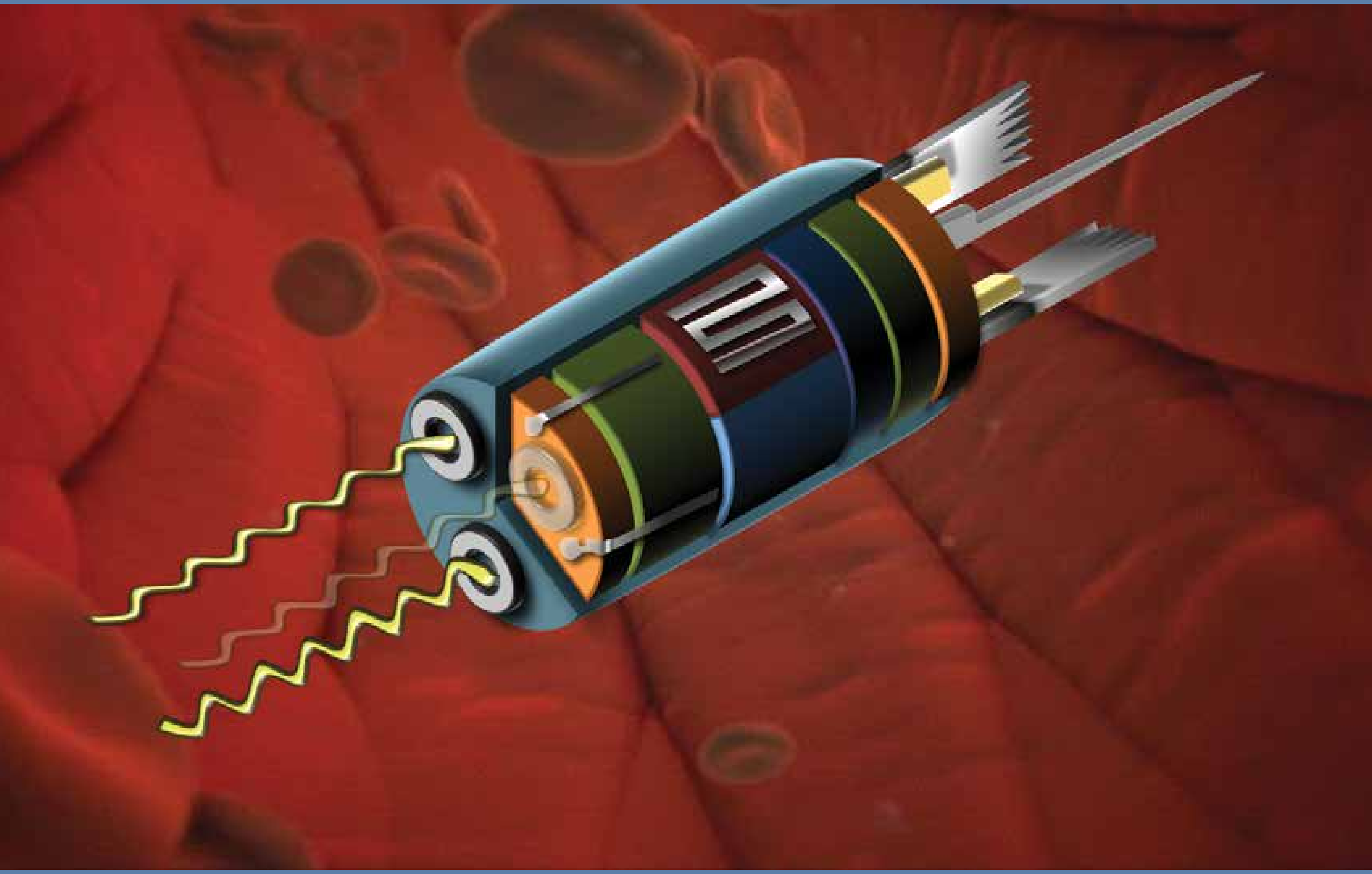
Mechanical & Aerospace Engineering Department

2012-13



UCLA ENGINEERING
Henry Samueli School of
Engineering and Applied Science

Birthplace of the Internet

Chair's Message

Dear Friends and Colleagues,

I am pleased to present to you the Annual Report of the Mechanical and Aerospace Engineering Department. The Report presents highlights of the accomplishments and news of the Department's alumni, students, faculty, and staff during the 2012-2013 Academic Year.

As a member of the global higher education and research communities we strive to make significant contributions to these communities and to positively impact society. From reading these pages, I hope you will sense the pulse of our highly intellectual and vibrant community.

Sincerely Yours,

Tsu-Chin Tsao

Tsu-Chin Tsao, Department Chair

FRONT COVER: UCLA MAE NSF Center "Translational Applications of Nanoscale Multiferroic Systems (TANMS)" focuses on developing nanoscale memory, antenna, and motor elements, all essential components in miniature navigation systems. The cover figure shows an illustration of a miniature submarine the size of a red blood cell, reminiscent of the classic "Fantastic Voyage" movie of 1966. Here the TANMS elements are key barrier technologies to make this science fiction notion an actual device, important for medical and other applications. Image by Josh Hockel.

Mission Statement

Our mission is to educate the nation's future leaders in the science and art of mechanical and aerospace engineering. Further, we seek to expand the frontiers of engineering science and to encourage technological innovation while fostering academic excellence and scholarly learning in a collegial environment.

The Department gratefully acknowledges UCLA Images for use of images throughout this report.

Alexander Duffy: Editor and Graphic Designer

UCLA MAE Annual Report 2012-2013

Table of Contents

Faculty and Staff

Ladder Faculty:	30
Joint Faculty:	3
Emeritus Faculty:	8
Adjunct Faculty:	6
Lecturers:	42
Administrative Staff :	25
Staff Research Associates:	12
Development Engineers:	13
Postdoctoral Scholars:	20
Visiting Ph.D. Scholars:	16
Visiting International non-degree Students:	20
GSRs total for the year:	260
TAs (3 quarters) total:	101

Recognitions

Society Fellows:	24
CAREER or Young Investigator Awards:	10
NAE members:	7
Regular Faculty:	4
Affiliated Faculty:	2
Emeriti:	1

Publications

Journal Articles:	103
Conference Papers:	79
Books & Book Chapters:	4
Patents:	14

Research Centers

CESTAR: Center for Energy Science and Technology Advanced Research (Abdou)

FSTC: Fusion Science and Technology Center (Abdou)

SMERC: Smart Grid Energy Research Center (Gadh)

SYDYC: Systems, Dynamics and Controls (Gibson, M'Closkey)

TANMS: Center for Translational Applications of Nanoscale Multiferroic Systems (Carman)

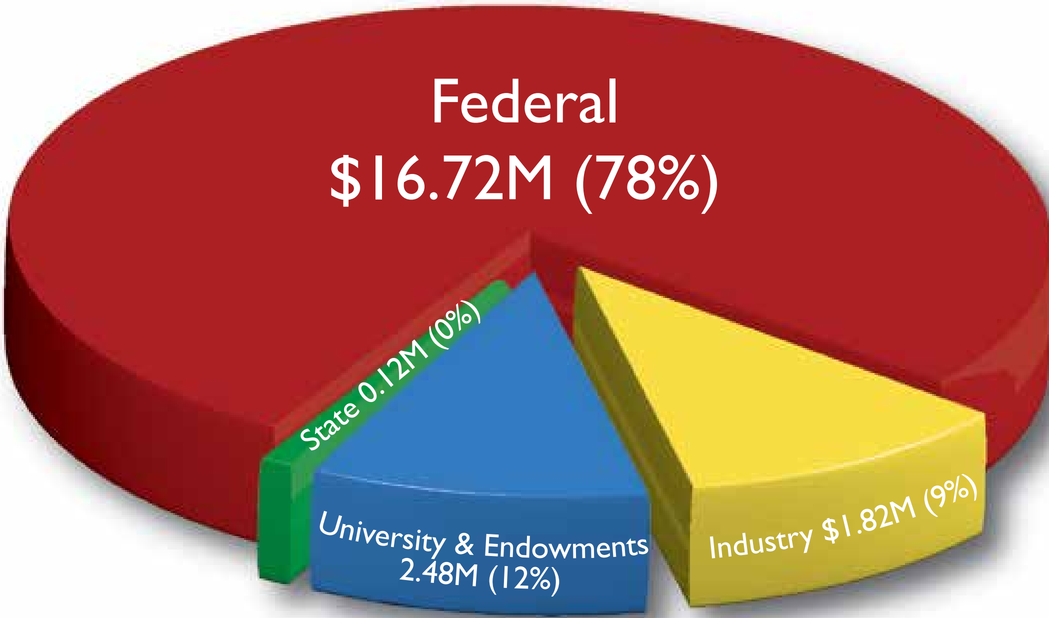
WINMEC: Wireless Internet for Mobile Enterprise Consortium (Gadh)

Laboratories and Research Groups

Active Materials (Carman)
Autonomous Vehicles Systems and Instrumentation (Speyer)
Beam Control (Gibson)
Boiling Heat Transfer (Dhir)
Chen Research Group
Complex Fluids & Interfacial Physics (Kavehpour)
Computational Biomechanics (Klug)
Energy & Propulsion Research (Karagozian, Smith)
Hypersonics & Computational Aerodynamics Group (Zhong)
Materials Degradation Characterization (Mal)
Materials in Extreme Environments (Ghoniem)
Mechatronics and Controls (Tsao)
Micro Nano Manufacturing (Kim, C.J.)
Micro Systems (Ho)
Modeling of Complex Thermal Systems (Lavine)
Morrin-Gier-Martinelli Heat Transfer Memorial (Catton, Pilon)
Multiscale ThermoSciences (Ju)
Optofluidics Systems (Chiou)
Pilon Research Group
Simulations of Flow Physics and Acoustics (Eldredge)
Thin Films, Interfaces, and Composites Characterization (Gupta)
Turbulence Research (Kim, J.)
Wirz Research Group

Fiscal Year 2012-2013 Sponsored Research Budget - Total $21M

(Fiscal Year 2012-2013 Sponsored Research Expenditures - Total $13M)



Undergraduate Students

Enrolled / Aerospace: 173, Mechanical: 391, Total: 564
Applicants / Freshmen: Aerospace: 922, Mechanical: 1978, Total: 2900
Applicants / Transfers: Aerospace: 121, Mechanical: 398, Total: 519
Admitted / Aerospace: 144, Mechanical: 244, Total: 388
New Students Enrolled / Aerospace: 39, Mechanical: 53, Total: 92

Graduate Students

Students Enrolled / Aerospace: 49, Mechanical: 216, Total: 265
Applicants / MS: 437, PhD: 248, Total: 685
Admitted / Aerospace: 59, Mechanical: 216, Total: 275
New Students Enrolled / Aerospace: 19, Mechanical: 69, Total: 88

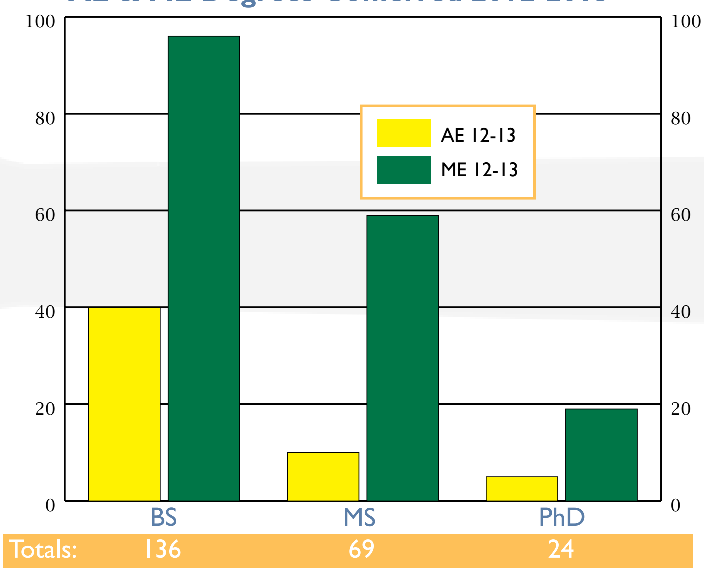
Number of AE & ME Degrees conferred 2012-2013 (BS, MS, PhD)

BS Aerospace: 40
Mechanical: 96
Total: 136

MS Aerospace: 10
Mechanical: 59
Total: 69

PhD Aerospace: 5
Mechanical: 19
Total: 24

AE & ME Degrees Conferred 2012-2013



Funding Received by Graduate Students

GSR Salaries (without benefits)	$ 1,614,016.00
Research Scholarships (Graduate Division)	$ 826,137.00
Teaching Assistantships	$ 646,318.00
Eugene Cota Robles Fellowships (4 Mechanical, 2 Aerospace)	$ 138,236.76
Dissertation Year Programs (3 Aerospace, 1 Mechanical)	$ 104,427.58
Dean's Matching NRT Funds	$ 90,612.00
Camp Fellowship Funds	$ 15,000.00
Dean's Fellowship Funds	$ 14,285.00
Total	**$3,449,032.34**

TANMS NSF ERC First Year's Highlights

UCLA's TANMS NSF ERC, under the direction of MAE Professor Greg Carman, has been up and running for one year now, and is already working on its second year goals.

