF SCIENCE DEGREES

Commencement, June 2006.

Chad Joseph Abunassar: Plan II-Comprehensive Examination [Prof. O. Bendiksen, Advisor]

Leah Noel Ow Adams: Plan II-Comprehensive Examination [Prof. S. Gibson, Advisor]

Jennifer Blackwell: Plan II-Comprehensive Examination [Prof. L. Pilon, Advisor]

Jeannie Yan-Nay Chan: Plan II-Comprehensive Examination [Prof. D.C.H. Yang, Advisor]

Yi-Hung Chen: Plan II-Comprehensive Examination

Johnny Kuan-Nan Chen: Plan II-Comprehensive Examination [Prof. J. Shamma, Advisor]

Shin Choi: Plan II-Comprehensive Examination [Prof. H.T. Hahn, Advisor]

Hsiu-Shih Chu: Plan II-Comprehensive Examination

Theophania Mae Dick Tingley: Plan II-Comprehensive Examination [Prof. H.T. Hahn, Advisor]

Jaime Marie Dyk: Plan II-Comprehensive Examination

Michael Horton Ferrante: Plan II-Comprehensive Examination [Prof. R. M'Closkey, Advisor]

Gregory David Fiore: Plan II-Comprehensive Examination [Prof. T.C. Tsao, Advisor]

Gregory James Glenn: Plan II-Comprehensive Examination [Prof. T.C. Tsao, Advisor]

Hengli Hsueh: Plan II-Comprehensive Examination [Prof. M.A. Abdou, Advisor]

John Chih-Chiang Hu: Plan I - Thesis Title: "Hydraulic Amplification of a Piezoelectric Actuator with Applications to Camless Engine" [Prof. T.C. Tsao, Advisor]

Soojung Hur: Plan II-Comprehensive Examination [Prof. L. Pilon, Advisor]

Allen Kiyoshi Ishimoto: Plan II-Comprehensive Examination

Jeff Jue: Plan II-Comprehensive Examination

Prasanth Kachgal: Plan II-Comprehensive Examination [Prof. P. Kavehpour, Advisor]

Krist Khodjasaryan: Plan II-Comprehensive Examination [Prof. A. Lavine, Advisor]

Bonguk Koo: Plan II-Comprehensive Examination [Prof. J. Kim, Advisor]

Nathan Kwok: Plan I - Thesis

Ying-Yu Lin: Plan II-Comprehensive Examination

Elaine Lui: Plan II-Comprehensive Examination [Prof. W. Klug, Advisor]

Charles E. Marks: Plan II-Comprehensive Examination

George Yohei Matsumoto: Plan II-Comprehensive Examination

Motoomi Alfonso Miyamoto: Plan II-Comprehensive Examination

Salman Monirabbasi: Plan II-Comprehensive Examination [Prof. S. Gibson, Advisor]

Adam Derek Montalvo: Plan II-Comprehensive Examination [Prof. I. Catton, Advisor]

Avi Okon: Plan I - Thesis Title: "In-Situ Characterization of Climbing Hold Features Using Tactile Sensing" [Prof. D.C.H. Yang, Advisor]

Salah Muheeb Owdeh: Plan II-Comprehensive Examination

Muhanned Muheeb Owdeh: Plan II-Comprehensive Examination

Puru Parthasarathy: Plan II-Comprehensive Examination [Prof. Y. Chen, Advisor]

Charisse Sy Pua: Plan II-Comprehensive Examination [Prof. H.T. Hahn, Advisor]

David Richard Pyle: Plan II-Comprehensive Examination [Prof. V. Gupta, Advisor]

Jennifer Sue Quan: Plan II-Comprehensive Examination [Prof. N.M. Ghoniem, Advisor]

Juan Ignacio Rodriguez: Plan II-Comprehensive Examination [Prof. A.R. Karagozian, Advisor]

Leyla Sabet: [Prof. C.M. Ho, Advisor]

Mark Samir Saleh: Plan II-Comprehensive Examination [Prof. E. Frazzoli, Advisor]

