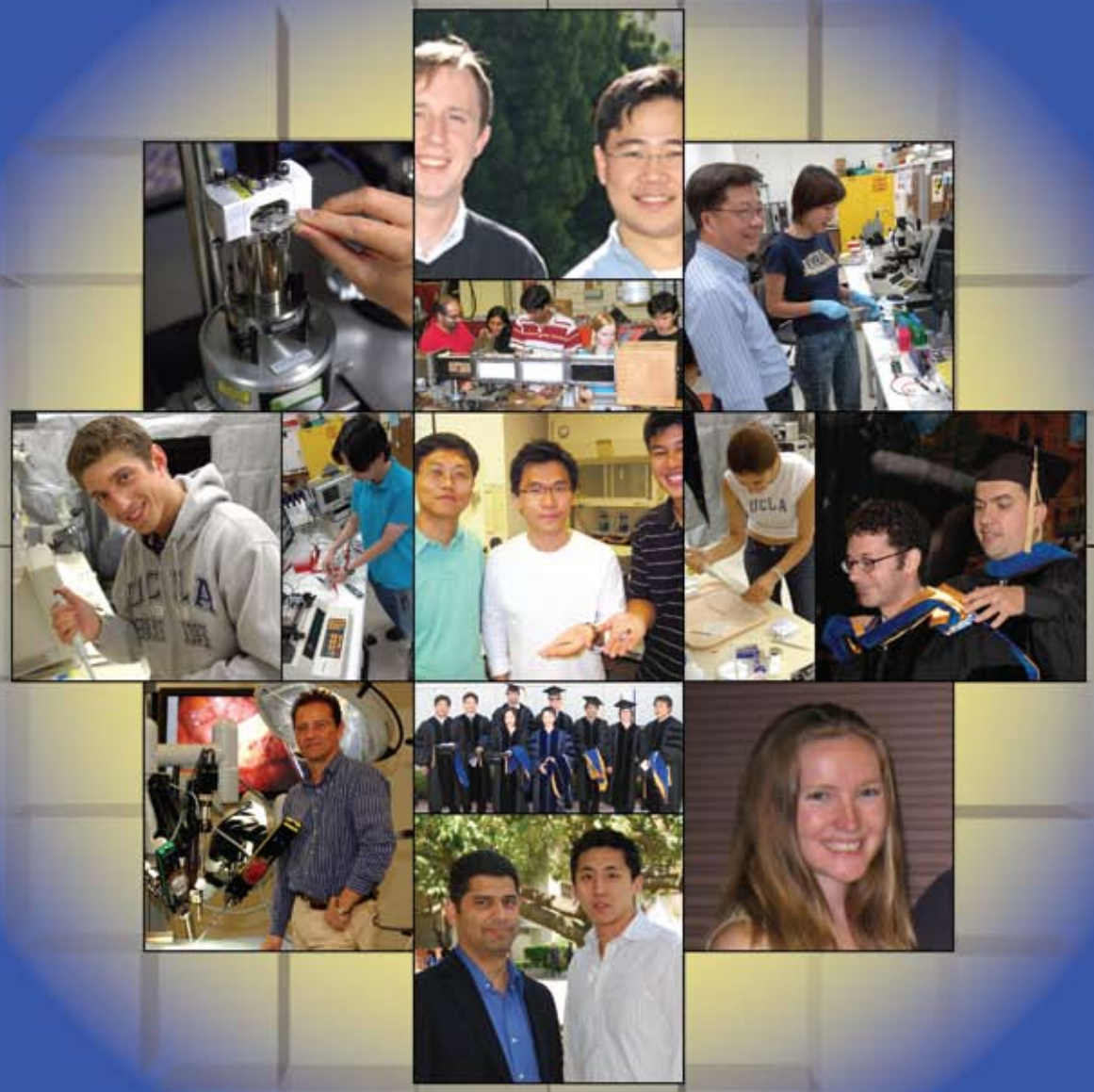
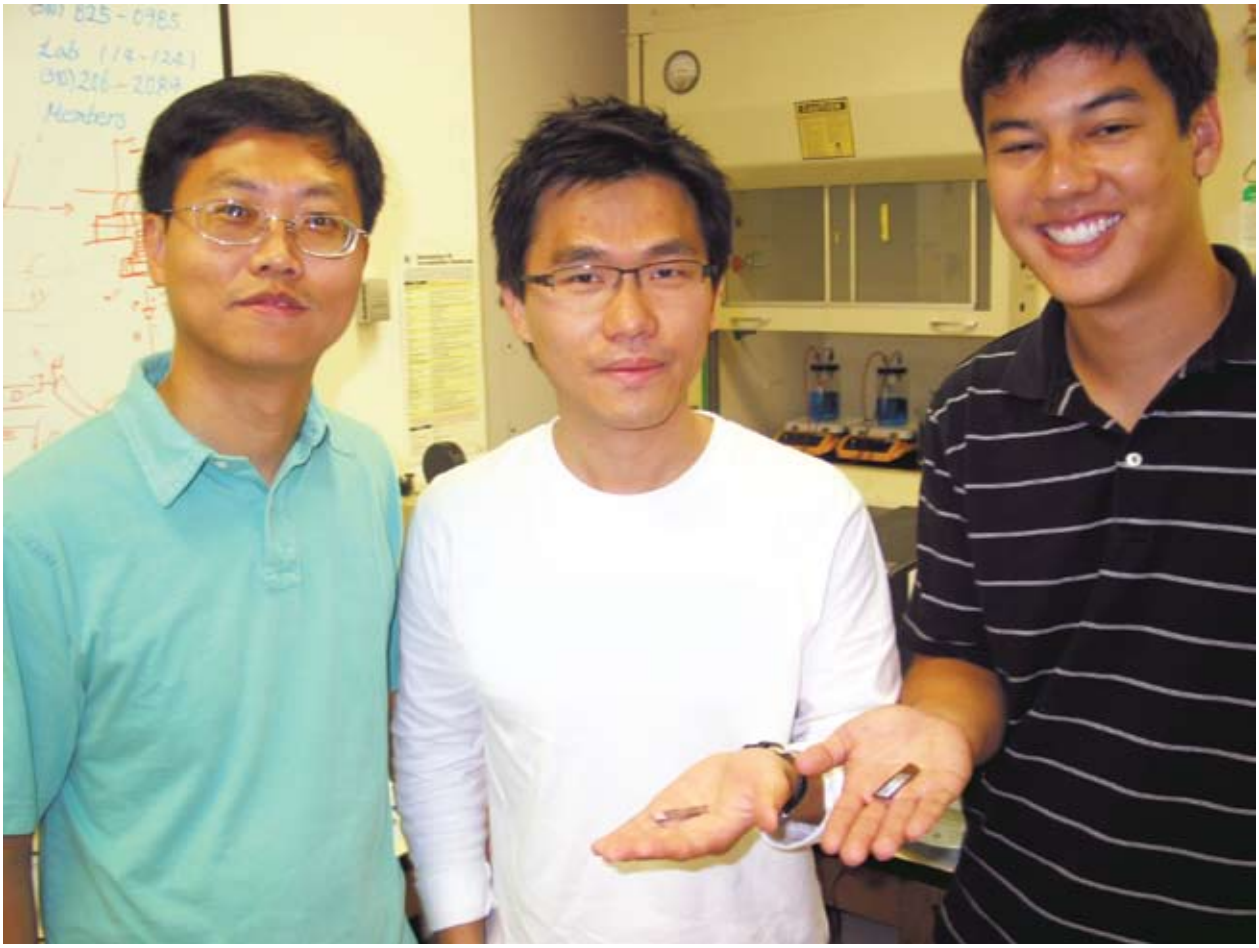
Mechanical & Aerospace Engineering Department

2007-2008



UCLA Engineering

HENRY SAMUELI SCHOOL OF
ENGINEERING AND APPLIED SCIENCE



Professor Y. Sungtaek Ju, with graduate students Youngsuk Nam and Stephen Sharratt, with RFID devices. Photo by Alexander Duffy.

Y. Sungtaek Ju and his team win DARPA grant to conduct innovative research and development in the area of electronics cooling

BY Y. SUNGTAEK JU

An interdisciplinary team of researchers led by UCLA professor of Mechanical and Aerospace Engineering, Sungtaek Ju, recently received a $3.8 million award from the Defense Advanced Projects Research Agency (DARPA) to conduct innovative research and development in the area of electronics cooling. DARPA is an agency of the U.S. Department of Defense responsible for the development of revolutionary technology for military and military-commercial dual applications. Other participants of the research program include Professors Ivan Catton (MAE, UCLA), Bruce Dunn (MSE, UCLA), and Massoud Kaviany (ME, University of Michigan); and engineers from Advanced Cooling Technologies, Inc. based in Pennsylvania.

As electronic system technology advances, there has been increasing pressure on the thermal engineering and heat rejection technologies used. Despite efforts to achieve dramatic reductions in power consumption in specific electronic devices, the need for performance inevitably leads to operation of most electronic systems at the limits of the available thermal management technology.

DARPA has asked the research team to come up with technology that would enhance the cooling of electronic devices to improve the performance of their military electronics. RF and microwave circuits that are used in radar and communications devices and systems are the primary applications of interest.

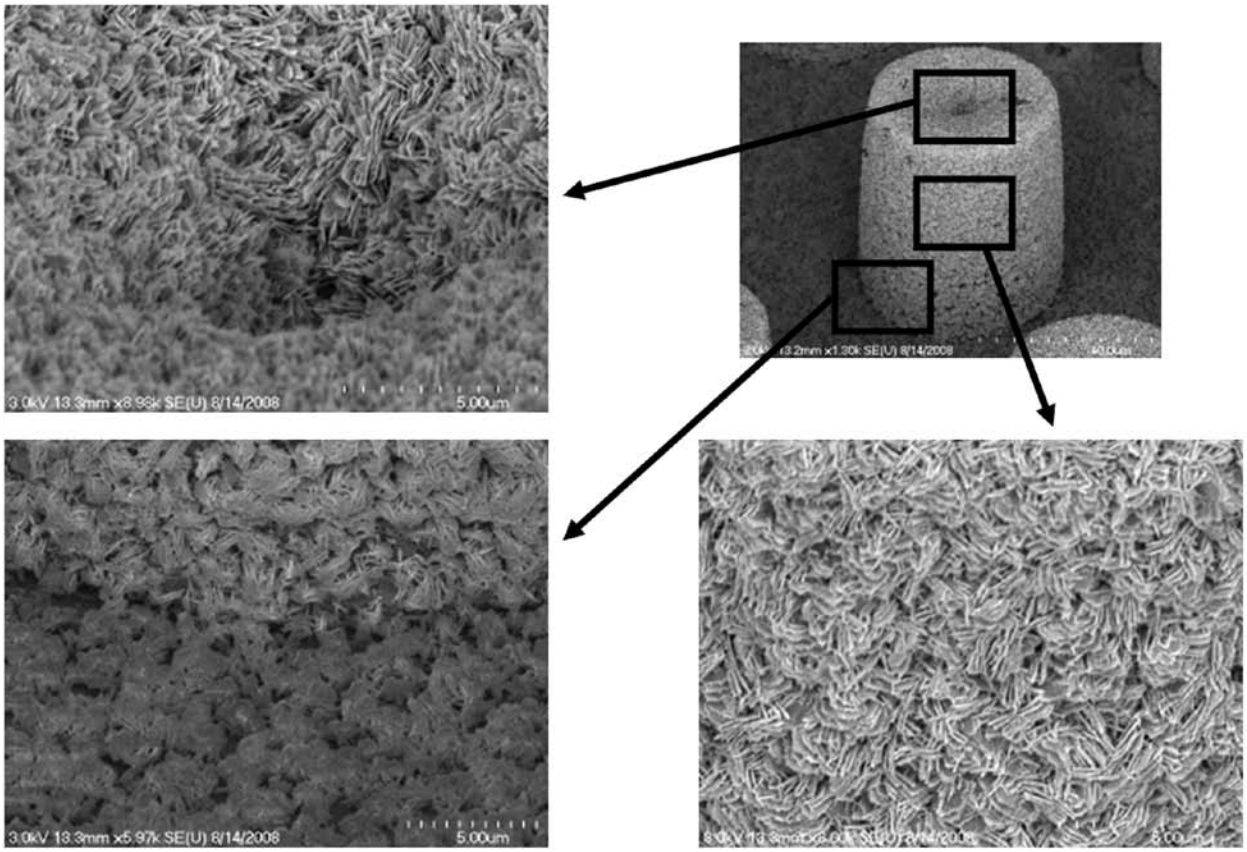


Figure 1: Nanostructured micro-post wicks being developed in the MAE department for high critical heat flux heat pipes.