TANMS, or the Center for Translational Applications of Nanoscale Multiferroic Systems, works to engineer a revolution in miniature electromagnetic electronics through development of a new class of nanoscale multiferroic materials. Beyond development of new, optimal electromagnetic materials, TANMS seeks to increase its capacity for innovation by integrating its research with commercialization, and fostering life-long skill development. TANMS brings together a diverse talent pool of students, postdocs, and faculty pursuing engineering research, education, and translational activities in the United States. The education program includes working with students from K-12 to generate interest in engineering while providing entrepreneurial skills for long-term success in the engineering world. TANMS seeks to develop a culture fostering diversity with the aim at increasing the participation of individuals from traditionally underrepresented groups in science, engineering, technology and math STEM programs. This goal is all done under the umbrella of advancing fundamental research in the area of multiferroic materials with an emphasis on translating new discoveries to industrial applications.

UCLA researchers develop new method of controlling tiny devices

FINDINGS

Electromagnetic devices, from power drills to smart-phones to antennas, require an electric current to create the magnetic fields that allow them to function. But with smaller devices, efficiently delivering a current to create magnetic fields becomes more challenging.

In one recent discovery that could lead to big changes in storing digital information and creating electromagnetic waves in small hand-held devices (antennas), researchers at UCLA have developed a method for switching tiny magnetic fields (superparamagnetic behavior) on and off with an electric field — a sharp departure from the traditional approach of running a current through a wire. Therefore, this approach overcomes efficiency problems associated with present small electromagnetic devices.

The researchers, affiliated with the university's National Science Foundation–funded TANMS (Translational Applications of Nanoscale Multiferroic Systems), developed a composite that can control magneto-electric activity at a scale of about 10 nanometers, some 100 times smaller than a red blood cell. Previously, the instability of magnetic particles at this very small scale made it impossible to control their movement (i.e. superparamagnetic), much less the energy reaching them or being produced by them.

The team used a composite of nickel nanocrystals coupled with a single crystal piezoelectric material — which deforms when a small amount of electric field is applied to it — to control the north–south orientation of the particles as well as their tendency to spin around, which are essential aspects of activating or deactivating a magnetic field. This exciting discovery could lead to revolutionary changes in tiny electromagnetic devices.

IMPACT

These and other TANMS findings could potentially change the way electromagnetic devices are designed in the future. With additional research, the team said, the discovery may allow significant miniaturization of equipment ranging from memory devices and antennas to instruments used to analyze brain activity. The researchers noted that while their findings represent a major scientific step, practical applications of the discovery still require further research advancements and cooperation with industrial sectors interested in this technology.

Greg Carman discusses the work TANMS is doing on memory and antennas

How is TANMS coupling a piezoelectric and a magnetoelastic material together to create a new structural design for memory?

GC: Piezoelectricity works on the principle that if you apply voltage to a piezoelectric it expands or shrinks. Magnetostrictive materials work on the principle that a mechanical load reorients the internal magnetization state. By mechanically coupling a piezoelectric material to a magnetostrictive material we transfer energy between electrical and magnetic states through the deformation of the piezoelectric. For example, if we apply a voltage to this composite combination the expansion/shrinkage produces magnetic reorientation in the magnetostrictive material. This simple process is quite important when considering a bit of memory which intrinsically stores information in magnetic orientation. While bits of memory have been around for many decades they still are not as efficient as we would like, i.e. it takes to much energy to write the bit of information. This is due to the fact that electrical current is presently used to reorient the magnetic moment and the current in the small scale is energy intensive.

Our multiferroic, i.e. piezoelectric coupled to magnetostrictive materials, dramatically increases the efficiency by reducing/eliminating the current. Maybe a simple way of thinking about our multiferroic is taking a permanent magnet, and just squeezing it, and being able to intrinsically change the north and south poles. This is possible because the material is magnetoelastic, i.e. it's coupled between the magnetic states and elastic states. TANMS designs a structure where a piezoelectric is mechanically coupled to a magnetoelastic material, just like a composite. They're not glued, we deposit them using a sputter deposition process, but to the layman it's like taking two pieces of material, gluing them together, applying a voltage that induces a strain which reorients the magnetization. TANMS has successfully been able to achieve this reorientation during our first year at the nanometer scale, for comparison purposes a red blood cell is 100x times larger than our multiferroic element.

You are switching from the 0 to the 1 through a different physical mechanism?

GC: It's the same type of magnetic memory, but you're switching it from the 0 to the 1, through a different physical mechanism. Previously, the magnetic bit was flipped by passing a current through the element which alters the magnetization states. The reason that's undesirable is that as the diameter of a wire decreases, the loss characteristics increase and there lies the problem with efficiency in the small scale.

In our multiferroic material, TANMS applies a voltage inducing mechanical loading to reorient the bit of information rather than a current. That mechanical loading causes the magnetization to rotate. This writing process is very elastic in the mechanical realm implying a non-hysteretic phenomena represented by a very low loss process. While the size of TANMS memory bit is similar to conventional systems at this time, the real advantage here is the TANMS approach requires substantially lower energy to write the bit as compared to present memory devices. For example, we have all experienced the temperature increase associated with computers or phones during the writing process, i.e. energy loss, TANMS believes the multiferroic approach can reduce the energy consumption to the point that this heat loss will nearly be unobservable .

What is the difference between a classical antenna, and the one TANMS is developing?

GC: Classical antennas are resonance based systems that rely on receiving or transmitting an EM wave using current through a wire. The antenna size is based on the EM wavelength (i.e. resonance structure) which is related to the speed of the wave in the medium, for air that is the speed of light. Therefore, since the speed of light is so large the wavelength is also big and thus the antenna size is large. To understand this maybe a simple explanation of resonance such as pushing a child on a swing would be useful.

If you push the child at the right moment you can get the child to go higher and higher. If you don't push the child at the right moment/frequency, you can't push the child higher. Antennas rely on a similar resonance based phenomena, that is the EM waves are additive in nature when the antenna size is tuned to the correct wavelength and frequency. Therefore, the EM wave length – think of an ocean wave but now it's an electromagnetic wave – dictates the size of your antenna to maximize gain.

For example, your cellphone operates near 2 GHz and the speed of the EM wave is on the order of 3×10^8 m/s. The EM wavelength for that frequency is on the order of 15 cm which dictates the antenna size. In a TANMS multiferroic antenna, we take that EM wave and transition it into a slower mechanical wave. So what's the big deal about that? Remember, the EM wave travels at the speed of light while a mechanical wave travels at the speed of sound $\sim 3 \times 10^3$ m/s, i.e. dramatically slower. Transforming the EM wave to the mechanical wave slows the wave down and also alters the wavelength. Instead of having a wave length of 15cm, the mechanical wavelength is approximately 1.5 microns or about 3-4 orders of magnitude smaller than the original EM wave. So now, theoretically at least, the size of your cell phone antenna goes from something that is relative large to something the size of a red blood cell. While some may argue that 15 cm is not extremely large, remember other applications rely on much smaller frequencies, say 1MHz. For this frequency the antenna size is too large (300m) for virtually all but stationary applications, however, TANMS approach reduces this to a manageable 3mm.

TANMS: First Annual Review

TANMS had its first Annual Review by NSF in May 2012 at UCLA. This review went quite well, and NSF provided feedback that will help guide TANMS' direction into its second year. Before the review meetings TANMS also held its inaugural Industrial Advisory Board (IAB) meeting, which included student presentations and a poster session. Juan Alzate won the award for best oral presentation and best poster awards were won by Joshua Hockel, Paul Nordeen, Mark Nowakowski, Laura Schelhas, and Kyle Wetzlar. By the end of the first year, The Boeing Company, General Motors Company, Lockheed Martin, Maritime Applied Physics Corporation (MAPC), NextGen Aeronautics, Northrop Grumman Corporation, and Raytheon Company have become TANMS IAB members.

TANMS also has an exciting education and outreach program. Throughout the year it impacts students at each of the four partner universities in a variety of engineering and science disciplines. These programs are designed for graduate students to mentor groups of diverse undergraduates in a lab research environment. In addition to academic year programs, TANMS has a number of summer programs including the Young Scholars Program for high school students, Research Experience for high school teachers, and Research Experience for Undergraduates.

During the academic year, TANMS Building Engineers and Mentors (BEAM) students run a weekly, after school science and engineering program at local schools across Los Angeles. Through BEAM, UCLA students hone their communication skills and share their passion for STEM to inspire the next generation of scientists and engineers. TANMS has been instrumental in the development of an official BEAM course (MAE 194) and a partnership with CSUN to create magnetism-themed lesson plans.

In other news, this summer TANMS undergraduates won 1st & 2nd place in the UCLA Center for Excellence in Engineering and Diversity (CEED) Research Intensive Series in Engineering for Underrepresented Populations (RISE-UP) Poster Competition. First place was awarded to Adam Garcia (who recently completed his 1st year in Mechanical Engineering) for his work on Characterizing Magnetorefractive Glass under the direction of Professor Greg Carman. Second place was awarded to Edward McAboy (who recently completed his 2nd year in Chemical Engineering) for his work on Magnetostrictive Materials for use in Composite Multiferroic Systems, under the direction of UCLA Engineering Associate Dean and Professor Jane P. Chang.

Rajit Gadh's Living Lab

Article and images by Alexander Duffy

When we think of a lab, we might think of scientists in white coats and goggles pouring chemicals into vats, or technicians in clean suits putting together microchips. If someone was to say "living lab," we might think of a lab full of microscopic creatures on slides, being viewed under microscopes, under lock and key. In contrast, UCLA MAE Professor Rajit Gadh's Living Lab is on full public display in UCLA's parking lots, charging electric vehicles (EVs) and sending data back to UCLA's Smart Grid Energy Research Center (SMERC), where Prof. Gadh is the director.

You might not notice the Living Lab if you didn't know where to look. On Level 4 of Lot 9, a box hangs on a wall. A sticker on the box says "EVSmartPlugTM" and two EVs are attached to the box via thick electric cables. This would appear to be a standalone EV charging station, but it's much more, explains Gadh. The box is a smart communications and control device, part of the WINSmartEVTM Network and it is controlled by a mobile app, developed by SMERC.

"This mobile app shows the system informing the user as to how many spots are available in Parking Lot 9," explains Gadh. "It says there is a total of 8 parking outlets and 4 available. On this particular box on the wall behind us, you can actually see that 2 of the 4 wires are being used, and 2 are available. We monitor the energy consumption on this box periodically, and send the data back to the control center. What the control center does is look at the available capacity of the garage. It looks at the electric vehicles that are charged. Some EVs might require 12 amperes, some might require 20 amperes, and it looks at that particular driver's profile. If a driver is leaving at 5pm versus if a driver is leaving at 7pm, you could schedule the charging in differential manners that it requires. It also looks at the data coming in from the grid, so that if the grid operator is having a shortage of electricity, then they may offer disincentives for energy consumption, by raising the price in real time, or they may offer incentives, where they may sell the power back, to the grid operator."