David Michael Schwartz: Plan II-Comprehensive Examination [Prof. R. M'Closkey, Advisor]

Kamyar Setvanpour: Plan II-Comprehensive Examination

James Anthony Sharp: Plan II-Comprehensive Examination [Prof. T.C. Tsao, Advisor]

Kyle David Smith: Plan II-Comprehensive Examination [Prof. L. Pilon, Advisor]

Scott Yowrong Su: Plan II-Comprehensive Examination [Prof. O. Smith, Advisor]

Jeffrey Jia-En Tai: Plan II-Comprehensive Examination [Prof. A.R. Karagozian, Advisor]

Motoki Ujihara: Plan II-Comprehensive Examination

Brian Joseph Van Dyk: Plan I - Thesis Title: "Development of a Biologically Inspired Display Concept Using Electro-Wetting on Dielectric (Ewod) Microfluidics [Prof. C.J. Kim, Advisor]

Teddy Richard Vaughan: Plan II-Comprehensive Examination

Eason Francis Wang: Plan II-Comprehensive Examination [Prof. H.T. Hahn, Advisor]

Wing K. Wong: Plan II-Comprehensive Examination [Prof. O. Bendiksen, Advisor]

S. Yasmin Meza Wood: Plan II-Comprehensive Examination [Prof. D.C.H. Yang, Advisor]

Tong Zhang: Plan II-Comprehensive Examination [Prof. C.M. Ho, Advisor]

Publications

Journal Articles

Dynamics

Frazzoli, E., Dahleh, M.A., and Feron, E., "Maneuver-Based Motion Planning for Nonlinear Systems with Symmetries," IEEE Transactions on Robotics and Automation, vol. 21, no. 8, pp. 1077-1091, December 2005.

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Conference Papers

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Overview

Faculty and Staff

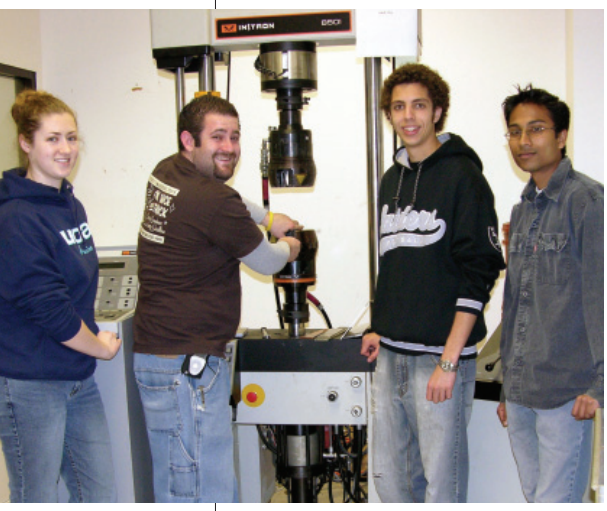
Ladder Faculty:	32
Joint Faculty:	2
Emeritus Faculty:	16
Adjunct Faculty:	7
Lecturers:	36
Research Staff:	26
Administrative Staff:	23

Recognitions

Society Fellows:	27
NAE members:	9
Regular Faculty:	3
Affiliated Faculty:	3
Emeriti:	3

Publications

Journal Articles:	75
Conference Papers:	89
Books:	2
Book Chapters:	7
Patents:	5



Professor Ajit Mal's Undergraduate Researchers

Research Facilities

Department contributes to three Research Centers:

- CMISE
- SINAM
- CNSI

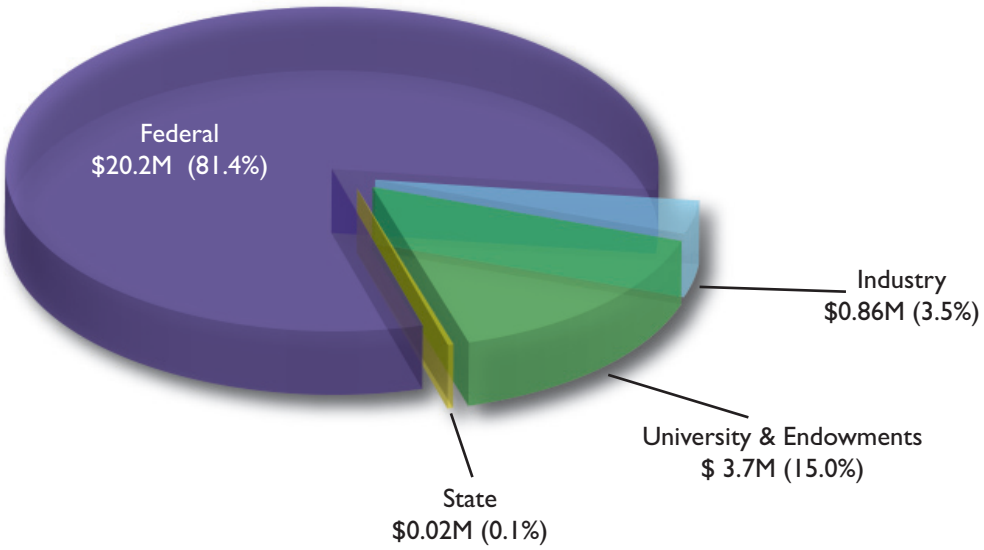
Laboratories and Research Groups: 32

Facilities square footage: 32,743 sq. ft.

Department square footage: 76,918 sq. ft.

Funding Available for Research 2005-2006 ($25M)

(Research Expenditures 2005-2006, $15M)



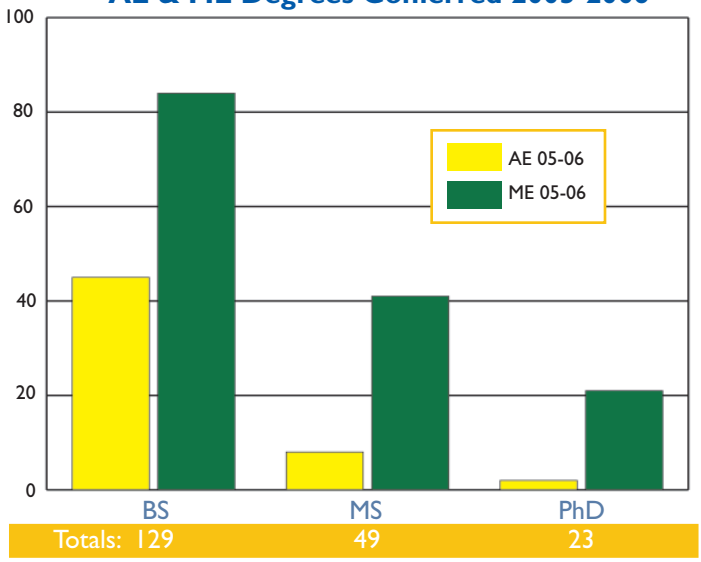
Undergraduate Students

Students Enrolled:	573
Applicants:	1522
Admitted:	450
New Students Enrolled:	157
Acceptance Rate:	29.6%
Average Freshman GPA:	3.85/4.0

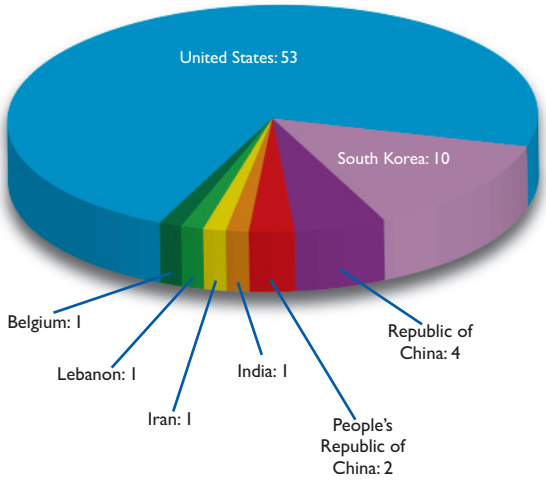
Graduate Students

Students Enrolled:	221
Applicants (MS and PhD):	406
Admitted:	185
New Students Enrolled:	73
Acceptance Rate:	45.6%
Average GPA:	3.40/4.0