The overall goal of the new research program is the creation of a thin, lightweight substrate dubbed thermal ground planes (TGPs) with the thermal conductivity at least 100 times higher than those of common copper alloy substrates currently used in these applications. TGPs will be particularly important for enhancing existing systems that are highly constrained in size and weight, including air-borne electronic radar arrays and other avionics.

Professor Ju's team is focusing on the development of planar heat pipes to effectively spread heat generated in electronic components. When heat pipes are applied at very high heat fluxes, which is most often the case for ultra-high performance military electronics, their heat transfer capacity is very often limited by heat transfer crises in the evaporators. The team is developing novel multiscale wicks to drastically increase the critical heat flux of heat pipes. An example of such wicks, which consist of an array of nanostructured micro-posts, is illustrated in Figure 1.

In addition, arterial wicks will be developed to efficiently supply coolant to the evaporator. The length of the liquid feed wick can be as much as several centimeters in TGPs, which presents a significant engineering challenge. The team has been evaluating various innovative design concepts, including high-permeability liquid arteries made of superhydrophilic powders and planar capillary guides.

A key cause of failure in semiconductor devices is mismatch in thermal expansion coefficient between the semiconductor and heat sink/spreader materials. The team is developing novel composites that incorporate fillers with isotropic negative thermal expansion (NTE) coefficients to be used as a casing material for TGPs. By using this approach, the team can tailor the CTE by simply changing the volume fraction of NTE fillers.

By working with a premier electronics cooling technology manufacturing company, the UCLA-led team will also rapidly transition breakthrough fundamental research into commercial technology. The new technology will enable a new generation of high-performance, integrated systems to operate at high power density without problems from temperature gradients, increased weight, or added complexity.

Chih-Ming Ho works with researchers to develop method to rapidly ID optimal drug cocktails

BY WILEEN WONG KROMHOUT

Chih-Ming Ho

UCLA researchers have developed a feedback control scheme that can search for the most effective drug combinations to treat a variety of conditions, including cancers and infections. The discovery could play a significant role in facilitating new clinical drug-cocktail trials.

The best known use of drug cocktails has been in the fight against HIV, the virus that causes AIDS. Drug cocktails also have been used to combat several types of cancer. Often, drugs that might not be effective in combating diseases individually do much better in combination.

With the use of the new closed-loop feedback control scheme, an approach guided by a stochastic search algorithm, researchers at the UCLA Henry Samueli School of Engineering and Applied Science and UCLA's Jonsson Comprehensive Cancer Center have devised an invaluable means of identifying potent drug combinations fast and efficiently. Their findings appear in the March 17 online version of the journal Proceedings of the National Academy of Sciences.

It has long been a difficult challenge for clinical researchers to determine the optimal dose of individual drugs used in combination. For example, a researcher testing 10 different concentrations of six drugs in every possible arrangement would be faced with 1 million potential combinations.

"With the development of this optimization method, we've overcome a major roadblock," said study author Chih-Ming Ho, UCLA's Ben Rich-Lockheed Martin Professor and a member of the National Academy of Engineering. "There have always been too many choices and too many combinations to sort through. It was like finding a needle in a haystack."

In one test case, the research team examined how to best prevent a viral infection of host cells. Using the closed-loop optimization scheme, they were able to identify, out of 100,000 possible combinations, the drug cocktails that completely inhibited viral infection after only about a dozen trials. In addition, they found that total inhibition of the virus occurred at much lower drug doses than would be necessary if the drugs were used alone; in fact, the concentrations of the drugs were only about 10 percent of that required when used individually.

"Viruses grow very rapidly and change rapidly as well. Because of that, a virus can become resistant to a particular drug," said Genhong Cheng, a member of the research team at the UCLA Center for Cell Control and UCLA's Jonsson Comprehensive Cancer Center. "This is why it's so important to be able to use a combination of more than one drug. If the virus mutates to become resistant to one drug, it is still sensitive to the other drugs."

Drug combinations can also be used effectively to inhibit infectious diseases because resistance to a single drug is very common, according to Ren Sun, UCLA professor of molecular and medical pharmacology and a member of the research team.

"If we can apply multiple drugs against one infectious agent, it probably will prevent the occurrence of drug resistance," said Sun, who is also a researcher at the Jonsson Cancer Center. "But, of course, when you use multiple drugs, side effects will be strong. With this model, there is a way to optimize the combination to reduce the side effects while maintaining efficacy that will be very beneficial."

"What the search scheme does is it tries to detect trends for optimal output," said Pak Wong, a former UCLA graduate student who participated in the study and is now an assistant professor of mechanical engineering at the University of Arizona. "Basically, the algorithm sees a trend and a direction and drives the trend in that direction. It's like mountain climbing and finding a way to get to the peak. So you keep going, and soon you rapidly find the peak while being guided by a smart search scheme."

In an example used to illustrate the prevention of viral infection of host cells, researchers started with arbitrarily chosen dosages of the drugs. The percentage of non-infected cells under this initial drug-cocktail treatment was fed into the stochastic search algorithm, which essentially helps guide a random search process. The algorithm then suggested the next drug concentrations for producing a

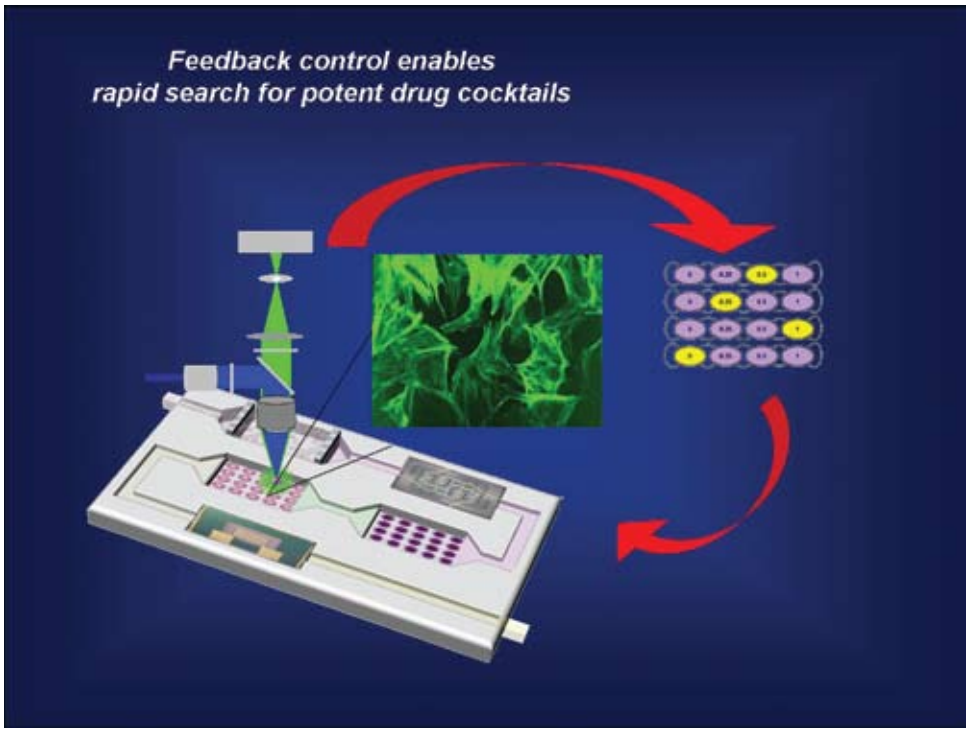
higher percentage of non-infected cells. This closed-loop feedback control scheme is carried out continuously until the best combination is found. Randomness is built into the search decision, preventing the trap at local optimum levels and allowing the search process to continue until the optimal drug cocktail is identified.

The model also provides an alternative approach to studying cellular functions. Molecular biologists can identify all the players of a particular regulatory pathway in order to decipher how to block or augment that pathway. Cells are complex systems with many redundant functions, and it is difficult to predict how a cell will respond to multiple stimulations at one time. The model overlooks these details and lets the system determine what works best for itself. If researchers are more interested in how the cellular network functions, this approach can provide an initial bird's-eye view, but it also allows them to home in on the important molecular activities controlled by the best drug combinations.

This search scheme is an extremely effective and versatile tool that can be applied to combat numerous diseases, including cancer, the researchers say, and its multidimensional properties will likely make it useful in a wide variety of additional situations.

The next steps are animal and clinical testing.

The study was funded and supported by the Center for Cell Control, a nanomedicine development center funded by the National Institutes of Health through the Roadmap for Medical Research, and by the Institute for Cell Mimetic Space Exploration, a NASA-sponsored institute.



Professor Pirouz Kavehpour and UCLA graduate student Kevin Lu. Photo by Don Liebig.

Pirouz Kavehpour and researchers at UCLA Engineering discover a theoretical model to predict jamming that could provide new avenues in materials innovation and medicine

BY WILEEN WONG KROMHOUT

UCLA researchers at the UCLA Henry Samueli School of Engineering and Applied Science have come up with a theoretical model to predict when granular materials become jammed. This advancement not only broadens fundamental knowledge, it also provides new avenues to a number of practical areas that range from materials innovation to medicine. The study, available on the Nature Physics Web site, was published in the journal's print edition on May 1.

"We started this research by looking at the behavior of dry powders as solid lubricants as well as the behavior of a powdered rock in fault zones called gouge during an earthquake. What we found led us to a model that can accurately predict the behavior of dense granular flows. What we realized soon after was that the granular particles interact similarly to that of molecules in materials that jam, such as colloids and foam" said study's author Pirouz Kavehpour, an assistant professor of mechanical and aerospace engineering and director of the Complex Fluids & Interfacial Physics Laboratory at UCLA. "From there, we were able to find a universal law that can predict the jamming behavior for the first time."

According to Emily Brodsky, associate professor of earth and planetary sciences at UC Santa Cruz and also an author of the study, "We understand how water flows. We understand how honey flows. We even understand how elastic bands deform. But granular flows are complicated and hard to understand. If you're pouring sand down a hill or in an hour glass, there was never a good formula for the strain or the strain rate as a function of stress. This formula is definitely new and unique."

Kavehpour initially sought out Brodsky in 2003 in an effort to collaborate. Brodsky at the time was an assistant professor of geology at UCLA and Kavehpour had learned of Brodsky's work on tribological properties of rock and sand systems during earthquakes from her study in Physics Today. Tribology is the science and technology of interacting surfaces in relative motion, and embraces the study of friction, wear, and lubrication.

The two then brought in new UCLA Engineering graduate student Kevin Lu and after a series of experiments realized their focus should be on the dynamics of dry sand which resulted in their findings today.

Lu, lead author of the study, showed that the new formula also quantified glass-transition. "Glass is a solid that flows. But structurally, it's a liquid. The molecules in a glass are jammed and unable to flow past each other so the material actually flows sluggishly. One evidence of this can be found in the window panes of old churches in Europe. Studies have shown that the bottom of the windows are consistently thicker than the top. Glassy liquids flow very much in the same manner as granular media," said Lu.

This new theoretical framework, the authors believe, can be applied to many different areas. Pharmaceutical companies can use the new equation to decide the size and quantities of pills that may or may not fit through a shoot that fills containers. Also, from knowing the fundamentals of jamming, scientists can now engineer materials that are both durable and strong. Instead of working with composites or alloys, the jamming theory provides a roadmap to tune material properties from pure substances.

"It can also help us to better understand certain diseases in medicine. In sickle cell anemia, for example, the abnormal blood cells are long and skinny, resulting in the obstruction of blood flow to various organs. Now we can do more to reduce the likeliness of death-threatening implications to benefit the medical community," said Lu.