The bigger picture is UCLA's Microgrid Integration. Electrical energy is available from energy storage batteries in the SMERC Lab, from rooftop solar panels, and from cogeneration. All of these energy sources are connected to a Control Center, which sends control signals to the charging stations which in turn dispatch electrical energy as needed to the EVs. EVs can draw energy, or give it back.

This smart system of energy use means that both the EV user and the grid operator are participants in how the electricity is consumed. Contrast that to filling up a car with a tank of gas, which is a one-way transaction. Gadh demonstrates how the smart grid is a two-way street.

"One of the experiments that we are starting to run right now – you saw the battery set-up in the lab – and that experiment is called 'vehicle to grid.' The battery in the lab would then send the energy back to the grid depending upon when the grid is experiencing shortage of energy. The way the grid operator can ask for energy is either explicitly specifying the kilowatts and duration for which they are needed, or they can do it by way of a proxy, such as dynamic price modification. This new methodology called transactive control can indirectly reduce (or increase) energy consumption in a short period of time by increasing (or reducing) the price of energy, with the hope that rational customers would respond to price changes. Therefore, by direct or indirect load modification control signals, when there exist a large number of vehicles modeled as an aggregated load, this load can act as an intelligent energy consumer, when connected to the grid operator, modifying its consumption in both directions. For example, Lot 9 can be one aggregated load, Lot 8 – which has 6 or 7 EVs parked – could be another aggregated load – and we can model as well as test out their characteristics to the grid operator. Sometimes they are consuming energy, sometimes they are giving energy back – and how they respond is a subject of research. Sometimes one car might be consuming energy, while another might be giving energy back. Sometimes those methods for arbitrage can also be used for local optimization."

And the box on the wall? So ordinary looking, but there is a story behind it, as Gadh explains. "The plug behind me was the first ever installation on campus. Most of UCLA today has the third generation boxes, but this was the first installation, at this location. This is a 110 volt, 20 ampere circuit, and in Lot 8 we are up to 220 volt, 120 amp circuit, a higher capacity circuit. We could theoretically install several electric cars to it, over a one day period, perform intelligent scheduling, and still provide requisite amount of energy to each car by the end of the day."

A short walk across the street is Lot 8, where the big box is. Cars come and go from the parking lot, oblivious to the science experiment taking place. For Gadh, this is a good thing. The Living Lab EV station boxes are installed in parking lots across campus, and the point is to make them a normal part of the parking lot landscape, as normal as the white lines separating the parked EVs.

Gadh turned his attention to the Lot 8 box, pointing out outlet #1 and turning it off from his mobile app. "You'll see that light should turn off right now," and like magic, light #1 goes off. "I'm going to turn it on again, and when that turns on, the lights on the car turn on – see these two lights?" The two charge lights on the electric vehicle turn on. Gadh then uses the app to turn off the charge. "See, I'm turning it off again, from my mobile app turn-off screen." The manual feature allows the consumer to be in-charge and override the smart algorithms should they wish to do.

One thing about the system in Lot 8 is its sophistication. "This particular system is actually much more sophisticated. We look at the user profile of individual users, and for example, on a statistical basis, when they come and when they go, and the control system looks at the input from the garage – looks at the capacity – for example, a 120 amp circuit, compared to a 20 amp circuit in Lot 9, this has 6 times the capacity for the same voltage. It looks at the electric vehicles, and how many amps they draw. It looks at the grid conditions. It takes all of those factors and creates an optimized schedule for EV charging for each of the cars. It releases the schedule every so often."

It's not all algorithms and programming. The human factor comes into play. "What happens is that human beings do things that are unpredictable. For example, I just turned my car off. That's why you need to have some advanced scheduling – let's say 24 hours in advance for estimation purposes – but then you need to have real time scheduling. Why? Suppose on a 40 amp circuit, you have 4 cars parked, and each car can take up to 20 amps. You could serve 2 out of 4 cars at 20 amps each, or 4 cars at 10 amps each. How do you determine what to do? That's an example of an outcome of the algorithms that we have. We generate, execute, and measure the outcome. Measurement in the control system is essential to keep the system stable and have a smart feedback."

The Lot 8 box keeps the system stable, explains Gadh. "We can regulate the current from each of the circuits, and that's done right here, in this box. This box is 120 amps and is the highest capacity box we have on campus. This box is the newest and the latest technology. It's called the 'Current Control Technology.' We literally talk to the car, and we tell the car 'you can now draw so many amps'. We tell each car and we can change that every so often. We want to use this box as a master template. This is a 220 volt version, a 120 amp version. We are creating a 110 volt, 20 amp version, of the same. We may even change some of the power system components inside, but the logic, communications, and embedded systems platforms do not need to change. We have a smart computing systems platform in here for the Current Control, called the pulse modulation technique. Many of such things do not need to change, just the power systems have to be toned down for a lower ampere system."

The plan is to continue expanding the WINSmartEVTM Infrastructure. At this time, there are EV charging stations in Lots 2, 3, 6, 8, and 9. Additionally, there are 4 stations at the LADWP, and more on the way being installed in the City of Santa Monica. If you have an EV and would like to be a part of the Living Lab, please contact Prof. Gadh. He's got an outlet for you.

SMERC in the news

UCLA SMERC Director and MAE Professor Rajit Gadh appears on CCTV America. CCTV's Yakenda McGahee reports from Los Angeles on LED technology and how it is benefiting the environment. The amount of energy saved by using LED lights can accumulate to $100 billion in global energy savings over the next 5 years as countries adopt green technology.

Also, Prof. Gadh was quoted in the MIT Technology Review article "China Tests a Small Smart Electric Grid":

Smart grids use computer networking to let utilities monitor everything from electricity use in customers' homes to the performance of generators at power stations in real time. The concept has gained much attention in the United States but has been slow to catch on. This is partly because regional utilities have different ideas about how to best connect the last mile of the smart grid to users' homes, says Rajit Gadh, a professor in UCLA's School of Engineering and Applied Sciences.

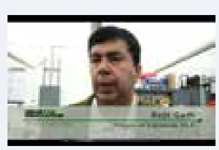
"We have about 3,000 utilities in the United States compared to two main utilities in China," Gadh says. "In our infrastructure, there is a mix of technologies that has been deployed for communications and that ranges from broadband to wireless."

UCLA's Gadh is more optimistic, however. Despite the different market conditions in the U.S., he believes utilities there may benefit from observing the SGCC pilot—although it would be down to each individual company to decide whether to follow suit. "I am sure there will be research and trial and error, and there will be lessons learned from the project in China," he says. "Based on lessons learned, American utilities would be able to determine if the technology is suitable for them."

After blasting the Northeast with 80-mile-per-hour winds, Hurricane Sandy has left 6 million people without power. Last year, Hurricane Irene knocked out power to 7.4 million homes, and a freak Halloween storm left 90 percent of Connecticut in the dark for almost a week. With so many storms wreaking havoc on our power grid, why not put power lines underground?

Rajit Gadh, a smart-grid specialist at UCLA, says that even if residential networks were underground, some infrastructure would inevitably remain aboveground and be vulnerable to weather-related disruptions. Even in New York City, where most power lines are already located underground, an explosion at a 14th Street substation left hundreds of thousands of New Yorkers in the dark.

(Please read full article at popularmechanics.com)



An EE Times video on innovation featured Rajit Gadh, professor of mechanical and aerospace engineering and director of the UCLA Smart Grid Energy Research Center, who discussed his research in smart grid systems and how consumers can benefit from demand-response technologies.

Professors Lavine, Wirz, Garcia-Garibay, and Kavehpour.

THERMAL STORAGE SUPERC FLU

UCLA's "SuperTES" project, unde Richard Wirz, are finding new w

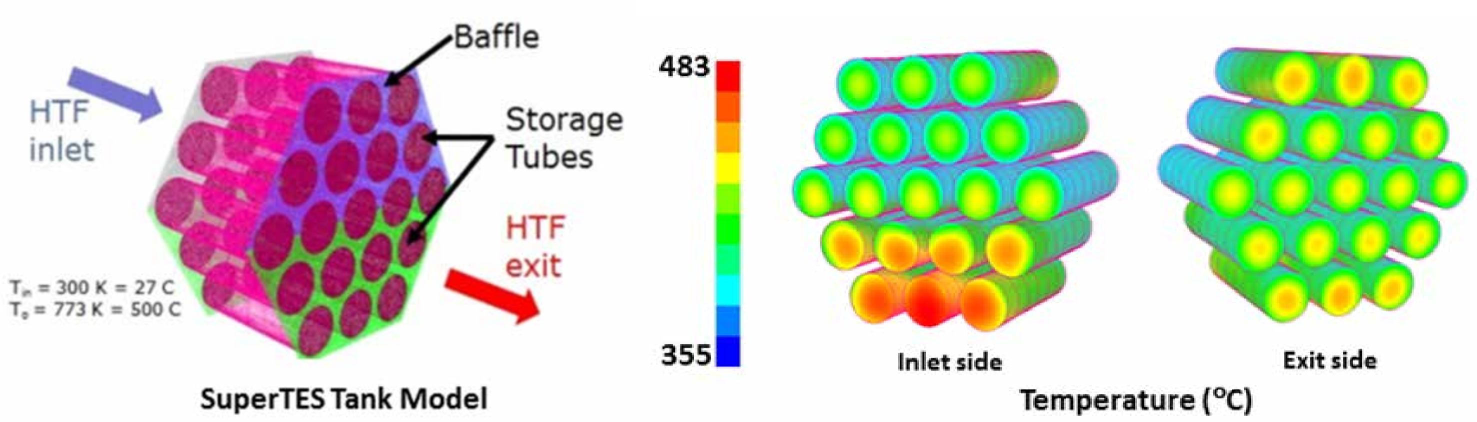
Reducing the cost of thermal energy storage can help turn large-scale renewable energy into a reality. To address this issue, UCLA's Mechanical and Aerospace Engineering Department is leading a 3-year/$3M effort to develop a novel thermal energy storage system that uses supercritical fluids ("SuperTES") to reduce the system installation cost of thermal storage.

Through this project, lead by MAE Prof. Richard Wirz, a diverse group of scientists and engineers are teamed to find a revolutionary alternative for the state-of-the-art of thermal energy storage. One of the primary objectives of the project is selecting alternative cost-efficient storage fluids that can operate in the supercritical regime for high temperature solar thermal applications (i.e, ~350 – 600 °C). Meeting this objective can help make solar energy available 24 hours a day.

Thus far, the team has found several organic fluids candidates that offer promising performance and long term thermal stability. The thermal behavior and chemical stability of the selected fluid candidates are explored using a high-pressure/high-temperature autoclave reactor vessel. In-depth chemical analyses (including gas chromatography and mass spectrometry) are used to ensure the chemical stability of these organic fluids in high pressure and high temperature conditions.

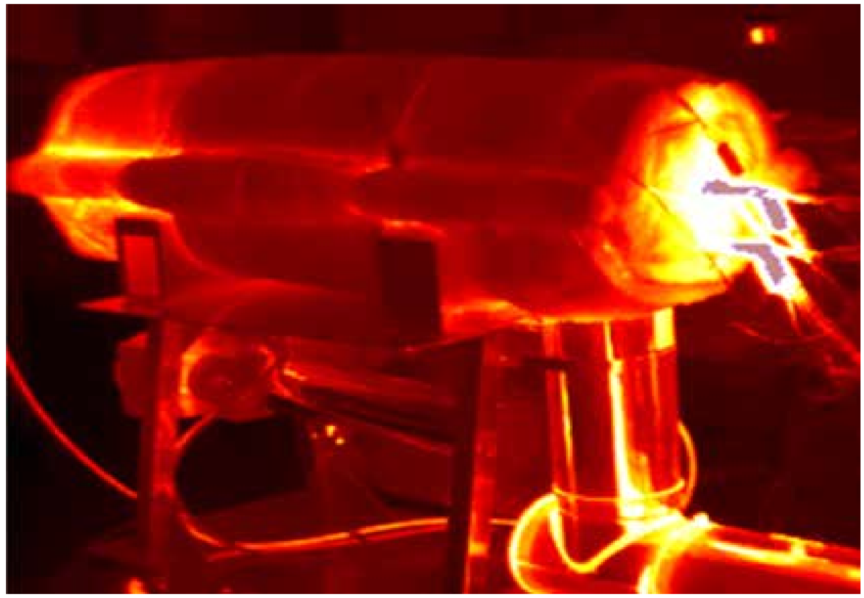
Exploring the heat transfer behavior of the supercritical fluids is an important part of the project that is also being conducted at UCLA MAE. A computational and analytical approach is utilized by the team to characterize the behavior of the supercritical fluids in charge/discharge cycles. This study is pursued to ensure that poor thermal properties of organic fluids do not impose a heat recovery problem on the system.