AE & ME Degrees Conferred 2005-2006



Graduate Enrollment for Fall 2005
By country of origin



Department Fellowships and Teaching Assistantships

TA Funding	$ 611,491
Graduate Division	$ 470,100
HSSEAS	$ 125,000
Cota-Robles Fellowship	$ 26,110
GOFP Fellowship	$ 40,219
Chancellor's Prize Fellowship	$ 10,000
Total	**$1,282,920**

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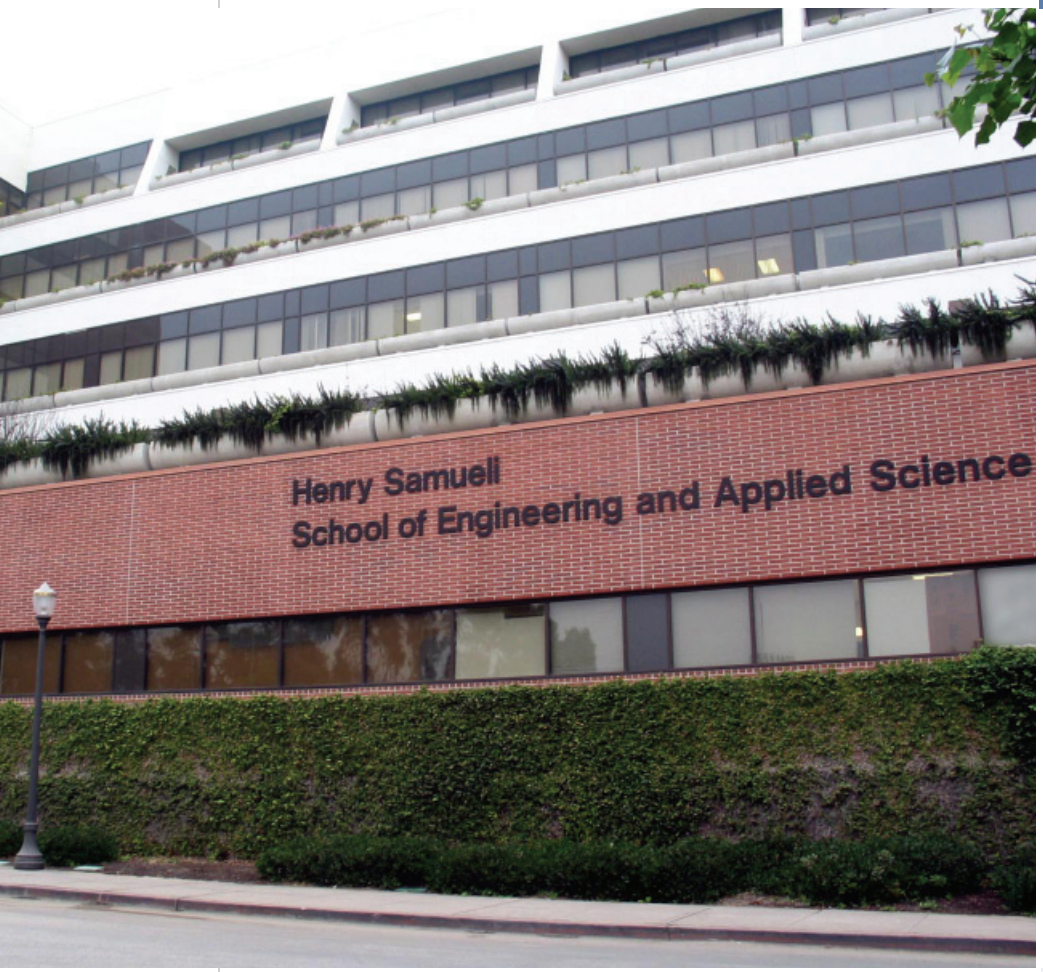

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