As a geologist who studies fault zones and earthquakes, Brodsky is particularly interested in the granular flow of gouge found in fault zones and having a formula to figure out when the rock is jammed and when it's free flowing can be significant.

"Knowing how things flow and the granular behavior in a fault zone is one of the very important steps in trying to figure out how exactly faults slip," said Brodsky.

The study was partially funded by the Air Force Office of Scientific Research. The Website for the UCLA Complex Fluids & Interfacial Physics Laboratory: http://www.seas.ucla.edu/cfip/index.html. Professor Emily Brodsky's website at UC Santa Cruz, Department of Earth and Space Sciences: www.pmc.ucsc.edu/~brodsky/

Laurent Pilon's diabetes detector

BY JUSTIN MULLINS

Diabetes is a rapidly growing problem in the developed world. It is characterised by high levels of glucose in the blood, but measuring this accurately can be both invasive and time-consuming. The current diagnostic tests require a patient either to fast overnight before giving a blood sample, or drink a specific amount of glucose in solution and wait a couple of hours before the resulting sugar level in their blood is measured.

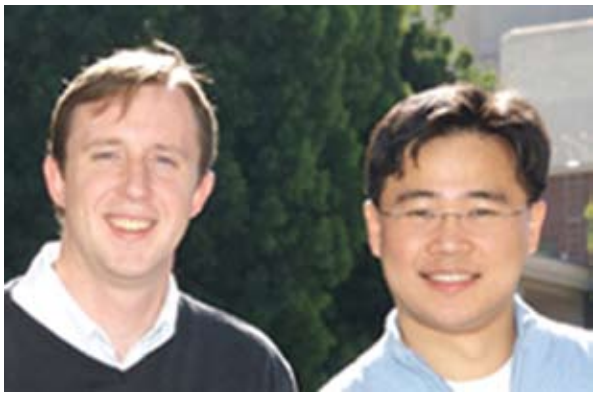
Now researchers at the University of California in Los Angeles, US, have devised another altogether simpler approach based on what happens to excess glucose in the body.

Laurent Pilon and Kamal Katika say glucose reacts with proteins in body tissues such as the skin and blood vessels to produce a set of chemicals called advanced glycation end-products. AGE products tend to accumulate in the walls of blood vessels causing them to become thicker and more rigid, which is one of the complications of diabetes.

The researchers point out that AGE products fluoresce when zapped with light - the greater their concentration, the more fluorescence they produce. So they propose a device that beams a series of short pulses onto the skin and measures the amount of fluorescence produced by any AGE products. The fluorescence would not only allow diabetes to be diagnosed but also give an idea of how advanced it has become.

Read the full patent application for the diabetes detector. at http://www.uspto.gov/patft/index.html.

(This article was originally posted on the New Scientist Technology website, The article address is http://technology.newscientist.com/channel/tech/dn12472-invention-social-networking-tv.html.)



2008 NSF CAREER AWARD Winners: William Klug and Eric Chiou. Photo by Don Liebig.

Two MAE faculty win the National Science Foundation 2008 Faculty Early Career Development Awards

BY WILEEN WONG KROMHOUT

Two faculty members in the MAE Department have won the highly competitive and prestigious National Science Foundation's 2008 Faculty Early Career Development (CAREER) award. The award, among the highest of honors for young faculty, recognizes the dual commitment of scholarship and education. The two this year are now among 16 UCLA Engineering faculty who have won CAREER awards in the past five years.

Eric Pei-Yu Chiou and William Klug, both assistant professors of mechanical and aerospace engineering, each received $400,000 in funding for support of their research over a five-year period.

Chiou will develop a "Massively Parallel Light-Driven Droplet Manipulation Platform for Large Scale Multiplexed Single Cell Analysis," and Klug will look at "Membrane-Protein Interactions and the Mechanics of Cell Organelles."

"We are extraordinarily pleased that Tatiana [Segura], Eric and Bill were honored this year by the National Science Foundation," said Vijay K. Dhir, dean of the school. "We take great pride in our young faculty and in knowing that the research these three are conducting could one day lead to the enhanced treatment of diseases for the medical community."

Chiou will design and fabricate a device based on a novel floating electrode optoelectronic tweezers (FEOET) mechanism that allows for the use of direct optical images to control liquid droplets suspended in an oil environment. The oil is required to prevent the droplets from mixing with other chemicals. Currently, technologies exist that allow for droplets to be released at a very high speed, about 10,000 droplets per second. But there is no technology capable for controlling such a large number of droplets individually and in parallel for the purpose of analysis.

The FEOET platform is potentially capable of preparing one million different, multiplexed drug combinations in less than two hours. This type of technology will help researchers to test individual cell responses to different combinations of drugs on a massive scale. Due to the capability of using low-cost materials, this super drug screening device could dramatically reduce the fabrication cost of large-scale lab-on-a-chip systems. Medical and pharmaceutical labs could eventually use this type of technology to more efficiently and effectively find the right combination of drugs to fight diseases like cancer.

Building a theoretical framework for the exploration of the effects of transmembrane protein interactions on the formation and stability of membrane structures in cell organelles is Klug's goal. His research aims to understand the physical forces that maintain the structures of membranes in cell organelles, in particular endoplasmic reticula, Golgi apparatus, and mitochondria.

One question Klug's research hopes to address is whether the proteins that are so densely packed into organelle membranes actually are responsible in some way for producing the complex membrane structure or if the membrane simply provides a nice home for the proteins. Recent experiments have shown that changing the proteins can lead to whole-scale rearrangements of the membrane, suggesting that the protein molecules can act like a kind of "glue" that holds the membrane together in certain geometric patterns.

The results of the study may ultimately enable new medical techniques and treatment of diseases related to organelle function, including viral infections, diabetes, tumor growths, and neurodegenerative diseases.

The CAREER award also contains a strong educational component. Both Chiou and Klug will incorporate their research activities into their teaching curriculum for undergraduate and graduate students. Summer outreach programs for underrepresented students of various grade levels from Los Angeles area schools and community colleges will also be developed.

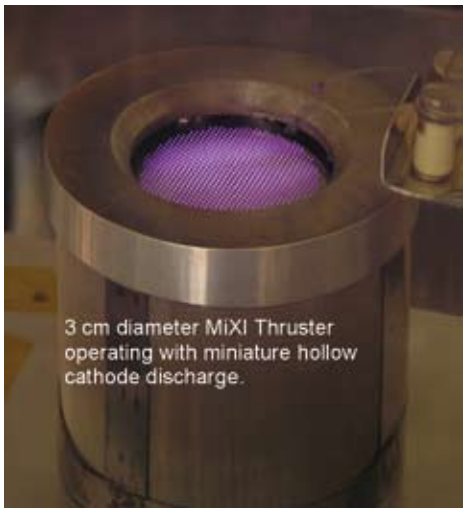
Meet Richie Wirz

Richie Wirz

Professor Richard Wirz has joined the UCLA faculty effective Fall, 2008, as a professor of Mechanical and Aerospace Engineering. During the 2007–2008 school year, he taught two classes for the UCLA MAE Department, Introduction to Astronautics (161A) in the fall and Rocket Propulsion (150R) in the spring and served as advisor to the Rocket Project that won first place this year. Previous to joining the UCLA faculty, he was a Senior Engineer at NASA's Jet Propulsion Laboratory researching advanced propulsion, spacecraft systems, space missions, and terrestrial alternative energy. He received several individual and team awards for his work at JPL. While at JPL, he was also appointed to the Committee for Global Change and Energy and was also appointed Lead for solar thermal technologies. Professor Wirz's professional and academic path has been somewhat unique. After completing two undergraduate degrees at Virginia Tech (Aerospace Engineering and Ocean Engineering) he worked in industry for several years before attending Caltech to complete his graduate education in Aeronautics. During his time in industry he worked at Gibbs & Cox, Inc. (an international naval engineering firm) in the areas of ship propulsion, seakeeping, dynamics, and electrical systems. At Gibbs & Cox he also worked on alternative energy and was appointed to the position of Manager of Renewable Energy Technologies. Before Gibbs & Cox he worked at SeaSun Power Systems, Inc. as the Technical Lead for ocean renewable energy technologies such as wave power and ocean thermal energy conversion.

Professor Wirz's current research consists of many areas of spacecraft propulsion (ranging in thrust from 1 μN to over 30 kN), including: micropropulsion, ion thrusters, Hall thrusters, electrospray thrusters, solid rockets, and retrorocket ground interactions. He developed the world's first miniature noble gas ion thruster at a diameter of only 3 cm (state-of-the-art ion thrusters are nearly 30 cm in diameter). This thruster is now known as the Miniature Xenon Ion (MiXI) thruster (see figure) and has a nominal thrust of about 1 mN. He recently made advancements to miniature ion thruster electronics to add precision capability to the remarkably efficient and low-contamination MiXI thruster, thus helping open the possibility for a wide range of new planet-finding and Earth-observing missions that are currently being considered by NASA and the European Space Agency. He has helped the understanding of the performance and life of electric thrusters by combining experimental and computational investigations of electric thrusters of all sizes. His research, in part, has focused on the plasma discharges and cathodes of these thrusters. Ion thrusters, such as the Xenon Ion Propulsion System (XIPS) thruster used on the XM satellites and the NSTAR thrusters used on the Deep Space One and DAWN missions employ dc plasma discharge that are confined by permanent magnetic fields. Many plasma discharges are treated as weakly- or fully-ionized; however, Wirz's research revealed that the plasma diffusion mechanisms in dc ion thruster discharges can be accurately described by treating the plasma as intermediately-ionized. As part of his research in cathode technology, he recently received a patent for a new cathode technology that can be used for electric propulsion as well as terrestrial applications that require rugged electron sources, such as plasma processing facilities and scanning electron microscopes.

Professor Wirz is also involved in research and system analysis of solar, ocean, and wind energy technology. Much of his current efforts have focused on solar thermal technologies and improving the implementation of photovoltaic and wind technology. Outside of his research, he is an active artist/musician/songwriter and is currently completing his third CD release.



3 cm diameter MiXI Thruster operating with miniature hollow cathode discharge.

Nasr Ghoniem co-authors new book, "Instabilities and Self-Organization in Materials"

"Instabilities and Self-Organization in Materials" and its co-author, Professor Nasr Ghoniem

Prof. Nasr Ghoniem and Daniel Walgraef have co-authored a new book, "Instabilities and Self-Organization in Materials", published by Oxford University Press.

A description of the book: In materials, critical phenomena such as phase transitions, plastic deformation and fracture are intimately related to self-organization. Understanding the origin of spatio-temporal order in systems far from thermal equilibrium and the selection mechanisms of spatial structures and their symmetries is a major theme of present day research on the structure of continuous matter. Furthermore, the development of methods for producing spatially-ordered and self-assembled microstructure in solids by non-equilibrium methods opens the door to many technological applications. There is an increasing demand for a better understanding of new materials from a more fundamental point of view. In order to describe and understand the behavior of such materials, dynamical concepts related to non-equilibrium phenomena, irreversible thermodynamics, nonlinear dynamics, and bifurcation theory, are required. The generic presence of defects and their crucial influence on pattern formation and critical phenomena in extended systems is now well-established. Similar to observations in hydrodynamical, liquid crystal, and laser systems, defects in materials have a profound effect. We found it thus timely to develop a unified presentation of tools, concepts, and methods that are useful to material scientists and engineers. Although specialized treatments of various topics covered in this book are available, we feel that a comprehensive approach may give the reader a higher vantage point. Hence, emphasis is placed on combining the basic physical, mathematical and computational aspects with technological applications within the material's life-cycle, from processing, degradation to eventual failure. The book is divided into two parts that are organized as follows. The first volume of this book is devoted to the most basic concepts of the physics, mechanics, mathematical theory and computational methods utilized in the analysis of non-equilibrium materials.