The project includes three system-level demonstration efforts to show the feasibility of supercritical thermal storage for high-temperature, medium-temperature, and low-temperature systems. The demonstrations exhibit the feasibility of



L ENERGY E USING CRITICAL UIDS

er the direction of MAE Professor ays to store solar thermal energy



supercritical thermal storage from component-level to system-level, are being operated at the Jet Propulsion Laboratory (JPL) and Southern California Gas Co. (SCG) campuses. The high-temperature demonstration was performed in 2012 and the supercritical thermal storage concept was tested using naphthalene as the storage fluid. The system was charged and cycled into supercritical conditions (> 475 °C & 41 bar) and discharged to room temperature. The medium and low temperature demonstrations are currently in design and fabrication phase and will be performed "on-sun" using micro Concentrated Solar Plant (micro-CSP) facilities at JPL in Pasadena, CA and SCG in Downey, CA.

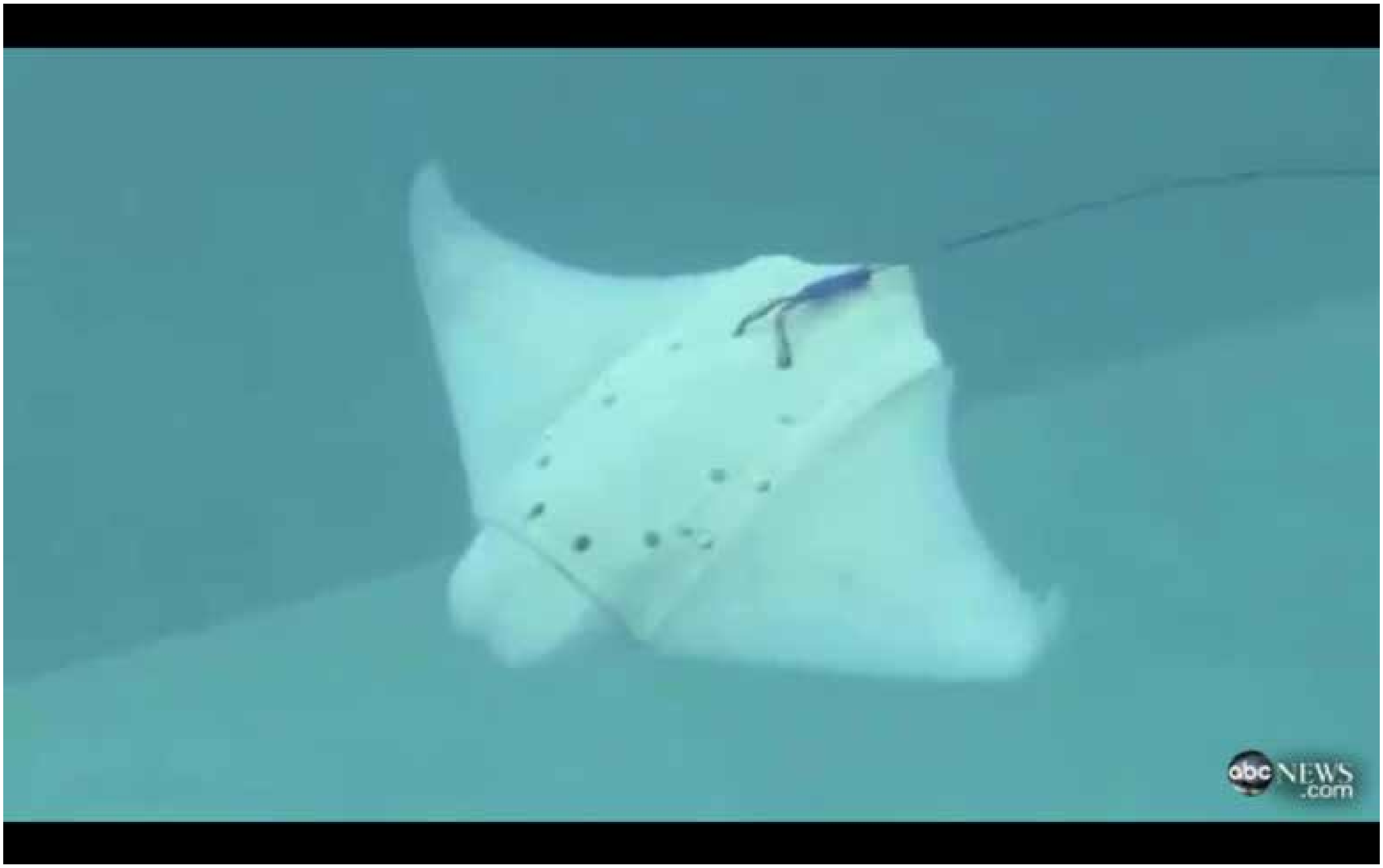
This effort is funded by the U.S. Department of Energy (DOE) Advanced Research Project Administration – Energy (ARPA-E) and industry partner SCG. The Principal Investigator for the project is Prof. Richard Wirz of MAE. Professors Adrienne Lavine and Pirouz Kavehpour from MAE lead the heat transfer and system/fluid modeling aspects of the project, while Prof. Miguel Garcia-Garibay from the Department of Chemistry and Biochemistry leads the chemical analysis efforts. UCLA postdocs and Ph.D. students currently working on the project are Dr. Reza Baghaei Lakeh, Dr. Antoine Stopin, Louis Tse, Ben Furst, and Gabriella Bran. UCLA researchers work closely with a team of NASA JPL engineers led by Dr. Gani Ganapathi, a Principal Scientist at JPL.

The outcomes of the project have been presented in more than 40 articles and presentations, and seven provisional patents and invention reports. Most recently, a collaborative effort has been initiated with Anderson business school to prepare a technology-to-market plan to pave the road for commercialization of this technology.

Researchers in the SuperTES laboratory next to the high-temperature, high-pressure autoclave reactor used to test new storage fluids in supercritical conditions.

Left to right:
Dr. Reza Baghaei Lakeh, Prof Garcia-Garibay, Prof Wirz, Dr. Antoine Stopin, Louis Tse, Gabriella Bran, and Prof Lavine.

Tetsuya Iwasaki and the amazing mechanical manta ray: Engineers copy nature



Hilary Bart-Smith leads an interdisciplinary project involving scientists and engineers at four universities whose collective effort has resulted in a mechanical version of a cownose ray that looks remarkably lifelike as it swims through the water in the University of Virginia's swimming pool. At this stage, it's no match for the real thing, but it will serve as an instrument in an ongoing effort to learn from the Batoidea ray, a collection of 500 species in 13 families including stingrays and mantas.

The rays move forward through the water by flexing their pectoral fins, commonly referred to as "wings" because that's what they look like. But how they do that is still something of a mystery. An aircraft uses propulsion to drive itself forward, creating lift as air passes over its wings. A ray flaps its wings up and down -- but has no visible means of forward thrust.

Tetsuya Iwasaki, an expert on animal locomotion at the University of California, Los Angeles, has been addressing that question. Animals, including humans, are propelled by a linear series of electrical pulses from the brain that cause us to put one foot in front of the other, a pretty simple solution to a complex problem. But rays flap their wings up and down to produce forward thrust and maintain proper depth instead of sinking to the bottom of the ocean.

Vijay Gupta to assist in UCLA study determining if copper surfaces can reduce hospital-acquired infections

By Rachel Champeau

Hospital-acquired infections are a huge public health burden, and hospital environments play a key role in harboring potentially deadly bacteria such as E. coli, C. difficile and methicillin-resistant Staphylococcus aureus.

These microbes may persist for extended periods in the hospital, on surfaces such as bed rails, doorknobs, chairs, tray tables, toilet seats and even call buttons in patient rooms.

Copper surfaces, which are not routinely used in hospitals, are known to kill bacteria on contact, and studies have found much lower levels of bacteria living on copper surfaces than on standard hospital surfaces.

Now, an interdisciplinary team from UCLA is taking this research to the next level. In one of the first randomized clinical trials of its kind, researchers will determine if the reduction of surface bacteria due to the use of copper will result in a decreased number of hospital-acquired infections.\

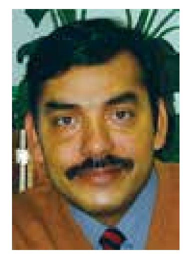
Funding for the landmark $2.5 million study will be provided by an RO1 grant (HS021188-01) from the Agency for Healthcare Research and Quality, part of the U.S. Department of Health and Human Services. The project will involve teams from the David Geffen School of Medicine at UCLA, the UCLA Fielding School of Public Health and the Henry Samueli School of Engineering and Applied Science. The collaborative research initiative is a project of the UCLA Sustainable Technology and Policy Program.

For the clinical trial, two intensive care units at Ronald Reagan UCLA Medical Center will be outfitted with copper, sham stainless steel, or conventional surfaces such as plastic or other types of coatings. Over a four-year period, all three surface types will be sampled for bacteria levels, and patient-infection outcomes rates will be compared among the three surfaces.

"We will be studying if lowering the level of bacteria on hospital surfaces results in reduced infection rates in patients, better outcomes and even lower costs," said the project's principal investigator, Dr. Daniel Uslan, director of the antimicrobial stewardship program at the Geffen School of Medicine and an assistant clinical professor of medicine in the division of infectious diseases.

Additional environmental microbiologic studies and evaluations of surface cleaning will be included in the research, as well as a detailed cost–benefit analysis.

Dr. Peter Sinsheimer, executive director of the UCLA Sustainable Technology and Policy Program, a joint initiative of the Fielding School of Public Health and the UCLA School of Law, helped arrange the interdisciplinary collaborations.



"Being at UCLA makes it easy to pull together diverse teams of top-flight scientists to conduct such important prevention-based research," said Sinsheimer, whose program focuses on primary health prevention through materials substitution.

The initial idea for the hospital-based study came from Sinsheimer's research on the viability of alternatives to lead-based copper piping in delivering safer drinking water.

Hospital surfaces selected for the study will include bed rails, chairs, a bedside table that can also be positioned on top of the bed, and a mobile treatment cart-top used by nursing staff that includes handles, a keyboard and a mouse.

A team at UCLA Engineering will assist with the testing of the copper and other surfaces used in the clinical trial.

"We will be incorporating copper, plastic or sham stainless steel materials into the selected everyday surfaces used by patients and staff in the hospital," said Vijay Gupta, a professor of mechanical and aerospace engineering.

The cost-effectiveness analysis will be conducted by Dr. Gerald Kominski, director of the UCLA Center for Health Policy Research and a professor in the department of health policy and management at the Fielding School of Public Health.

"Finding effective interventions to reduce hospital infection rates in a cost-effective manner is an emerging priority for U.S. hospitals," Kominski said. "This study will provide valuable information on whether copper-touch surfaces are a cost-effective technology for achieving this goal."

Eric Chiou's work on holography optoelectronic tweezers is selected as the cover of Lab on a Chip

(Front cover image from the Royal Society of Chemistry)

UCLA MAE Associate Professor Eric Chiou's research paper was selected as the cover paper for the journal Lab on a Chip, Volume 13, Issue 12, 21 June 2013.

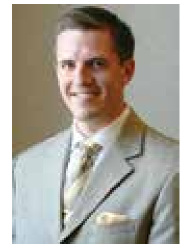
The article, "Optoelectronic tweezers integrated with lensfree holographic microscopy for wide-field interactive cell and particle manipulation on a chip" features the following abstract:

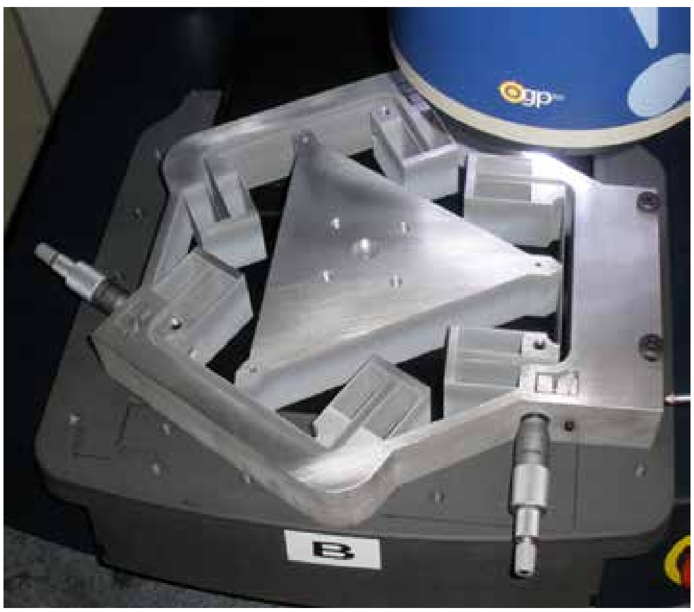
"We demonstrate an optoelectronic tweezer (OET) coupled to a lensfree holographic microscope for real-time interactive manipulation of cells and micro-particles over a large field-of-view (FOV). This integrated platform can record the holographic images of cells and particles over the entire active area of a CCD sensor array, perform digital image reconstruction to identify target cells, dynamically track the positions of cells and particles, and project light beams to trigger light-induced dielectrophoretic forces to pattern and sort cells on a chip. OET technology has been previously shown to be capable of performing parallel single cell manipulation over a large area. However, its throughput has been bottlenecked by the number of cells that can be imaged within the limited FOV of a conventional microscope objective lens. Integrating lensfree holographic imaging with OET solves this fundamental FOV barrier, while also creating a compact on-chip cell/particle manipulation platform. Using this unique platform, we have successfully demonstrated real-time interactive manipulation of thousands of single cells and micro-particles over an ultra-large area of e.g., 240 mm2 (i.e. 17.96 mm × 13.52 mm)."

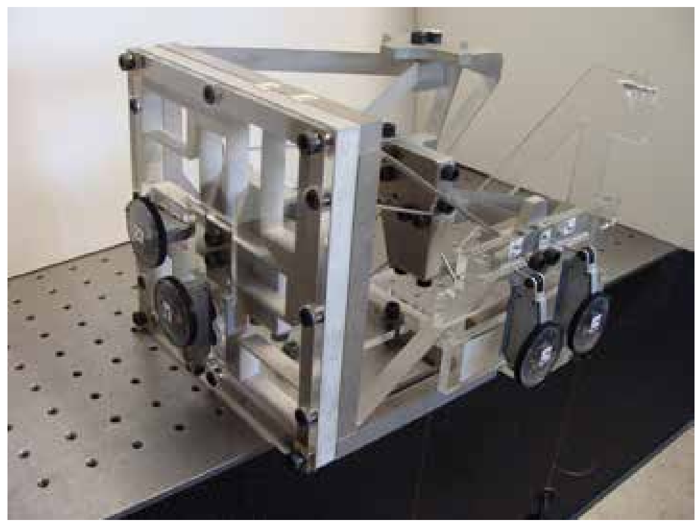
Jonathan B. Hopkins joins UCLA MAE Faculty

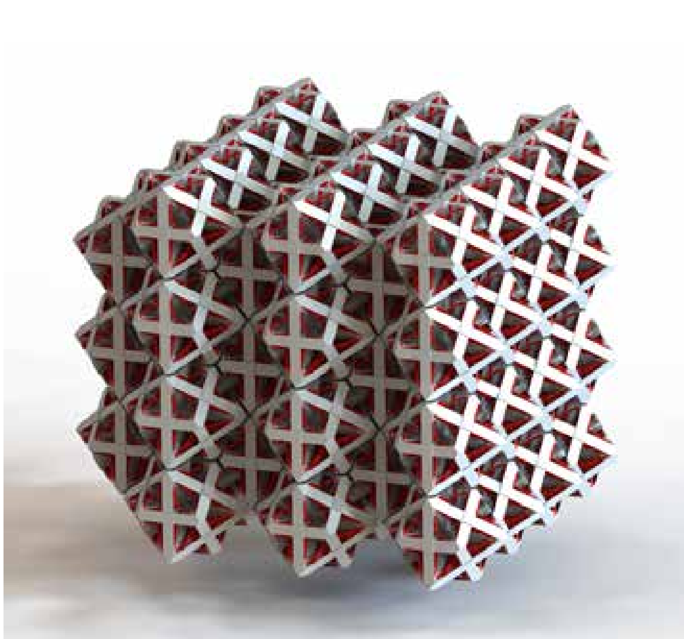
Dr. Jonathan B. Hopkins (B.S. 2005, M.S. 2007, Ph.D. 2010, all at MIT) has joined UCLA's Mechanical and Aerospace Engineering Department as an assistant professor effective July 1, 2012. Hopkins was on one-year leave at Lawrence Livermore National Laboratory's Materials Engineering Division, working as a post doc scientist, through June 2013. He began work at MAE in July 2013.

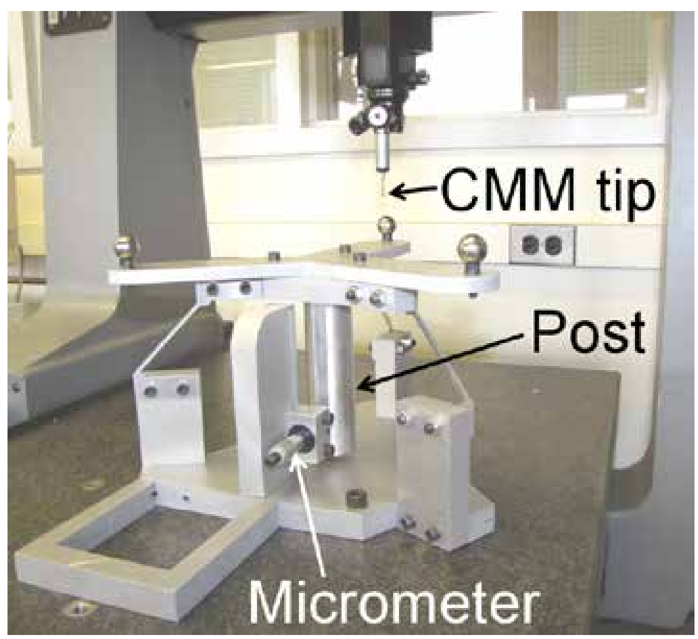
Dr. Hopkins' dissertation on design of flexure-based motion stage for mechatronic systems via freedom, actuation, and constraint topology (FACT) contributes to design of multi-degree-of-freedom systems for precision manufacturing. At Lawrence Livermore Lab he has started new research directions in engineered microstructural architectures, multi-material nano fabrication techniques, and massively parallel multi-axis micro-reflector array for high-speed directed light-field projection.











Clockwise from upper left: (1) A 3DOF microscopy stage with flexures that decouple its actuators, (2) a two axis transmission flexure mechanism, (3) A flexure stage that characterizes actuation error, and (4) a stiff micro-architecture that achieves negative thermal expansion.

Pirouz Kavehpour appointed new Faculty Director of UC LEADS

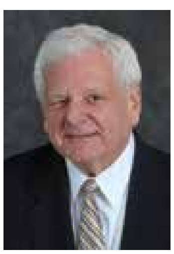
UCLA MAE Associate Professor Pirouz Kavehpour has been appointed the new Faculty Director of the University of California Leadership Excellence through Advanced DegreeS (UC LEADS) program.

UC LEADS is a two-year capstone program that offers resources and research opportunities for first generation and minority science and engineering students. At UCLA, this program supports 6-8 UCLA upper-division undergraduate students, providing stipends to support students engaged in undergraduate research in physical science and engineering disciplines. The UC LEADS program at UCLA prepares students for entry into PhD programs, preferably at the University of California. UC LEADS also gives them skills to ensure that the students assume positions of leadership following the completion of their doctoral degrees.

Prof. Kavehpour will serve as Director from 2012-2015 and follows longtime Faculty Director Dr. Richard L. Weiss of the Chemistry and Biochemistry Department. Kavehpour has a strong history with the Undergraduate Research Center (URC)-Sciences office, having served on the Center's advisory board in years past. Kavehpour will be on the team of faculty that work with Dr. Tama Hasson, Assistant Vice Provost for Undergraduate Research.

Albert Carnesale: Capturing an Asteroid to Study

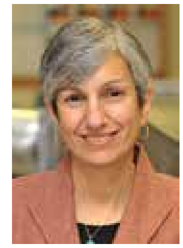
From UCLA Newsroom. Image courtesy NASA.



Albert Carnesale criticized the White House and Congress for not giving more direction to NASA, in regards to NASA's plan to capture and study an asteroid, according to an article posted in the April 12, 2013 issue of Pasadena's Star-News. The article referenced a 2012 report prepared by a National Academy of Sciences panel chaired by Carnesale, who is a UCLA chancellor emeritus, and a professor of public policy and of mechanical and aerospace engineering.

Having the asteroid capture in the budget makes a big difference, said Carnesale. "The House, Senate, and administration all wind up agreeing we'll do all of the above with no additional money," Carnesale said.

Ann Karagozian interviewed by the EE Times on alternative fuels for aviation



UCLA MAE Professor Ann Karagozian was interviewed by the EE Times on the subject of alternative fuels for aviation. The military as well as the aviation industry have been vigorously pursuing the development, testing and demonstration of the performance of "drop in" fuels which could have the same combustion characteristics as traditional aviation fuels but with improved environmental characteristics. Such fuels may be derived from a range of feedstocks, including switchgrass, algae, and liquid synthetic fuels derived from natural gas and other sources.

The complete interview may be viewed at http://www.eetimes.com/video.asp?section_id=124&doc_id=1318682.

J.S. Chen wins IACM Computational Mechanics Award

Chancellor's Professor J. S. Chen is among the two recipients of the Computational Mechanics Award given biannually by the International Association for Computational Mechanics. This award is a recognition among researchers from all over the world with significant contribution to traditional and new areas of Computational Mechanics.

Professor Chen received this award for his seminal contribution in nonlinear finite element and meshfree methods, Arbitrary Lagrangian Eulerian finite element method for large deformation and contact mechanics, multiscale materials modeling, and the stabilized Galerkin and collocation meshfree methods. The award was given in the Award Ceremony in the World Congress on Computational Mechanics held in Sao Paulo, Brazil, July 8-13, 2012.

Professor Chen has joint appointments with three UCLA Departments: Civil & Environmental Engineering; Mechanical & Aerospace Engineering; and Mathematics. He is Editor-in-Chief of Interaction and Multiscale Mechanics: an International Journal.



In Memoriam
David Okrent 1922-2012

David Okrent, UCLA professor emeritus of mechanical and aerospace engineering, who made pioneering contributions in nuclear reactor design and safety, died December 14, 2012. He was 90.

Okrent received his bachelor's degree from Stevens Institute of Technology in 1943. He then attended Harvard University for graduate school and received his Ph.D. in 1951, with his dissertation titled, "On the Sensitivity of Photographic Grains to Electrons."

After receiving his Ph.D., Okrent joined Argonne National Laboratory in Illinois, starting out as an associate physicist. He quickly rose through the ranks and became the manager of the lab's Fast Reactor Physics and Safety in 1957, a position he held through 1971.