Jeff Eldredge hosts successful fluid dynamics symposium for graduate students and post-docs

Jeff Eldredge

On Saturday, April 12, MAE Prof. Jeff Eldredge hosted the 2nd Southern California Symposium on Flow Physics in Engineering IV at UCLA. The symposium, called "So Cal Fluids 2", for short, was jointly organized with Prof. Tim Colonius from Caltech. The event provided a forum for graduate students and post-docs in Southern California to present their fluid dynamics-related research. A total of 42 speakers and 95 attendees (students, post-docs and faculty), from 9 different Southern California universities—UC Santa Barbara down to UC San Diego— participated in the day-long event. Two parallel sessions were held in the morning, early and late afternoon.

Said Eldredge, "This event gave the students a chance to meet their future colleagues, to advertise their work, and to discuss potential academic positions with faculty from other universities. For some of them, this was their first time speaking in front of a group of their peers and faculty, so it was important to keep the atmosphere relaxed." The students did a wonderful job with their presentations, and the technical quality was first-rate."

Profs. Eldredge and Colonius also organized So Cal Fluids 1, held last April at Caltech. This year's event drew more speakers and more attendees than the first one, demonstrating the potential for this to become an annual event among the Southern California universities. The low registration cost (an optional $2) stands in stark contrast to the large fees of most professional society meetings. "We have a critical mass of fluid dynamics researchers in Southern California, which should maintain the long-term success of this series," said Eldredge.

Kuo-Nan Liou elected Vice Chair of the NAE's "Special Fields and Interdisciplinary Engineering" section


Kuo-Nan Liou

Kuo-Nan Liou, Distinguished Professor of Atmospheric Sciences and Founding Director of the Joint Institute for Regional Earth System Science and Engineering (JIFRESSE), was elected Vice Chair of the "Special Fields and Interdisciplinary Engineering" Section of the National Academy of Engineering. Liou holds a joint appointment in the UCLA Mechanical and Aerospace Engineering Department. He became Chair of this section on July 1, 2008.

Oddvar Bendikson world class visiting scientist, also gave two keynote NATO lectures


Oddvar Bendikson

Oddvar Bendiksen was a World Class Visiting Scientist at the Air Force Research Laboratory at WPAFB during the summer of 2007, where he engaged in research on the transonic flutter behavior of high-speed aircraft.

Professor Bendiksen also gave one of the two keynote lectures by U.S. delegates to the NATO Research and Technology Organisation (RTO, formerly AGARD) AVT-154 Symposium on Advanced Methods in Aeroelasticity, Loen Norway, May 5-8, 2008.

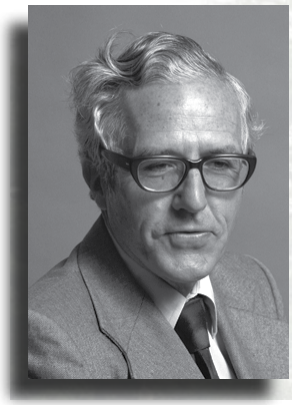
Ann Karagozian quoted in LA Times, also gives Northrop-Grumman talk


Ann Karagozian

Mechanical and aerospace engineering professor Ann Karagozian was quoted in the Los Angeles Times on Sunday, June 29, 2008, in an article about job opportunities in Southern California's aerospace industry. "I'm constantly getting phone calls and e-mails — 'We're hiring in this area. Do you have any students?' " said Ann Karagozian, professor in the UCLA MAE Department. The engineer's job is to "look at things critically and think 'What can go wrong? What are the pitfalls of this particular technology? How can I ameliorate that?' " Karagozian added.

Karagozian gave a lecture at Northrop-Grumman's Integrated Systems Western Region's Distinguished Speaker Series. Her presentation, "Preserving the Seed Corn: Perspectives on Aerospace Engineering and Basic Research in the U.S." provided an interesting and provocative look at past and current trends in the investment in and emphases within aerospace engineering.

In Memoriam



Dr. Rudolf X. Meyer

(1922-2008)

It is with great sadness that we acknowledge the passing of Adjunct Professor Rudolf X. Meyer. Rudy Meyer, a renowned expert on space technology and author of "Elements of Space Technology," developed and taught our course sequence on that topic for several years, from 1986 through 1999. His students benefited greatly from his many years of practical experience as an engineering manager and lead engineer at the Aerospace Corporation. His ready willingness and strong desire to transfer his industrial experience to students is one of the reasons why students judged his teaching to be outstanding. The department was very fortunate to have had this association with him. The faculty, staff, and students in the MAE department have lost a friend and colleague who will be greatly missed.

Mohamed Abdou has been elected as the Chairman of the International Standing Committee (ISC) for Fusion Nuclear Technology (FNT). ISC-FNT members includes key leaders with major responsibilities for FNT research and development in countries with major fusion programs (Europe, Japan, USA, Russia, China, S. Korea, and India). Fusion Nuclear Technology includes sciences, technical disciplines and technologies for all fusion nuclear components and plasma-interactive and high heat flux components. Prof Abdou will serve a 4-year term as the Chair of ISC-FNT.

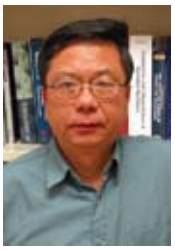
Greg Carman and postdoctoral student Chia-Ming (Gavin) Chang's paper received the Best Paper Award in Materials for 2007 from the Adaptive Structures and Material Systems Committee of the Aerospace Division of ASME, for their paper "Experimental evidence of end effects in magneto-electric laminate composites," which was published in the Journal of Applied Physics. Prof. Carman has won this award previously.

Research on thermal energy harvesting carried out by Professor Greg Carman's group and published in Applied Physics Letters, was highlighted by both Nature Materials ("Magnets for Energy") and Nature Physics ("Heat Harvest") in their Research Highlights sections. The paper, "Thermal energy harvesting device using ferromagnetic materials," published in Applied Physics Letters, discusses how to convert waste heat into useful electricity using magnetic material phase transformation properties.

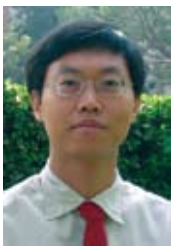
Pei-Yu Chiou won the National Science Foundation 2008 Faculty Early Career Development Award. Prof. Chiou will receive $400,000 in funding for support of his research over a five-year period. He will develop a "Massively Parallel Light-Driven Droplet Manipulation Platform for Large Scale Multiplexed Single Cell Analysis."

Vijay Dhir received ASME's 2008 Robert Henry Thurston Lecture Award. He was recognized for "seminal and path-breaking contributions to science and engineering of phase-change heat and mass transfer with boiling and multiple flows, which have had a long-lasting and significant impact on a diverse set of critical applications." The award will be presented at the 2008 ASME International Mechanical Engineering Congress and Exposition, to be held this fall in Boston.

Rajit Gadh was awarded the William Mong Visiting Research Fellowship in Engineering. Prof. Gadh will visit The University of Hong Kong for research collaboration with Dr. G.Q. Huang for two weeks during the period from July to August 2008.



Chih-Ming Ho received an Honorary Chair Professorship from the Engineering School of National Tsinghua University (NTHU) in Taiwan. This award recognizes Prof. Ho's impact made in the micro/nano technology field and his contributions in helping the growth of the Institute of NanoEngineering and MicroSystems (INMS) of National Tsinghua University. Dr. Ho was involved in the planning stage with the former President and Dean of NTHU to establish INMS. Among the INMS faculty members, four of them, Fan-Gang Tseng, Ta-Jen Yen , Jeffrey Da-Jeng Yao, and Ming-Chang Lee, received PhDs from UCLA. They have established a strong micro/nano system research program.



Y. Sungtaek Ju led a team of UCLA researchers to receive a major multi-million dollar award from DARPA to conduct innovative research and development (R&D) research in the area of electronics cooling.

Pirouz Kavehpour received the prestigious Young Investigator Award from the US Army. His research proposal, "Interfacial Tension & Contact Angle of Ionic Liquids: a Parametric Study" was selected after a peer review process. The objective of the Young Investigator Program is to attract outstanding young university faculty members to Army research, to support their research, and to encourage their teaching and research careers.

Chang-Jin Kim received the 2007-2008 Susan and Henry Samueli MAE Teaching Award. This award recognizes contributions to the educational mission of the department, and is based on student evaluations of teaching, contributions to student welfare, and curriculum development. Professor Kim was instrumental in the development of the MEMS curriculum for the department.

Bill Klug won the National Science Foundation 2008 Faculty Early Career Development Award. Prof. Klug will receive $400,000 in funding for support of his research over a five-year period. He will study "Membrane-Protein Interactions and the Mechanics of Cell Organelles."

Kuo-Nan Liou was recognized by the Intergovernmental Panel on Climate Change (IPCC) for his substantial contributions to the 2007 report that led to the IPCC being awarded the 2007 Nobel Prize with former Vice President Al Gore.

Anthony Mills won the Professor of the Year award from the Engineering Society of the University of California (ESUC). The award was presented at the Engineering Senior Dinner on Friday, May 30, 2008 in Covell Commons. ESUC's Professor of the Year award is given annually to a professor who has demonstrated excellence in teaching at the undergraduate level.

Neil Morley was recently appointed to the Editorial Board of the Journal of Fusion Engineering and Design, which is a highly respected international scholarly journal in the area of fusion nuclear science and technology. The main responsibility of an Editorial Board member is to help maintain the highest standards of quality for the journal through encouraging key authors to submit papers and by assisting in the editing and refereeing of newly submitted articles.

Laurent Pilon was awarded the ASME 2008 Bergles-Rohsenow Young Investigator Award in Heat Transfer. "Established in 2003, the award is given to a young engineer who is committed to pursuing research in heat transfer, and must have demonstrated the potential to make significant contributions to this field." Prof. Pilon's citation commends his "significant contributions to heat, mass and radiation transfer in foams, nanocomposite materials and biological systems."

Daniel Yang's paper "On the generation of analytical noncircular multi-lobe internal pitch-pair" received an "Honorable Mention Award" at the M&R (Mechanism and Robotics) Conference's Best Paper category. He and his co-authors were recognized at the ASME M&R Conference dinner. The 31st ASME Mechanisms and Robotics Conference was held September 4-7, 2007 in Las Vegas, Nevada.

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, was elected into the National Academy of Engineering (NAE) in 2006. 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. 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 Center for Cell Control and 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 Professor

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.

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 Chair

Professor Chih-Ming Ho holds the Ben Rich-Lockheed Martin Chair, 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.

L to R: Bret Keller (Senior, Project Manager); Jim Barrowman (Judge); Sara Wales (Senior, Recovery Lead); James Cox (Senior, Project Director); Paul Mueller (Founder of ESRA). Right: The first place UCLA Rocket being launched!

UCLA Rocket Team takes first in ESRA competition

BY BRET KELLER (founder and project manager)

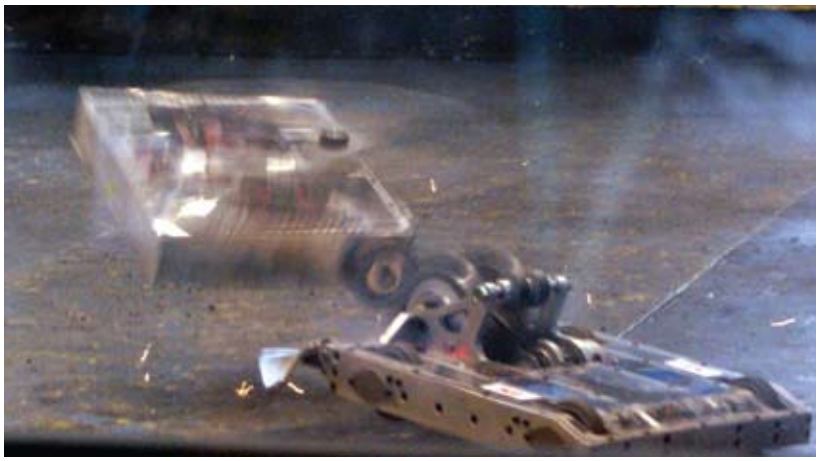
It was the UCLA Rocket Project's first year both as a project at UCLA and a team competing in an intercollegiate competition. Therefore it was fitting that the Project also placed first out of five university teams in the Experimental Sounding Rocket Association (ESRA)'s Third Annual Rocket Competition. The goal of the competition - which was held in Green River, Utah, June 26-27 - was to design, build, and launch a rocket capable of taking a 10 lb. payload to 10,000 ft. as well as submit a paper and give a team presentation. The competition was designed by the ESRA to give students hands-on design and construction experience that cannot be taught in a classroom.