After spending 20 years at Argonne National Lab, Okrent joined UCLA Engineering as a faculty member and established a world-leading research program in nuclear safety. Okrent taught undergraduate classes in thermodynamics, nuclear reactor theory and design, and probabilistic risk assessment, and he led graduate-level courses in several areas of reactor safety and design. During his tenure he advised 50 Ph.D. students.

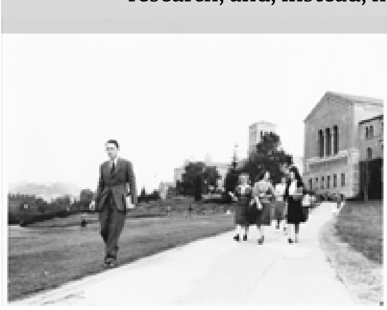
"David did not believe in giving a prescription to research, and, instead, he always answered questions with great questions of his own," said Vijay Dhir, dean of the UCLA Henry Samueli School of Engineering and Applied Science, who considered Okrent a mentor, a longtime collaborator and close friend. "He was a brilliant scholar, a great thinker, a superb mentor of graduate students and, above all, he was a true gentleman. His influence spread far and wide in establishing a culture of safety for nuclear reactors."

Throughout his career, Okrent received many prestigious honors for his work, including a Guggenheim Fellowship. In 1974, Okrent was elected to the National Academy of Engineering for "contributions in fast reactor design, including critical experiments, safety tests and analyses, and neutron cross-section evaluation.

In 2007, Okrent was honored by the American Nuclear Society with its George C. Laurence Pioneering Award. It recognizes individuals who have made outstanding pioneering contributions to the field of nuclear reactor safety over their lifetime.

Okrent retired from UCLA in 1991, but continued teaching classes and mentoring graduate students for several years after that.

Memorial services for Okrent were held on Dec. 17, 2012 at Hillside Memorial Park and Mortuary in Los Angeles.



Distinguished FACULTY

DR. VIJAY DHIR

Vijay Dhir was recognized with Honorary Membership in ASME for pioneering scientific and engineering contributions to boiling heat transfer, nuclear reactor thermal hydraulics, and safety; for contributions to industry as a consultant; for significantly influencing engineering education through academic leadership; and for continued exceptional service to the mechanical engineering profession.

An ASME Fellow, Dr. Dhir has served ASME in various capacities ranging from associate editor for a symposium volume (1978) and advisor for the UCLA Student Section (1983-84) to chair of the Heat Transfer Division's K-13 Heat Transfer in Multiphase Systems Committee (1984-87) and Honors and Awards Committee (1998-99). He received the Society's Heat Transfer Memorial Award in 1992 and Robert Henry Thurston Lecture Award in 2008, and Best Paper awards from the Journal of Heat Transfer in 1999 and 2006.

Dean Dhir was presented the award on November 12 in the Honors Assembly at the ASME 2012 International Mechanical Engineering Congress & Exposition (IMECE).

Dhir was also honored in February 2013 by the Engineers' Council with the organization's 2013 John J. Guarrera Engineering Educator of the Year Award.

The honor, first awarded in 1982, recognized Dhir for "exemplary leadership and contributions as an educator, scholar, researcher, administrator and mentor."

The award noted Dhir's leadership in developing outreach programs in science, technology, engineering and mathematics (STEM), including UCLA Engineering's online tutoring program for middle and high school students (Engineering Science Corps), the school's High School Summer Research Program, and the High School Tech Camp.

Dhir was also recognized for improving engineering curricula as a member of the American Society for Engineering Education (ASEE).

The Engineers' Council was founded in 1955 as the San Fernando Valley Engineers' Council (SFVEC) mutual benefit society through the joint efforts of the California Society of Professional Engineers, the American Institute of Plant Engineers, the Society of Manufacturing Engineers and the Institute of Electrical and Electronics Engineers. The Engineers' Council activities have evolved from a joint meeting of societies into today's "Honors & Awards Banquet."

DR. JASON L. SPEYER

Jason L. Speyer was named the inaugural holder of the school's Ronald and Valerie Sugar Chair in Engineering.

The chair was established with a $1 million gift from UCLA alumni Ronald D. Sugar, former chairman and CEO of Northrop Grumman Corp., and his wife, Valerie Sugar.

"Jason Speyer is a recognized leader in guidance and control systems for aviation and aerospace craft, as well as an excellent educator," said Vijay K. Dhir, dean of UCLA Engineering. "I am pleased he has been named to this prestigious chair and am grateful for the generous contributions of Ron and Valerie Sugar, who have long been friends of the school."

Speyer has worked on the guidance, navigation and control systems of vital aerospace and military craft for 50 years. He contributed to the autonomous navigation system on several of NASA's Apollo missions to the moon. He determined the sequence of star, Earth and moon horizons used by astronauts to make angle measurements with a sextant in order to obtain the best estimate of their craft's position. This system was tested on Apollo 8 in 1968 and used in several subsequent Apollo missions.

Speyer also formulated the guidance laws for the U.S. Army's Patriot missile system and developed the longitudinal control laws for the U.S. Air Force's Advanced Fighter Technology Integration F-16 aircraft.

Speyer was also conferred Doctor Honoris Causa, the highest honor of the Technion – Israel Institute of Technology, in acknowledgement of his "groundbreaking and long-lasting contributions to deterministic and stochastic optimal control theory, and their application to important aerospace engineering problems." He was notified by Peretz Lavie, President of the Technion. The conferral ceremony was held in Technion City, Haifa, Israel, on June 10, 2013.

NAE
National Academy of Engineering Members

Albert Carnesale
Chancellor Emeritus

Albert Carnesale is Chancellor Emeritus and Professor at the University of California, Los Angeles (UCLA). He was Chancellor of the University from July 1, 1997 through June 30, 2006, and now serves as Professor of Public Policy and of Mechanical and Aerospace Engineering. His research and teaching focus on public policy issues having substantial scientific and technological dimensions, and he is the author or co-author of six books and more than 100 articles.

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, in honor of his work on boiling heat transfer and nuclear reactor thermal hydraulics and safety. 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.

Chih-Ming Ho
Ben Rich
Lockheed Martin Chair

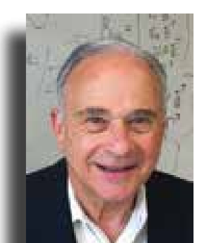
Professor Chih-Ming Ho, director of the Center for Cell Control and holder of the Ben Rich Lockheed Martin Chair, was elected in 1997 for his contributions to the understanding and control of turbulent flows. He joined UCLA to lead research in microelectromechanical system (MEMS) in 1991, and served 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.

John Kim
Rockwell Collins Chair

Professor John Kim was elected into the National Academy of Engineering in 2009 for development of direct numerical simulation and seminal contributions to the understanding of the physics and control of turbulent flows. Kim, who also holds the Rockwell Collins Chair in Engineering, revolutionized the way turbulent flows are studied and modeled. He has made outstanding contributions to the development of direct numerical simulations and large eddy simulations as reliable and respected tools for understanding the physics and control of turbulence.

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.



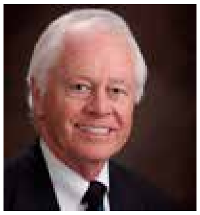
Jason Speyer
Ronald and Valerie Sugar Chair

Professor Jason 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.

NAE Professor Emeritus: Lucien Schmit (not pictured)

MAE Distinguished Speaker Allan McDonald on Lessons from the Challenger Disaster

By Bill Kisliuk and Matthew Chin
Challenger photos courtesy NASA / Lecture photo by HauChee Chung



With the Space Shuttle Challenger's fatal launch as the backdrop, a top engineer with first-hand knowledge of the episode told UCLA engineering students last week never to hesitate to have the courage to speak truth to power and to apply their technical expertise in regards to safety.

Allan J. McDonald, who delivered the Mechanical and Aerospace Engineering Department's Distinguished Seminar on April 18, was the Director of the Space Shuttle Solid Rocket Motor Project at Morton Thiokol at the time of the 1986 Challenger disaster. He and other Thiokol engineers had warned that conditions at Cape Canaveral made it unsafe to launch the Shuttle, and McDonald refused to sign off on the launch. But the engineers' warnings were not heeded, and the ensuing tragedy plunged the country into mourning as well as national soul-searching with respect to the future of America's civilian space program.

In an Engineering V conference room packed with nearly 100 students and faculty members, McDonald offered detailed descriptions of the political and safety assessment missteps that led to the Challenger catastrophe. McDonald was accompanied in his visit to UCLA by Mike Huggins, Chief of the Space and Missile Propulsion Division of the Air Force Research Laboratory's Propulsion Directorate, located at Edwards Air Force Base.

According to McDonald, author of "Truth, Lies and O-Rings: Inside the Space Shuttle Challenger Disaster," NASA officials ignored written warnings about possible problems with operation of the solid rocket boosters at low temperatures as well as concerns from McDonald, who was at Cape Canaveral for the January launch, about the havoc that could be caused by unusually high wind shears.

"I'm not recommending not launching because of what I know," he recalled telling a NASA official. "I'm recommending not launching because of what I do not know."

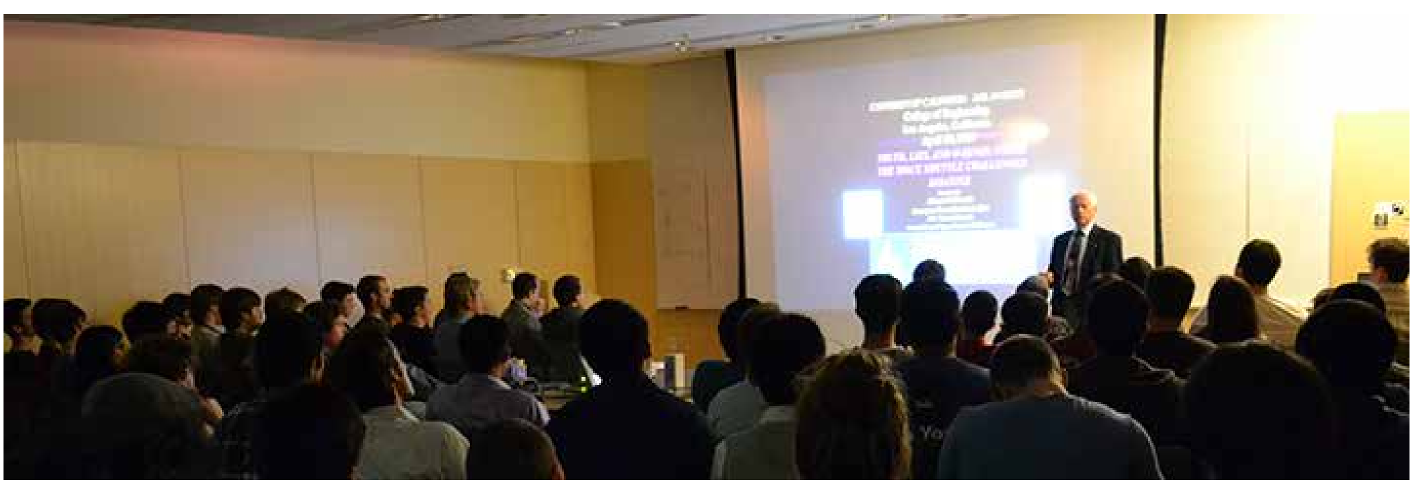
McDonald began the seminar outlining the deteriorating weather conditions and NASA's urgency to launch, especially with a high-profile astronaut, New Hampshire school teacher Christa McAuliffe, aboard. He then showed video of the launch, with the explosion 73 seconds after liftoff.

After the disaster, a Blue-Ribbon Presidential commission issued a report backing the validity of the warnings from McDonald and his engineers at Thiokol Propulsion. McDonald testified five times before the commission, which was led by former Secretary of State William Rogers, and twice before Congress.

McDonald told the audience that it is essential for engineers to apply a "standard of reasonableness" – in addition to their calculations and work in the lab -- to make sure they are offering solid assessments of risks and performance. He told students that once they graduate and enter the working world, "It is your professional responsibility to give your opinion."