The rocket was constructed mainly out of advanced composites. The body was made by hand rolling carbon fiber cloth into tubes, while the nosecone was completely student-built using fiberglass. Although the team was designing a student-built rocket motor, restrictions on obtaining and storing the necessary components forced the team to use a commercial rocket motor. The active payload for the rocket was a student-built CanSat, which deployed at apogee and took live video during its descent. The CanSat had a GPS and altimeter for recovery. The rocket itself also had an onboard GPS and altimeter for live tracking and final recovery of the rocket.

UCLA had a flawless launch and recovery of both the rocket and CanSat. It reached an altitude of 8,100 feet confirmed by both altimeters and both GPS's. It was also the only rocket at the competition to be successfully recovered in a timely manner.

It will be hard for next year's team to place better, but with a more advanced competition coming next year also hosted by the ESRA, there is always room for improvement and more dedicated members. We thank Raytheon for their support and hope they continue to support our program.

The Faculty Advisor for the UCLA Rocket Project is Professor Richard Wirz; students interested in joining the Rocket Project should contact Professor Wirz at wirz@ucla.edu.



UBRuined (left) and K2 (right) go weapon to weapon on a hit that sends UBRuined flying but breaks K2's steel disc. Photo by Rob Glidden.

ASME Battlebots represents UCLA with five robots at 2008 ROBOGames

BY ROB GLIDDEN

The ASME Combat Robotics student group represented UCLA with an unprecedented 5 robots at the 2008 ROBOGames, the largest robotics competition in the country. Competing in the 30, 60, and 120 lb weight classes, ASME robots demonstrated robust construction that took repeated pounding with little more than cosmetic damage.

Returning from 2007, 60 lb robot UBRuined 2.0 got off to a rowdy start by tearing through the wheels of Herr Gepounden, a 7-year veteran of robotic combat. Later in the event, UBRuined was the only robot able to do damage to ultimate champion K2, breaking K2's heavy toothed disk.

120 lb robot DracUCLA caught a couple of bad breaks, getting caught on the side rails due to its low ground clearance – an intended design, but ultimately a flaw. For a subsequent fight, the ASME team opted to give DracUCLA a gladiator's death at the hands of rival Bliss rather than forfeit. *(See DracUCLA's amazing final moments at http://www.burntpopcorn.net/~robotvideos/2008RG/HighSpeed/37%20-%20Bliss%20-%20DracUCLA.mov.)*

New to the event were 60 lb Bruiner of Worlds and 30 lb BruClash. These bots made use of lessons learned in 2007, built from welded aluminum 'bathtubs' that made construction simple and maximized internal space. Both bots performed better than designed, suffering no appreciable damage in any fight.

The ASME Combat Robotics team is establishing a reputation for continually 'stepping up' its presence at ROBOGames, bringing enough tools and spare parts to guarantee a solid event. We hope to maintain this image in the future with continued support from alumni and departmental resources. By continually building upon lessons learned, rather than simply maintaining existing projects, we can better demonstrate UCLA's status as a premier school for education in Engineering.

UCLA AIAA increases presence

BY GERARD TORIBIO (2007-2008 branch chairman)

The UCLA Student Branch of AIAA (the American Institute of Aeronautics and Astronautics) put on a larger slate of student programming in the 2007-2008 school year, increasing its presence among students. Through these programs, the Branch strives to enrich the UCLA engineering community, especially students in the Mechanical and Aerospace Engineering Department.

UCLA AIAA organized and hosted 19 guest speaker, industry tour, and student social events in 2007-2008. This past year, the Branch continued to expand its host of company info sessions, adding such notable organizations as Alliant TechSystems (ATK), Edwards Air Force Flight Test Center and United Space Alliance to the meeting slate. Field trips to Boeing's High Bay facility in El Segundo and Gulfstream's Long Beach site also doubled as recruitment sessions. These activities were supplemented by Career Development Workshops run by the Los Angeles Section of AIAA and the annual "Young Alumni Panel," at which recent UCLA MAE alumni shared their experience with life during and after undergraduate education. An ongoing series of technical seminars organized by the Branch have also complemented classroom learning; topics last year included NASA's Mars Science Laboratory, the science behind the Global Positioning System, satellite design, and the proper use of adhesives.

During the last two years, UCLA AIAA has established a tradition of providing engaging and fun student programs. This year, the UCLA Student Branch was awarded the AIAA Outstanding Region VI Student Branch Award based on its accomplishments in the 2006-2007 school year.

Supermileage Vehicle team's hope and change

BY BRETT ROSENTHAL

The 2007-2008 academic year was a tough one for UCLA Supermileage. Three of the team's founding members graduated: Michael Raymond, Brian Wilhelm, and Ben Pagliuso, two of whom (Mike and Brian) had been the team managers for the past two years. This created a huge manpower, experience and knowledge gap that the team attempted to overcome with new leadership in Project Manager Brett Rosenthal and Co-Assistant Project Managers Jordan Chase and Alex Chapman. For the first time the team would not be able to compete in the annual SAE SuperMileage competition in Marshall, MI because of funding constraints. However, SMV did compete at the American Shell Eco Marathon in Fontana, CA, taking 13th in a field of 29 highly fuel efficient vehicles.

One addition to the team that was extremely helpful was its new driver, Jessica Gu. In the past, Mike (weighing 160 lbs) had been the driver, but Jessica, weighing in at 110 lbs (the competition minimum weight for a driver), helped shave off 30% of the vehicle's total weight. Unfortunately, the weight saved with our new driver, accompanied by other advances in our vehicle design, were overshadowed by a broken weld.

Jessica Gu

After passing safety inspection and taking some practice laps, a weld on the gear reduction sprocket broke, effectively immobilizing the vehicle and ending hopes of reaching the 1000 mpg goal. Many phone calls and 24 hours later the team was able to locate a welder and have the sprocket fixed just in time to have a run before competition closed. The team's best run of 407.6 mpg was both disappointing and relieving. Disappointing because they had posted runs as high as 824 mpg last year at the same competition. Relieving because they overcame what would otherwise have been a competition ending mechanical failure in their drivetrain.

L to R: Ben Pagliuso, Jon Ho, Jordan Chase, Adam Kellada, Philippe Gerretsen, Henford Chan, Alex Chapman, Donald Lee, Brett Rosenthal. Photo by Jessica Gu.

Unable to go to Michigan in late spring as they would usually be able to, the team got a jump start on its new vehicle design. The 2008-2009 academic year is looking to be a promising one where the team may finally break its original goal of 1000 mpg with an upperclassmen-heavy and experienced team.

Along with the rest of the MAE department the SMV team felt the loss of Dale Cooper. He had helped mentor the students on the team and provided guidance for its design. The car this year was named in his memory as The Dale.

2008 UCLA Baja recap

BY ROHIT MITRA

The Society of Automotive Engineers (SAE) sponsors collegiate design competitions every year to allow engineering students from across the world to get real, practical, hands on experience. The competition with the greatest number of participants every year is the highly competitive Baja SAE series. In this engineering student project, students must design, build, test, and race an off-road dune buggy.

For the past nine years, UCLA has participated in the Baja SAE competition. This event starts on day one with a technical inspection, performed by volunteer engineers in the automotive field, where the students' vehicle is reviewed for compliance with the competition rules and safety requirements. This is followed by design presentations, sales presentations, and submission of cost and design reports. On day two the students race their cars in four small events: rock crawl, acceleration, hill climb, and maneuverability time trial. The competition is capped off on the final day with a four hour long endurance race where all teams' vehicles are on the track at the same time, all clawing for the most laps and the checkered flag.

This year, UCLA's Baja team continued their improvements on their vehicle designs and technical communication, besting their performance from previous years. Out of 115 teams, UCLA tied for 10th in Sales Presentation, tied for 12th in the Design Report, and tied for 2nd on the cost report. The second day's results were favorable, and allowed UCLA to keep a good position within the pack. On the final day, UCLA's vehicle posted roughly two and a half hours of track time in the endurance race, unfortunately leaving on two separate occasions for repairs. The vehicle did, however, finish the endurance race, crossing the finish line still in perfect running order after the four hours, a feat that most cars do not accomplish. Overall UCLA finished 35th, its best finish yet.

Generous donations from corporations such as General Motors made our participation in this project possible.

Robotics Club at UCLA has a great learning experience with 2008 University Rover Challenge

BY ANDREW BOGGERI

2007-2008 was the second year of the Mars Society's University Rover Challenge (URC) and the Robotics Club at UCLA was back again to compete. Facing a field of six teams from around the United States and Canada, the nascent competition had reached the next stage in its growth. The competition challenged teams to build an untethered, teleoperated rover capable of performing biological, geological, navigation, and construction tasks. Each team brought a unique perspective to the competition, evidenced by the great variety in construction and control methods for their rovers. The UCLA team's rover was distinct in being the only one to use hardened rubber treads as a drive system, as well as using IEEE 1394 (FireWire) Cameras and having a redundant communications system. The team also wrote a great deal of software, from sensor data parsing on the onboard microcontrollers to a high level communications protocol and user interface capable of scaling data transmission rates to fit the available network bandwidth.

Despite the solidity of the control software, the team suffered major mechanical failures in their drivetrain during on-site field testing, and were forced to withdraw after unsuccessful attempts at repair.

Neal Hutchinson, Shaun Taylor, Ioannis Manousiouthakis (back), Jennifer DePuy, Andrew Boggeri

The team is confident that their hard work will not go to waste, as the focus of the design this year was to create a modular platform capable of supporting future entries into the competition and requiring progressively less development as each year more time is spent on the hardware and software. The team would like to thank its generous sponsors, without whom their work this year would not have been possible: Northrop Grumman Space Technology, SolidWorks, PC Engines GmbH, Point Grey Research, Logic Supply, Foster-Miller, FreeWave, ViaSat, UCLA Engineering Alumni Association, National Instruments, Ubiquiti Networks, Labsphere, and UCLA CEED. For further information please see the team website at http://www.seas.ucla.edu/robotics/ and feel free to contact the team with questions or comments at ucla.robotics@gmail.com.

Fluid Mechanics Car Race

BY ALEKSANDRA SASHA LUKYANETS

This year's race theme in Prof. Kavehpour's Fluid Mechanics and Aerodynamics Laboratory (MAE 157A) was "Speed Racer", which seemed relevant, as the movie came out just as everyone was finishing up their projects. The difficulty present in this year's challenge was that the groups of 4 members were given the specifications for a particular motor that everyone had to build their remote-controlled cars around (to ensure that no particular group would have a powertrain advantage over the others), and their cars had to have a prime number of wheels! They participated in four different races: the first was a speed race around a long, oval track established on the 2nd floor, EIV patio; the second was a slalom race, following a pre-set path around the seating areas on the patio; the third was a tractor race, where each car had to pull a small Mickey Mouse mobile across a finish line, while it was struggling to pull the other way; and the final race was also a tractor race, where all of the participating cars were pitted head to head, elimination style.

Photo by Lili Bulhoes.

Juliett Davitian being congratulated on her award by Maj. Gen. (ret.) Bob Dickman, the AIAA Executive Director.

Juliett Davitian received one of the 2007 Outstanding Aerospace Engineering M.S. Student Awards from the AIAA (American Institute of Aeronautics and Astronautics), at the Space 2007 conference in Long Beach. Dr. Bill Ballhaus, Jr., President and CEO of the Aerospace Corporation, was the keynote speaker at the luncheon where Juliett was recognized.

Juliett received the UCLA Outstanding M.S. Student in Aerospace Engineering award in June, 2007. She is continuing her studies toward her Ph.D. degree under the guidance of Prof. Ann Karagozian. Juliett is experimentally exploring the nature of transverse jet shear layer instabilities and their control. To read more about Juliett's work, please go to http://www.seas.ucla.edu/combustion/projects/transverse_jet.html.