He also encouraged engineers not to let pressure to complete a task trump safety and rigorous engineering. And he told students that they should never be afraid to ask questions.

"I've heard a hell of a lot of dumb answers," McDonald said, "but I've never heard a dumb question."



IAB Member Natalie Crawford receives Air Force Academy's National Defense Award

Ms. Natalie W. Crawford, Senior Fellow, RAND Corporation, and member of the UCLA Department of Mechanical and Aerospace Engineering's Industrial Advisory Board, is the latest recipient of the U.S. Air Force Academy's Thomas D. White National Defense Award. Ms. Crawford has been a long-term supporter of the Air Force Academy and was instrumental in establishing an important long-term relationship between RAND and the Academy. Ms. Crawford, an alumna of UCLA, has worked at RAND for more than 40 years, during which she served for nine years as vice president and director of RAND Project Air Force. She is an expert in areas such as conventional weapons, attack and surveillance avionics, fighter and bomber aircraft performance, aircraft survivability, electronic combat, theater missile defense, force modernization, space systems and capabilities, and non-kinetic operations. Ms. Crawford has been a member of the Air Force Scientific Advisory Board since 1988, and was its vice chairman in 1990 and co-chairman from 1996 to 1999. Ms. Crawford has also been a tireless advocate for Science, Technology, Engineering, and Mathematics (STEM) as a critical component of our nation's military force development.

The Thomas D. White Award is presented annually to a U.S. citizen who has contributed significantly to U.S. national defense. Prior recipients have included Bob Hope, Sen. Barry Goldwater, Dr. Condoleezza Rice, and Sen. John Glenn.

MAE shares insights into the future of engineering at the 2013 UCLA Engineering Tech Forum

UCLA's Mechanical and Aerospace Engineering Department participated in the 2013 UCLA Engineering Tech Forum on May 8, 2013. 12 MAE faculty presented their research. Additionally, a gallery of 18 of the very best research posters from MAE's faculty and students were presented.

Mechanical and Aerospace Engineering Technical Session Agenda

Prof. Tsu-Chin Tsao: Overview of MAE department, Precision Motion Control Research
Prof. Robert M'Closkey: Inertial Sensor and Flow Control Research
Prof. Tetsuya Iwasaki: Neuronal Control Principles for Pattern Formation
Prof. Richard Wirz: Plasma Propulsion and Renewable Energy Research
Prof. Nasr Ghoniem: Development and Mechanics of Plasma-Resilient Materials for Space Electric Propulsion, Pulsed Power, and Fusion Energy
Prof. Laurent Pilon: Materials for Waste Heat Energy Harvesting and Energy Storage
Prof. Yong Chen: Carbon Nanotube Neuromorphic Circuits
Prof. Pei-Yu Chiou: High Speed Optofluidics for Biomedical Applications
Prof. Ajit Mal: Detection of Defects in Aircraft and Aerospace Structures
Prof. Oddvar Bendiksen: Aeroelasticity of High-Speed Aircraft Near Mach 1
Prof. Xiaolin Zhong: A New Passive Control Strategy of Hypersonic Boundary-Layer Transition by Surface Roughness
Prof. C. J. Kim: Micro-Mechanical Engineering with Surface Tension

Pratt & Whitney/Rocketdyne contributes $5,000 to the Vishal Parikh Memorial Scholarship

Dr. Munir M. Sindir presented a check for $5,000 to UCLA's Mechanical and Aerospace Engineering Department for the Vishal Parikh Memorial Scholarship. Dr Sindir, Director of Engineering Technical Disciplines at Pratt & Whitney Rocketdyne, presented the check on his company's behalf, on March 25, 2013.

Vishal Parikh, an exceptional aerospace engineering senior who passed away in April 2009 after a valiant battle with cancer, continues to inspire his fellow UCLA engineering students thanks to the scholarship established in his memory.

Parikh's exemplary academic achievements were recognized at the 2009 engineering school commencement with MAE's Outstanding Aerospace Engineering B.S. Student Award. On his behalf, his parents and sister Amita received his posthumous B.S. degree, summa cum laude.

The Vishal Parikh Memorial Scholarship is open to juniors in aerospace or mechanical engineering. Students with interest in a career focusing on rocket propulsion are encouraged to apply. Information is available on the MAE Department website.

MAE Industrial Advisory Board Meeting November 8, 2012.

Left to right: Shawn Philips (Air Force Research Laboratory), Geoffrey McKnight (HRL Laboratories, LLC), Roger Murry (Honeywell Engines, Systems & Services), Wayne H. Goodman (Aerospace Corporation), Dan M. Goebel (Jet Propulsion Laboratory), Prof. Ajit Mal (MAE Chair for Industrial Relations), Gary Ervin (Northrup-Grumman Corporation), Ingo Foldvari (National Instruments), Prof. Tsu-Chin Tsao (MAE Chair), Prof. Christopher Lynch (Director, MS Online Program), Pat Fitzgerald (Raytheon Space and Airborne Systems), Prof. Ted Iwasaki (MAE VC of Graduate Affairs), Prof. Adrienne Lavine (MAE VC of Undergraduate Affairs).

MAE Industrial Advisory Board, 2012-2013

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James S. Paulsen
SSME Program Manager

Pratt & Whitney Rocketdyne Inc.
Munir M. Sindir
Chief Engineer, California Operations

RAND Corporation
Natalie W. Crawford
Senior Fellow / Former Director, Project AIR FORCE

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Pat Fitzgerald
Department Manager, Thermal & Structural Design Mechanical & Optical Engineering Center

Left to right: Prof. Adrienne Lavine (MAE VC of Undergraduate Affairs); Gerard Toribio, '08, Northrop Grumman; Aditi Gobburu, '07, MS '08, Northrop Grumman; William R. Goodin, MS '71, PhD '75, ME '82, Chair, UCLA; Nhat Bui, '12, Northrop Grumman; Anthony Tyson, '12, Rocketdyne; Prof. Tsu-Chin Tsao (MAE Chair).

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MAE 2013 Open House

On April 14, 2013, the Mechanical and Aerospace Engineering Department welcomed 79 prospective freshmen, and their families, for a day-long Open House. In the morning, students attended a general Engineering session in Royce Hall where speakers included MAE Chair Tsu-Chin Tsao. In the afternoon, attendees met MAE faculty and alumni and viewed the student projects of our Robotics Club, UAS, Mini Baja, Supermileage, and BEAM student groups. Vice Chair Adrienne Lavine provided an overview of the department and our curricula, followed by a question and answer session with a panel of young alumni and current students. Our undergraduate teaching lab was also open for viewing. Many families expressed their appreciation for the great turnout of students, alumni, and faculty, which reflected well on our department.

Tak Sing Wong receives R&D 100 Award for ultra-slippery liquid-repellant coating

By Matthew Chin

Left: SLIPS and control contrast

Right: Wyss Postdoctoral Fellow Tak-Sing Wong, and Prof. Joanna Aizenberg, a Wyss Core Faculty Member and the Amy Smith Berylson Professor of Materials Science.

Tak Sing Wong PhD '09 was part of a research duo from Harvard University's Wyss Institute for Biologically Inspired Engineering that received a 2012 R&D 100 award for the development of an ultra slippery surface inspired by the carnivorous pitcher plant.

The R&D 100, nicknamed the "Oscars of Innovation," are awarded by R&D Magazine to the top 100 technology products of the past year. The awards were established in 1963 as the "I-R 100s" when the magazine was called Industrial Research.

Wong and the material's principal developer Joanna Aizenberg, a professor of materials science at Harvard, received the award earlier this month in Orlando, Florida.

Their liquid-repellant material, called Slippery Liquid-Infused Porous Surfaces or SLIPS, repels immiscible liquids of virtually any surface tension. The team combined a functionalized porous and textured solid with a chemically inactive liquid, which resulted into an ultra-smooth and chemically inert lubricating surface film. The new surface is largely incompressible, smooth, and free of defects down to the molecular level. It also can self-repair through wicking into damaged areas.

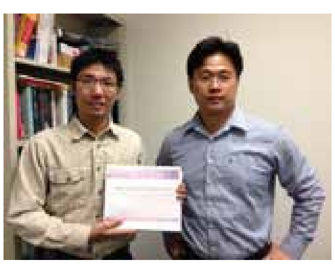
The technology was first described in the September 22, 2011 issue of the journal Nature. It has many potential applications across many areas, such as: refrigeration, preventing biofilms from forming on medical devices, and a host of everyday household applications.

"Many industrial applications that would require slippery, non-sticking coatings may be benefitted from the SLIPS technology," said Wong.

SLIPS can be optimized for high-temperature and pressure conditions, and can be used to transport fluids such as crude oil or biofuels; to form ice-resistant coatings; resist water- and oil-based spray paints; and to fulfill applications that require biocompatibility.

Wong received his Ph.D. degree under the guidance of Chih-Ming Ho (http://ho.seas.ucla.edu/), distinguished professor of mechanical and aerospace engineering and holder of the Ben Rich-Lockheed Martin Endowed Chair in Aeronautics. His Ph.D. thesis was on the investigation of the nanoscopic origins of fluid repellency. Wong is currently a Croucher Foundation Fellow (http://scholars.croucher.org.hk/scholars/tak-sing-wong) at the Wyss Institute (http://wyss.harvard.edu/). He will be starting as an assistant professor of mechanical and nuclear engineering at Pennsylvania State University (http://www.mne.psu.edu/wong) in January 2013, where he will develop novel biologically inspired technologies for materials, energy and biomedical applications.

Kuo-Wei Huang wins the IEEE Nanomed 2012 Best Paper Award



UCLA MAE PhD Student Kuo-Wei Huang won the IEEE Nanomed 2012 Best Paper Award at the 6th Annual IEEE International Conference on Nano/Molecular Medicine and Engineering, held November 4-7 in Bangkok, Thailand. The winning paper title is "Optoelectronic Tweezers Integrated with Lensfree Holographic Microscopy for Large-area Cell Detection and Manipulation," authored by Kuo-Wei Huang, Ting-Wei Su, A. Ozcan, and Pei-Yu Chiou.

The paper is a result of a collaboration between two UCLA laboratories: the Optofluidics Systems Lab directed by MAE Associate Professor Pei-Yu Chiou, where Huang is a PhD student; and the Bio/Nano-Photonics lab, directed by EE Associate Professor Aydogan Ozcam, where Su is a PhD student.

Xiaoyong Wang wins the 2012 Henry Ford Technology Award for Research

UCLA MAE alumnus Dr. Xiaoyong Wang won the 2012 Henry Ford Technology Award, as part of the team researching the design, development and implementation of the Global Vehicle Control System for Start-Stop Vehicles.

"The Henry Ford Technology Award is the highest technical accolade one can receive in Ford Motor Company," said Dr. Tony Phillips, Senior Technical Leader and Manager of Dr. Xiaoyong Wang. "Although many people worked on designing and developing the Stop/Start Technology that has now been launched in our vehicles globally, deserving special attention is the team that Xiaoyong was part of. This team developed the Global Vehicle Control System. Their effort to establish a standard architecture and vehicle control design has allowed this technology to easily migrate throughout the Ford product portfolio, thereby supporting Ford's mission to deliver value to the greatest number of people."

Below is a brief summary of the award and its team members.

RESEARCH

-For the design, development and implementation of the Global Vehicle Control System for Start-Stop Vehicles

Ming Kuang (R&AE), Urs Christen (R&AE-Germany), Thomas Rambow (R&AE-Germany), Xiaoyong Wang (R&AE), Hai Yu (R&AE)

Nominators – Scott Staley and Andreas Schamel

Wang was a member of UCLA MAE Professor Tsu-Chin Tsao's Mechatronics and Controls Laboratory. "Research and study at UCLA gave me a solid understanding of systems and control theories," said Wang. "At Prof. Tsao's lab, I gained hands-on experience in various control system applications, such as control applications in automotive engineering. The academic background I was able to establish during my graduate studies really provides me with a competitive edge in the research I am currently doing at Ford Motor Company."