Chia-Ming (Gavin) Chang

MAE postdoctoral student **Chia-Ming (Gavin) Chang** and MAE Professor Greg Carman received the Best Paper Award in Materials for 2007 from the Adaptive Structures and Material Systems Committee of the Aerospace Division of ASME, for their paper "Experimental evidence of end effects in magneto-electric laminate composites," which was published in the Journal of Applied Physics, v. 102, issue 12, Article Number: 124901, 2007, http://link.aip.org/link/?JAPIAU/102/124901/1.

Daniel Getsinger

Daniel Getsinger was just selected as a NASA Graduate Student Research Program fellow for the academic year 2008-2009. The nationally competitive NASA GSRP fellowship is renewable for up to three years. Daniel just finished his first year of grad school in the MAE department, having received his B.S. in Aerospace Engineering from the University of Maryland in 2007. He has been working in Prof. Ann Karagozian's Energy and Propulsion Research Laboratory on optical diagnostics for controlled jet experiments.

To read more about Daniel's project, please go to http://www.seas.ucla.edu/combustion/projects/transverse_jet.html.

Jong-Eun Ryu

Jong-Eun Ryu (doctoral student in Prof. H. Thomas Hahn's group) has won this year's Perkin Elmer Award. His abstract "The Incorporation of MWNT-Enzyme Biocomposites to Glucose/O_2 Biofuel Cell Devices" was judged the best out of the 24 entries received this year. The panel of experts from industry judged the entries in two rounds. All judging was done blind: the judges only saw the title, abstract, current degree of the participant (i.e. undergrad, Masters, Doctoral) and year this degree was started. They did not know the name or university affiliation. The Award carries a $500 travel allowance to SPE's ANTEC this year, $1000 prize money ($500 from PerkinElmer and $500 from the SPE Composites Division) and a plaque at the conference.

Tony Pereira (UCLA ME PhD Candidate) won a prestigious international engineering award nomination for a project submitted to the Mondialogo Engineering Award competition sponsored by UNESCO, DaimlerChrysler and the United Nations. Tony's project title is "Global Basic Needs in an Integrated Sustainable Approach." This award nomination carries a prize of $5,000 Euros (about $7,500 US), and a full paid trip to the award conference in Mumbai/India in December of 2007. A total of 3,200 students of engineering sciences from 89 countries and from prestigious universities worldwide such as Cambridge, MIT, Yale, and Stanford registered for this second edition of the Mondialogo Engineering Award. A total number of 891 projects from 69 countries were submitted in many diverse areas of engineering. From these, an international six-nation jury nominated 30 teams to proceed to the final of the worldwide engineering contest award conference in Mumbai/India. If Tony's project qualifies in the top ten projects at the Conference, a prize of $20,000 Euros (about $30,000 US) will be awarded to him. Prof. Shahram Sharafat at the UCLA-MAE-Fusion Dept. graciously offered faculty assistance and encouragement for the project.

Tony Pereira

"I am extremely pleased and honored for the recognition given to my project by the world community. It signifies a very welcome shift in awareness and critical thinking worldwide. Change to a sustainable way of life is required everywhere without delay if our species is serious about its own future in this far corner of the universe," says Tony.

MAE HSSEAS Student Awards winners

The recipients of the MAE Outstanding Student Awards for 2007-2008 were announced at this year's Commencement Ceremony. All students are commended for their accomplishments!

Samuel Araki, BS/AE, will be continuing as a graduate student in our department in the Fall.

Chia-Ming Chang, PhD/ME, received (with Greg Carman) the Best Paper Award in Materials for 2007 from the Adaptive Structures and Material Systems Committee of the Aerospace Division of ASME (see story on page 20).

Jaafar El-Awady, PhD/AE, is continuing his postgraduate work in the Advanced Metals group at the Wright-Patterson Air Force Lab (WP-AFRL) in Dayton Ohio. His research involves the development of computational methods that allow direct simulation of plasticity at the microstructure level, which is critical in addressing the Air Force's needs for creating next generation materials. These modeling and simulation techniques have the potential of reducing the cost and time of experiments that need to be conducted to gain fundamental insight into new materials. Part of this work is performed in collaboration with Prof. Nasr Ghoniem's research group in the UCLA MAE department.

Daniel Getsinger, MS/AE, was just selected as a NASA Graduate Student Research Program fellow for the academic year 2008-2009 (see story on page 20).

Karan Hemant Mistry, BS/ME, was also awarded the HSSEAS Outstanding B.S. Student Award; only one such award is given for the entire School of Engineering and Applied Science. He will be a graduate student at MIT in the Fall.

Damien Vanderpool, MS/ME, will be working as an engineering consultant at ATA Engineering in San Diego starting in September. Damien has worked on several projects at MAE (both as a graduate and undergraduate) including the direct conversion of waste heat into electricity via pyroelectricity, and the determination of the rheology of colloidal gas aphrons through various sized tubes (these projects can be found on MAE Prof. Laurent Pilon's website). Damien just finished his second year as a graduate student in the UCLA MAE Department, having written a thesis, two journal papers, and one conference paper.

DYNAMICS

Oddvar O. Bendiksen

Classical and computational aeroelasticity, structural dynamics and unsteady aerodynamics.
Associate Fellow, AIAA, 1995

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.

Daniel C. H. Yang

Robotics and mechanisms; CAD/CAM systems, computer controlled machines.
Fellow, ASME, 2007

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.

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

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.

John Kim

Numerical simulation of transitional and turbulent flows, turbulence and heat-transfer control, numerical algorithms for computational physics.
Fellow, American Physical Society, 1989

Owen I. Smith

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

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

HEAT AND MASS TRANSFER

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
Fellow, American Nuclear Society, 1999

Vijay K Dhir

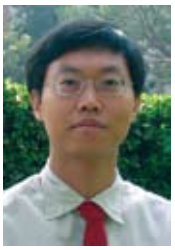
Two-phase heat transfer, boiling and condensation, thermal and hydrodynamic stability, thermal hydraulics of nuclear reactors, microgravity heat transfer, soil remediation.

Member, National Academy of Engineering, 2006
Fellow, ASME, 1989
Fellow, American Nuclear Society, 1997

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, sustainable energy, nanoscale thermoscience, foams.

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

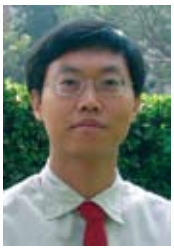
Damage and failure of materials in mechanical design; mechanics and physics of material defects (point defects, dislocations, voids and cracks); material degradation in severe environments (e.g. nuclear, fusion, rocket engines, etc.); plasma and laser processing; materials non-equilibrium, pattern formation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

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

H. Thomas Hahn

Multifunctional composites, nanocomposites, nanomanufacturing, energy harvest/storage systems, autonomic composites for self healing and thermal management.

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



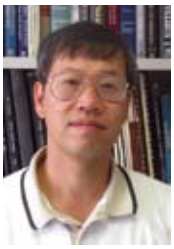
Y. Sungtaek Ju

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

Daniel C. H. Yang

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

Fellow, ASME, 2007



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.

MEMS AND NANOTECHNOLOGY

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.

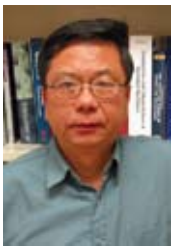
Pei-Yu Chiou

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

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



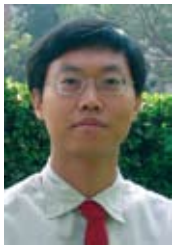
Chih-Ming Ho

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



Y. Sungtaek Ju

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

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.

Chang-Jin Kim

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

Laurent G. Pilon

Radiation transfer, biomedical optics, photobiological hydrogen production, sustainable energy, nanoscale thermoscience, foams.

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

Multifunctional composites, nanocomposites, nanomanufacturing, energy harvest/storage systems, autonomic composites for self healing and thermal management.
Fellow, ASME, 1993
Fellow, American Society for Composites 1996

William Klug

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

Christopher Lynch

Ferroelectric materials including experimental characterization of constitutive behavior under multiaxial loading.

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

SYSTEMS AND CONTROL

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.

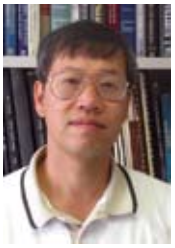
Robert T. M'Closkey

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

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.

JOINT APPOINTMENTS

Albert Carnesale
J.S. Chen
Kuo-Nan Liou

ADJUNCT PROFESSORS

Emilio Frazzoli
Leslie Lackman
Webb Marner
Neil Morley
Robert S. Shaefer
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
Alex Samson
Lucien A. Schmit, Jr.
Richard Stern
Russell A. Westmann

STAFF

Bedig, Janice	Management Services Officer
Bulhoes, Lili	Staff Personnel/Payroll
Castillo, Angie	Student Affairs Officer
Castro, Coral	Purchasing and Reimbursements
Chan, Grace	Administrative Assistant
Dang, Duy	Business Office Manager
Duffy, Alexander	Web and Publications Manager
Kono, Lance	Facilities Manager
Lebon, Abel	Student Affairs Officer
Lozano, Miguel	Senior Laboratory Mechanician
Macaso, Mary Ann	Fund Manager
Olekszyk, Martin	Fund Manager
Shatto, David	Administrative Assistant
Tan, Benjamin	Senior Development Engineer
Terranova, Marcia	Academic Personnel/Payroll

The MAE Department thanks its Industrial Partners:

CURRENT PARTNERSHIPS

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

Graduates 2007-2008 DOCTOR OF PHILOSOPHY

Commencement, June 2008.

Andersen, Michael Louis: Roughening of Surfaces Under Intense And Rapid Heating (Prof. N. Ghoniem)

Aryafar, Hamarz: Coalescence of Liquid Drops and Liquid-Liquid Interfaces (Prof. P. Kavehpour)

Chang, Chia-Ming: Coupling Effect of Finite Magneto-Electric Laminate Composites (Prof. G. Carman)

Chasparis, Georgios Christos: Distributed Learning and Efficient Outcomes in Uncertain and Dynamic Environments (Prof. J. Shamma)

Chatterjee, Sudipta: Tribological Properties of Pseudo-Elastic Nickel Titanium (Prof. G. Carman)

Enright, John Joseph: Efficient Routing of Multi-Vehicle Systems: Limited Sensing and Nonholonomic Motion Constraints (Prof. E. Frazzoli)

El-Awady, Jaafar: Large-scale Dislocation Dynamics Simulations of Fatigue Microstructure and Crack Initiation in Copper and Nickel-based Superalloys (Prof. N. Ghoniem)

Gong, Jian: Portable Digital Microfluidic System: Direct Referencing EWOD Devices and Operating Control Board (Prof. C.J. Kim)

Jameson, Kristina Kathleen: Investigation of Hollow Cathode Effects on Total Thruster Efficiency in a 6 kW Hall Thruster (Prof. A. Lavine)

Katika, Kamal: Transient Radiation Transport in Biological Tissues and Applications to Autofluorescence of Human Skin (Prof. L. Pilon)

Kim, Han Sang: Structural Integrity Enhancement of Graphite Fiber Composites Using Nanoparticles (Prof. T. Hahn)

Le, Anne Hong-An: Flutter Suppression of Wings with External Stores Using Shape Memory Alloys (Prof. G. Carman)

Lee, Hyesog: Sub-Diffracton-Limited Optical Imaging with Superlens and Hyperlens (Prof. X. Zhang)

Lin, Chi-Ying: Adaptive and Repetitive Control of a Fast Tool Servo for Precision Motion Control (Prof. T. Tsao)

Lu, Hsiang-Wei: Fluid Dynamics of an Electrowetting Drop: Theories, Simulations, and Experiments (Prof. C.J. Kim)

Meduri, Phani Kiran: Wall Heat Flux Partitioning during Subcooled Flow Film Boiling of Water on a Vertical Surface (Prof. V. Dhir)

Perez Arancibia, Nestor Osvaldo: Adaptive Control of Opto-Electro-Mechanical Systems for Broadband Disturbance Rejection (Prof. S. Gibson)

Sen, Prosenjit: Driving Liquid-Metal Droplets for Rf Microswitching (Prof. C.J. Kim)

Wang, Xiaoyong: Modeling and Experiment of Compressed Air Hybrid Engines (Prof. T. Tsao)

Wu, Jinfeng: Numerical Simulation of the Dynamics and Heat Transfer Associated with a Single Bubble in Subcooled Pool Boiling and in the Presence Of Noncondensables (Prof. V. Dhir)

Commencement, June 2008. All commencment photos by Angie Castillo.

Commencement, June 2008.

M.S. Thesis Plan

Dey, Rohit: RFID for In-Building Location Finding and RTLS (Prof. R. Gadh)

Fu, Jianping: Integrated Electroplated Heat Spreaders for High Power Semiconductor Lasers (Prof. G. Chen)

Hoshino, Tetsuya: Modeling the Biomechanics of Arterial Plaques (Prof. W. Klug)

Jordan, Brett Lebeau: Cable Based Environmental Sensing Systems (Prof. R. M'Closkey)

Karnani, Sunny: Characterizing the Reliability of Embedded Bragg Grating Optical Sensors (Prof. G. Carman)

Maung, Kyawwin: Multifunctional Characterization of Structurally Integrated Thin-Film Silicon Solar Modules (Prof. Y. Ju)

Papp, Daniel: Numerical and Experimental Studies on Creeping Contact Deformation and Lithium Metatitanate Ceramic Breeder Pebble Beds (Prof. M. Abdou)

Roth, Timothy Branchek: Modeling and Numerical Simulations of Pulse Detonation Engines with MHD Thrust Augmentation (Prof. A. Karagozian)

Uechi, Kawika A: Quantifying the Deformation of PDMS Microchannels under Pressure Driven Flow (Prof. P. Kavehpour)

Vanderpool, Damien: Numerical and Experimental Study of a Pyroelectric Energy Converter for Harvesting Waste Heat (Prof. L. Pilon)

Commencement, June 2008.

M.S. Comprehensive Exam Plan

Alley, Erick Shaw (Prof. N. Ghoniem)

Aoyama, Aaron Takeo (Prof. N. Ghoniem)

Asheghian, Laila Thurman (Prof. A. Lavine)

Attia, Joseph Ahmad (Prof. P. Kavehpour)

Ayala, Miguel A (Prof. P. Kavehpour)

Badger, Cody Card (Prof. D. Yang)

Behrens, John William (Prof. G. Carman)

Borst, Ken Link (Prof. R. M'Closkey)

Chang, Chia-Ming (Prof. G. Carman)

Chang, Mike Rocky (Prof. N. Morley)

Chao, Joseph (Prof. D. Yang)

Chen, Anthony Sean (Prof. A. Mal)

Chen, David Yen (Prof. P. Chiou)

Chen, Ken Jian (Prof. T. Tsao)

Choi, Jason (Prof. N. Ghoniem)

Christiansen, Alexander Paul (Prof. S. Gibson)

Chun, Young Jae (Prof. G. Carman)

Darrow, Matthew James (Prof. A. Mills)

Davis, Ryan (Prof. I. Catton)

Delli Quadri, Lino (Prof. A. Karagozian)

Fields, Michael James (Prof. C. Ho)

Fisher, Zachary Thomas (Prof. R. Gadh)

Fong, William Randal (Prof. J. Eldredge)

Garcia, Silverio, Jr (Prof. W. Klug)

Giudici, Daniel Philip (Prof. R. M'Closkey)

Gobburu, Aditi Usha (Prof. A. Mills)

Groth, Todd Allen (Prof. T. Hahn)

Haulot, Gauvain (Prof. C. Ho)

Hays, James Lee (Prof. A. Mills)

Hsu, Shun Ching (Prof. T. Tsao)

Huang, Kuo-Wei (Prof. P. Chiou)

Johnson, Dane Allen (Prof. G. Carman)

Johnson, William Leigh (Prof. T. Tsao)

Kang, Christopher Sunghwa (Prof. R. M'Closkey)

Kerrigan, Catherine Ann (Prof. G. Carman)

Kuron, Michael Joseph (Prof. J. Kim)

Li, Xiao (Prof. T. Tsao)

Lillehoj, Peter (Prof. C. Ho)

Lin, Chi-Ying (Prof. T. Tsao)

Lopez, Luis Fernando (Prof. T. Hahn)

Lostrom, Carl Eric (Prof. R. Gadh)

Ma, Christopher Bor-Hau (Prof. W. Klug)

Moore, Duane Padraic (Prof. X. Zhong)

Navid, Ashcon (Prof. L. Pilon)

Nazaryan, Hovik (Prof. O. Bendiksen)

Nordling, David Allen (Prof. A. Karagozian)

Parrelli, Brian Scott (Prof. J. Eldredge)

Pearson, Brandy Megan (Prof. V. Gupta)

Petrone, Nicholas Walker (Prof. C.J. Kim)

Pham, Hien Cao (Prof. R. M'Closkey)

Post, Ethan Adam (Prof. O. Bendiksen)

Quan, Alec Kam Lek (Prof. D. Yang)

Ramadan, Shadwa Ibrahim (Prof. A. Mal)

Reyes Martinez, Karla Arianne (Prof. G. Carman)

Rinard, Luke (Prof. T. Tsao)

Rodriguez, Edson Gabriel (Prof. A. Karagozian)

Sainath, Santhosh Kumar (Prof. J. Speyer)

Salha, Karim H (Prof. D. Yang)

Sentz, Nathan Robert (Prof. D. Yang)

Sharp, Tristan Alan (Prof. O. Smith)

Shim, Dong Eun (Prof. T. Hahn)

Silverberg, Kristen Elisabeth (Prof. T. Tsao)

Tam, Vincent Kai-Sing (Prof. I. Catton)

Tamayo, Thomas (Prof. R. Gadh)

Tanimoto, Rebekah (Prof. A. Karagozian)

Tarzi, Zahi Bassem (Prof. J. Speyer)

Tavassoli, Reza (Prof. A. Karagozian)

Tea, Chai Seng (Prof. A. Mal)

Tsai, Louis (Prof. D. Yang)

Venegas, Michael (Prof. S. Gibson)

Wang, David H (Prof. C. Ho)

Wang, Xiaoyong (Prof. T. Tsao)

Xia, Shuang (Prof. A. Lavine)

Yoo, Jang Lawrence Hyun (Prof. V. Gupta)

Yudovsky, Dmitry (Prof. T. Tsao)

Zachariah, Jopu (Prof. R. Gadh)

Zhen, Janet (Prof. C. Ho)

Journal Articles

Dynamics

Seber, G., and Bendiksen, O.O., "Nonlinear Flutter Calculations Using Finite Elements in a Direct Eulerian-Lagrangian Formulation," AIAA Journal, vol. 46, pp. 1331-1341, June 2008.

Fluid Mechanics

Megerian, S., Davitian, J., Alves, L.S. de B., and Karagozian, A.R., "Transverse Jet Shear Layer Instabilities. Part I: Experimental Studies," Journal of Fluid Mechanics, Vol. 593, pp. 93-129, 2007.

Alves, L.S. de B., Kelly, R.E., and Karagozian, A.R., "Transverse Jet Shear Layer Instabilities. Part II: Linear Analysis for Large Jet-to-Crossflow Velocity Ratios.," Journal of Fluid Mechanics, vol. 602, pp. 383-401, 2008.

Ashmore, J., Shen, A.Q., Kavehpour, H.P., Stone, H.A, and McKinley, G.H., "Coating Flows of Non-Newtonian Fluids: Weakly and Strongly Elastic Limits," J. Eng. Math, vol. 60, pp. 17-41, 2008.

Aryafar, H., and Kavehpour, H.P., "Hydrodynamic Instabilities of Viscous Coalescing Droplets," Phys. Rev. E., vol. 78, pp. 037302-1-037302-4, 2008.

Eldredge, J.D., "Dynamically coupled fluid-body interactions in vorticity-based numerical simulations," Journal of Computational Physics, vol. 227, pp. 9170-9194, 2008.

Eldredge, J.D. and Pisani, D., "Passive propulsion of a simple articulated system in the wake of an obstacle," Journal of Fluid Mechanics, vol. 607, pp. 279-288, 2008.

Zhang, J.L. and Eldredge, J.D., "A viscous vortex particle method for deforming bodies, with application to biolocomotion," International Journal for Numerical Methods in Fluids, pp. 1-22, 2008.

Lu, K., Brodsky, E.E., and Kavehpour, H.P., "A Thermodynamic Unification of Jamming," Nature Physics, pp. 1-4, April 2008.

Heat and Mass Transfer

Berberoglu, H., Yin, J., and Pilon, L., "Light Transfer in Bubble Sparged Photobioreactors for H2 Production and CO2 Mitigation," International Journal of Hydrogen Energy, vol. 32, pp. 2273-2285, September 2007.

Z. An, A. Ying, M. Abdou, "Application of discrete element method to study mechanical behaviors of ceramic breeder pebble beds," Fusion Engineering and Design, vol. 82, pp. 2233-2238, October 2007.

M. Ni, R. Munipalli, N. Morley, P. Huang, M. Abdou, "Validation Case Results for 2D and 3D MHD Simulations," Fusion Science & Technology, vol. 52, pp. 587-594, October 2007.

A. Ying, M. Narula, R. Hunt, M. Abdou, Y. Ando, I. Komada, "Integrated thermo-fluid analysis towards helium flow path design for an ITER solid breeder blanket module," Fusion Engineering and Design, vol. 82, pp. 2217-2225, October 2007.

T. Yokomine, J. Takeuchi, H. Nakaharai, S. Satake, T. Kunugi, N. Morley, M. Abdou, "Experimental Investigation of Turbulent Heat Transfer of High Prandtl Number Fluid Flow Under Strong Magnetic Field," Fusion Science & Technology, vol. 52, pp. 625-629, October 2007.

Berberoglu, H., and Pilon, L., "Experimental Measurements of the Radiation Characteristics of Anabaena Variabilis ATCC 29413-U and Rhodobacter Sphaeroides ATCC 49419," International Journal of Hydrogen Energy, vol. 32, pp. 4772-4785, November 2007.

Kitamura, R., Pilon, L., and Jonasz, M., "Optical Constants of Fused Quartz From Extreme Ultraviolet to Far Infrared at Near Room Temperatures," Applied Optics, vol. 46, pp. 8118-8133, November 2007.

J. Takeuchi, S. Satake, T. Kunugi, T. Yokomine, N. Morley, M. Abdou, "Development of PIV Technique Under Magnetic Fields and Measurement of Turbulent Pipe Flow of Flibe Simulant Fluid," Fusion Science & Technology, vol. 52, pp. 860-864, November 2007.

Mills, A.F., "Diffusion creep," International Journal of Heat and Mass Transfer, vol. 50, pp. 5087-5098, December 2007.

Navid, A., and Pilon, L., "Effect of Polarization and Morphology on the Optical Properties of Absorbing Nanoporous Thin Films," Thin Solid Films, vol. 516, pp. 4159-4167, December 2007.

Ju, Y.S., "Impact of Interface Resistance on Pulsed Thermoelectric Cooling," Journal of Heat Transfer, vol. 130, 2008.

Berberoglu, H., Barra, N., Pilon, L., and Jay, J., "Growth, CO2 Consumption and H2 Production of Anabaena Variabilis ATCC 29413-U Under Different Irradiances and CO2 Concentrations," Journal of Applied Microbiology, vol. 104, pp. 105-121, January 2008.

Berberoglu, H., Jay, J., and Pilon, L., "Effect of Nutrient Media on Photobiological Hydrogen Production by Anabaena variabilis ATCC 29413," International Journal of Hydrogen Energy, vol. 33, pp. 1172-1184, February 2008.

Chang, B.H., Mills, A.F., Hernandez, E., "Natural convection of microparticle suspensions in thin enclosures," International Journal of Heat and Mass Transfer, vol. 51, pp. 1332-1341, March 2008.

M. Pattison, K. Premnath, N. Morley, M. Abdou, "Progress in lattice Boltzmann methods for magnetohydrodynamic flows relevant to fusion applications," Fusion Engineering and Design, vol. 83, pp. 557-572, May 2008.

Katika, K.M., and Pilon, L., "The Effect of Nanoparticles on the Thermal Conductivity of Nanocomposite Thin Films at Low Temperatures," Journal of Applied Physics, vol. 103, June 2008.

Larmignat, S., Vanderpool, D., Lai, H., and Pilon, L., "Rheology of Colloidal Gas Aphrons," Colloids and Surfaces A: Physicochemical and Engineering Aspects, vol. 322, pp. 199-210, June 2008.

Manufacturing and Design

Z. Guo, X. Liang, R. Scaffaro, T. Pereira, and H.T. Hahn, "CuO Nanoparticle Reinforced Vinyl-ester Resin Nanocomposites: Fabrication, Characterization and Property Analysis," Composite Science and Technology, vol. 67, pp. 2036-2044, 2007.

Z. Guo, S. Park, H.T. Hahn, S. Wei, M. Moldovan, A.B. Karki, and D.P. Young, "Magnetic and Electromagnetic Evaluation of the Magnetic Nanoparticle Filled Polyurethane Nanocomposites," Journal of Applied Physics, vol. 10, pp. 1-3, 2007.

Z. Guo, S. Park, S. Wei, T. Pereira, M. Moldovan, A.B. Karki, D.P. Young, and H.T. Hahn, "Flexible High-loading Particle Reinforced Polyurethane Magnetic Nanocomposite Fabrication through Particle Surface Initiated Polymerization," Nanotechnology, vol. 18, issue 33, pp. 1-8, 2007.

Su, X., Chu, C.C., Prabhu, B.S., and Gadh, R., "On the Identification Device Management and Data Capture via WinRFID Edge-Server," IEEE Systems Journal, vol. 1, pp. 95-104, December 2007.

Coltman, T., Gadh, R., and Michael, K., "RFID and Supply Chain Management: Introduction to the Special Issue," Journal of Theoretical and Applied Electronic Commerce Research, vol. 3, pp. iii-vi, 2008.

Z. Guo, K. Kim, K. Lei, T. Pereira, H.T. Hahn, "Strengthening and Thermal Stabilization of Polyurethane Nanocomposites with Silicon Carbide Nanoparticles by a Surface-Initiated-Polymerization Approach," Composites Science and Technology, vol. 68, pp. 164-170, 2008.

Z. Guo, K. Lei, H. W. Ng, H.T. Hahn, "Fabrication and Characterization of Iron Oxide Nanoparticle Reinforced Vinyl-ester Resin Nanocomposites Composites Science and Technology," vol. 68, pp. 1513-1520, 2008.

Z. Guo, H.T. Hahn, H. Lin, A.P. Karki, and D.P Young, "Magnetic and Magnetoresistance Behaviors of Particulate Iron/Vinyl Ester Resin Nanocomposites," Journal of Applied Physics, vol. 104, pp. 1-5, 2008.

T. Pereira, Z. Guo, S. Nieh, J. Arias, H.T. Hahn, "Embedding Thin-Film Lithium Energy Cells in Structural Composites," Composites Science and Technology, vol. 68, pp. 1935-1941, 2008.

T. Pereira, R. Scaffaro, Z. Guo, H. T. Hahn, "Performance of Thin-Film Li-Ion Energy Cells under Uniaxial Pressure," Advanced Engineering Materials, vol. 10, pp. 1-7, 2008.

Y. Tan, G. Wu, S.S. Suh, J.M. Yang, and H.T. Hahn, "Damage Tolerance and Durability of Selectively Stitched Stiffened Composite Structures," International Journal of Fatigue, vol. 30, pp. 483-492, 2008.

Levi, D.S., Williams, R.J., Liu, J., et al., "Thin Film Nitinol Covered Stents: Design and Animal Testing," ASAIO Journal, vol. 54, pp. 221-226, May 2008.

MEMS and Nanotechnology

Chamran, F., Yeh, Y., Min, H.S., Dunn, B., and Kim, C.J., "Fabrication of High-Aspect-Ratio Electrode Arrays for Three-Dimensional Microbatteries," J. Microelectromechanical Systems, vol. 16, pp. 844-852, August 2007.

L. Chen, Y. Xia, X. Liang, K. Yin, J. Yin, and Z. Liu, Y. Chen, "Nonvolatile Memory Devices with Cu2S and Cu-Pc Bilayered Films," Applied Physics Letters, vol. 91, pp. 073511-073513, 14 August 2007.

Ho, C.M. and Chen, J.M., "The Convergence of Bio, Nano and Information Technologies," IEEE Nano Technology Magazine, vol. 1, pp. 18-21, September 2007.

N. P. Kobayashi, V.J. Logeeswaran, M. S. Islam, X. Li, J. Straznicky, S.Y. Wang, R. S. Williams, and Y. Chen, "Hydrogenated Microcrystalline Silicon Electrodes Connected by Indium Phosphide Nanowires," Appl. Phys. Lett., vol. 91, pp. 113116-113119, 14 September 2007.

S. Huang, E. Schopf, and Y. Chen, "Dynamically Configurable Biomolecular Nanoarrays," Nano Lett, 21 September 2007.

Lu, H.W., Glasner, K., Bertozzi, A., and Kim, C.J., "A Diffuse Interface Model for Electrowetting Drops in a Hele-Shaw Cell," J. Fluid Mechanics, vol. 590, pp. 411-435, November 2007.

Meng, D. D., Cubaud, T., Ho, C.M., and Kim, C.J., "A Methanol-Tolerant, Gas-Venting Microchannel for a Micro Direct Methanol Fuel Cell," J. Microelectromechanical Systems, vol. 16, pp. 1403-1410, December 2007.

Chiou, P. Y., Wu, T.H., "Laser Guided Drug Delivery and Therapy," IEEE Nano Technology Magazine, vol. 2, pp. 20-21, 2008.

Chiou, P.Y., Zhang, Z., Wu, M.C., "Droplets Manipulation with Light on Optoelectrowetting Device," IEEE Journal of Microelectromechanical Systems, vol. 17, pp. 133-138, 2008.

Chiou, P.Y., Ohta, A.T., Jamshidi, A., Hsu, H.Y., Wu, M.C., "Light Image Patterned Microfluidic Vortices for Parallel Nanoparticle Trapping and Transport," IEEE Journal of Microelectromechanical Systems, vol. 17, pp. 525-531, 2008.

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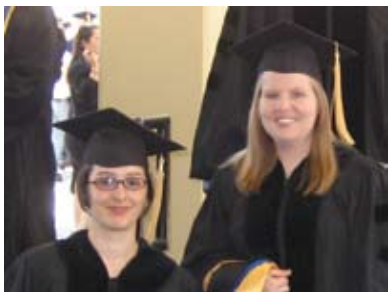

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Overview

Faculty and Staff

Ladder Faculty:	31
Joint Faculty:	3
Emeritus Faculty:	14
Adjunct Faculty:	6
Lecturers:	40
Research Staff:	15
Administrative Staff:	22

Recognitions

Society Fellows:	23
CAREER or Young Investigator Awards:	11
NAE members:	7
Regular Faculty:	3
Affiliated Faculty:	1
Emeriti:	3

Publications

Journal Articles:	90
Conference Papers:	61
Books and Book Chapters:	10
Patents:	10

Graduate student researcher Kancy Lee. Photo by Don Liebig.

Research Facilities

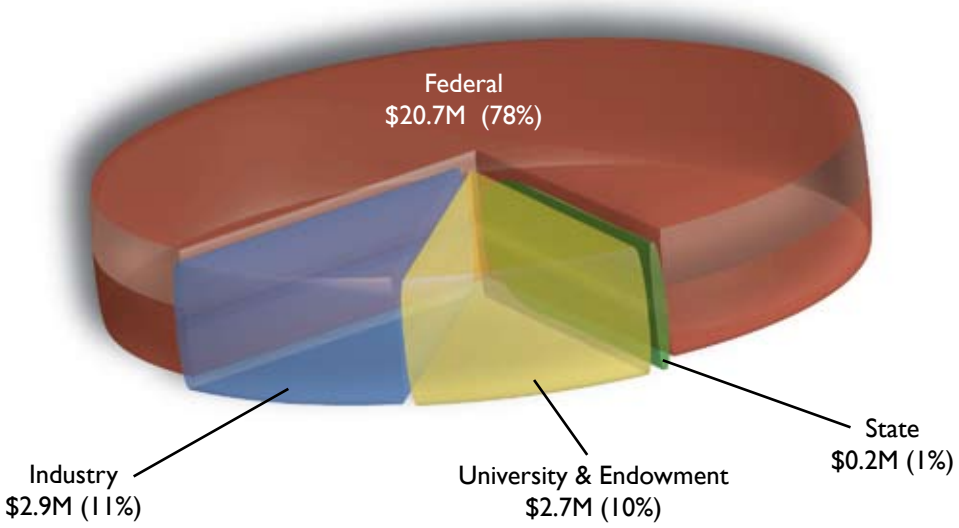
Department contributes to three Research Centers:

Center for Cell Control (CCC)
California NanoSystems Institute (CNSI)
Center for Scalable and Integrated NanoManufacturing (SINAM)

Laboratories and Research Groups: 32
Facilities square footage: 32,743 sq. ft.
Department square footage: 76,918 sq. ft.

Fiscal Year 2007-2008 Sponsored Research Budget - Total $26.5M

(Fiscal Year 2007-2008 Sponsored Research Expenditures - Total $14.3M)



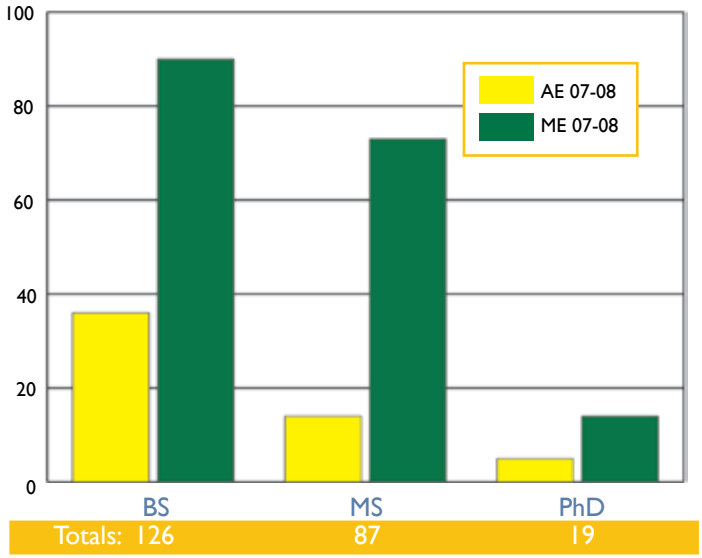
Undergraduate Students

Students Enrolled:	710
Applicants (Freshmen and Transfers):	2015
Admitted:	599 (30%)
New Students Enrolled:	251 (42%)
Average Unweighted GPA:	3.88/4.0

Graduate Students

Students Enrolled:	262
Applicants (MS and PhD):	393
Admitted:	196 (50%)
New Students Enrolled:	88 (45%)
Average GPA:	3.55/4.0

AE & ME Degrees Conferred 2007-2008



Department Fellowships and Teaching Assistantships

Graduate Division	$ 569,142.00
TA Funding	$ 555,143.00
HSSEAS	$ 176,000.00
Cota-Robles Fellowship	$ 81,604.50
GOFP Fellowship	$ 42,935.00
NSF Graduate Fellowship	$ 38,967.50
UCLA Competitive Edge	$ 12,000.00
Research Mentorship Program	$ 8,988.50
Total	**$1,484,780.50**

The Department gratefully acknowledges the UC Atkinson Archives, UCLA Photography, and the UCLA Office of External Affairs for permission to use many of the images in this report. Design and layout by Alexander Duffy.

UCLA Engineering

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