(Some material in this article was excerpted from an @Ford Online article by Megan Whalen)

Left: Dr. Xiaoyong Wang and Ford Motor Company CEO Alan Mulally

Right: 2012 Henry Ford Technology Award presentation. Left to right: Scott Staley (nominator and chief engineer), Ming Kuang, Xiaoyong Wang, Hai Yu, Paul Mascarenas (CTO, Vice President – Research and Advanced Engineering), Raj Nair (Group Vice President, Product Development).

Ray Hsu wins first 2012 "Tao Wu Researcher of the Year" award

UCLA Mechanical and Aerospace Engineering Department graduate student Chin-Jui "Ray" Hsu was selected to receive the first 2012 "Tao Wu Researcher of the Year" award. Chin-Jui Hsu's selection was based on his outstanding academic accomplishments in the Active Materials Laboratory (AML) over the last year.

The "Tao Wu Researcher of the Year" award was endowed and established by Dr. Tao Wu in 2011 and Dr. Wu is a former AML student advised by Prof. Gregory P. Carman. This award is offered every year to an AML member with the highest scientific impact publications and active research contributions during the previous year. The aim of this award is to encourage original and high impact research work conducted in AML and continue the tradition this lab was founded under back in 1992.

Chin-Jui "Ray" Hsu's research focuses on the conversion of energy between different states in multiferroic materials. He is most known for his work on thermomagnetic energy harvesting systems at the nanoscale as well as his recent work on electrically controlling the magnetic states of thin film ferromagnetic materials. Ray recently graduated with a PhD in Mechanical Engineering and recently joined Intel as a research engineer in December 2012.

Wei Yu raises $1.6 million for biofuel startup based on research from Chih-Ming Ho's Micro System Laboratories

In April 2013, UCLA MAE Ph.D. student Wei Yu raised $1.6M series A venture capital for Lyxia Corporation, a biofuel startup based on research from UCLA MAE Professor Chih-Ming Ho's Micro System Laboratories. Preceeding this, in July 2012, Lyxia Corporation was founded by Wei, and acquired exclusive rights to use new UCLA technology that increases the harvest of microalgae-derived biofuels.

While the current sugar-based microalgae biofuel industry is striving against the spread between sugars and fuels, researchers and scientists are exploring an efficient, natural way of directly converting carbon dioxide into fuels via microalgae. One possible candidate to this question in a commercial scale deployment could be Botryococcus Braunii, a green, pyramid shaped planktonic microalga, which lives in freshwater, but can also adapt to large range of (sea) salt concentration.

B. braunii is well known for its ability to produce hydrocarbons which have been described as equivalent to the "gas-oil fraction of crude oil." Like petroleum, these hydrocarbons can be turned into gasoline, kerosene and diesel .While other algal species usually contain less than 1 percent hydrocarbon, in B. braunii they typically occupy 20-60 percent of its dry matter, with a reported maximum of >80 percent. More importantly, these hydrocarbons are active being excreted outside of the cell, making extraction easier than when the cell wall has to be passed to reach the organics inside the cell. B. braunii's major disadvantage is that it grows slowly: its doubling time is 72 hours, and two days under laboratory conditions. This makes harvesting large amounts of oil from B. braunii become time consuming and thus more costly.

Wei, as a bioengineering Ph.D student, joined UCLA Micro System Laboratories at 2010. Under the guidance of Prof Chih Ming Ho, Prof James C. Liao and Prof Laurent Pilon, Wei worked with Priscilla Zhao, a Ph.D student from the same research group, to develop a possible means to accelerate B. braunii's growth and oil productivity. Within two years, it has been demonstrated that a special combination of catalysts can increase the cell growth over several times than control condition without feeding the cells with any sugar-based feedstock. This also effectively increases the total hydrocarbon content than control group. An explicit illustration of this technology is that the catalysts will trigger microalgae to rapidly turn into the "high-hydrocarbon phase", which appears brown in color.

In July 2012, Wei founded Lyxia Corporation in the state of Delaware with two UCLA MBA graduates, aiming to license this innovation generated from UCLA Micro Systems Laboratories. As an early stage company, Lyxia is focusing on the further R&D of this technology and expanding the application into other microalgae species and purposes. In future, Lyxia will actively deploy this technology into large scale production.

Jennifer Fox selected as finalist in Metropolitan Water District Spring Green Exposition

Jennifer Fox (M.S., Mechanical Engineering) submitted her graduate research project to the Metropolitan Water District's Third Annual Spring Green Exposition held on May 16, 2013. Her project, a soil moisture sensor irrigation control system, was selected to be featured as a student exhibition at the exposition along with 29 other college and graduate students in Southern California. Jennifer brought her working prototype for live demonstrations of the control system and gave a project pitch to eco-friendly vendors, student exhibitors and attendees of the Spring Green Expo. She was selected as one of four finalists in the the student project water conservation competition, and was the only independent project selected as a finalist.

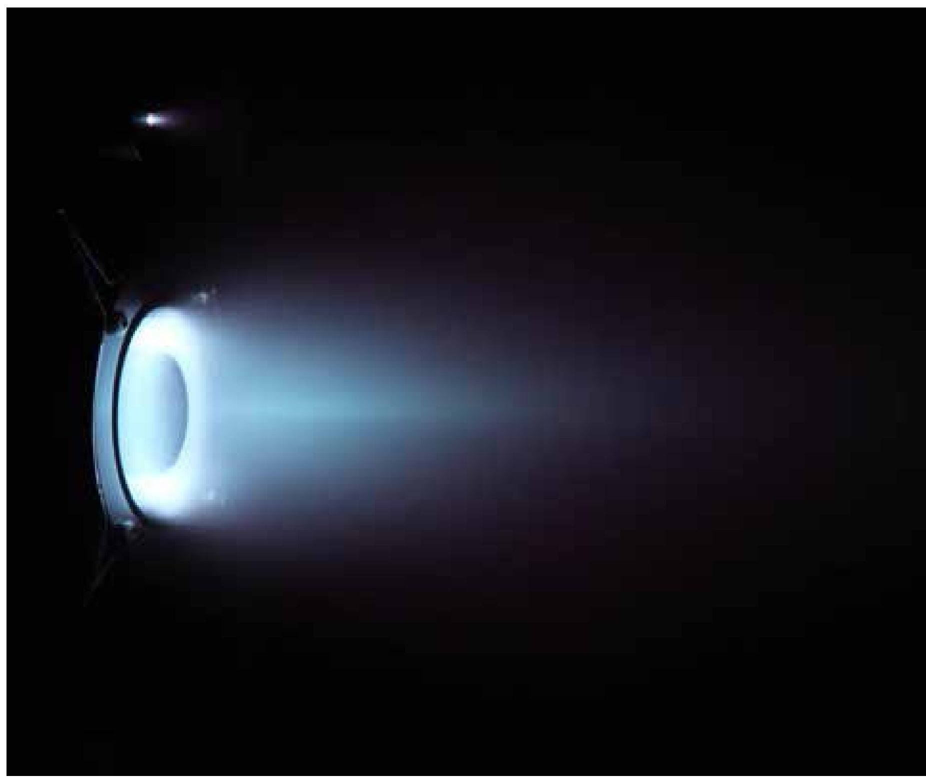
Ryan Conversano awarded the NASA Space Technology Research Fellowship

In May 2013, Ryan Conversano was awarded the NASA Space Technology Research Fellowship (NSTRF). The NSTRF is a prestigious and highly selective award designed "to sponsor [...] graduate student researchers who show significant potential to contribute to NASA's goal of creating innovative new space technologies for our Nation's science, exploration and economic future." According to NASA, "the goal of the NSTRF is to provide the Nation with highly skilled researchers and technologists to improve America's competitiveness. NASA Space Technology Fellows will perform innovative space technology research while building the skills necessary to become future technological leaders."

Conversano has enjoyed 8 years as a UCLA Bruin, earning his B.S. and M.S. in Aerospace Engineering in 2010 and 2011, respectively. He has been an active researcher in a variety of disciplines including spacecraft design, space mission analysis, aerodynamics, and materials science. Conversano is currently a PhD student under Prof. Richard Wirz in the UCLA Plasma & Space Propulsion Laboratory.

In general, Conversano's research is in the field of electric propulsion (EP). EP thrusters operate by ionizing a noble gas (usually xenon) to create a plasma and then electrostatically accelerating these ions to generate thrust. Although the thrust from EP devices is much less than that achieved through chemical means (i.e. rocket engines), EP offers significantly higher thrust duration per unit mass of propellant. This enables extended deep-space missions by requiring far less propellant to fulfill the mission goals, thereby lowering total mission costs.

Conversano's thesis investigation is focused on developing a novel miniature electric propulsion device (specifically, a Hall thruster) that offers dramatically increased operational lifetime and significantly improved performance compared to the current state-of-the-art. Details of the device are currently proprietary and patent pending; however, the thruster is scheduled to be revealed to the science community in late 2013. This research is important to the future of space exploration as it satisfies the needs of NASA's next-generation spacecraft.

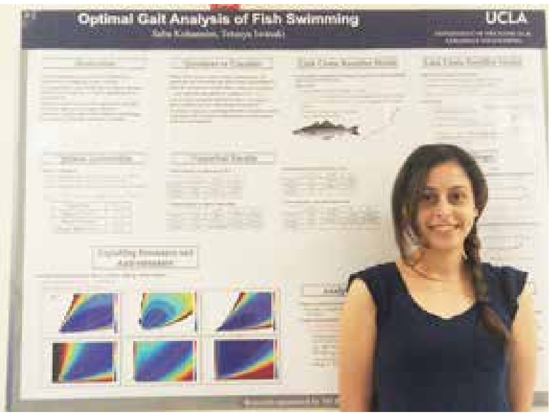


Top: Ryan Conversano standing in front of the Microthruster / Plasma Interaction Facility vacuum chamber.

Middle: UCLA's 300 W miniature Hall thruster in operation at the UCLA Plasma & Space Propulsion Lab.

Bottom: Conversano working on the Microthruster Test Facility vacuum chamber, preparing electrical connections and water cooling lines for future experiments.

Saba Kohannim receives an NSF Graduate Research Fellowship



MAE graduate student Saba Kohannim was selected to receive a 2013 National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP) Fellowship. Kohannim's selection was based on her "outstanding abilities and accomplishments," as well as her "potential to contribute to strengthening the vitality of the US science and engineering enterprise." She was among 82 recipients in the nation, in the field of Mechanical Engineering.

Kohannim's research aims to uncover the biological principles underlying fish swimming and develop a systematic method for designing feedback controllers for robotic vehicles that achieve efficient propulsion through natural oscillations of the coupled body-fluid system. The focused studies addressing specific scientific challenges in animal locomotion will have implications in broader contexts. Her research will contribute to understanding of neuronal control mechanisms for rhythmic movements. Elucidating how neural oscillators react and adapt to changes in the environment can have a long term effect in improving human locomotion and neural impairments. Her research will translate the biological knowledge to engineering design methods, developing a feedback control theory for global pattern formation through distributed local interactions -- a fundamental property of practical significance for various complex systems design.

Kohannim graduated Magna Cum Laude and received her B.S. in Mechanical Engineering from UCLA in 2011. She has published and presented preliminary results of the proposed project at various occasions including: "Optimal turning gait for undulatory locomotion," American Control Conference in 2012, and "Resonance in fish swimming to minimize muscle tension," the Society for Integrative and Comparative Biology Annual Meeting in 2013.

Adam Provinchain (right) and Brett Lopez (left) take 1st and 2nd place at 2012 RISE-UP Poster Competition

On August 23, 2012, the UCLA Center for Excellence in Engineering and Diversity (CEED) held its 8th Annual Research Intensive Series in Engineering for Underrepresented Populations (RISE-UP) Undergraduate Research Poster Competition. In the lobby of the California NanoSystems Institute (CNSI), nine researchers participated in the competition that was judged by: Dr. Esther Lan, Lecturer of Materials Science & Engineering; Dr. Gaurav Sant, Assistant Professor of Civil & Environmental Engineering; and Dr. Benjamin Williams, Assistant Professor of Electrical Engineering.

First place was awarded to Adam Provinchain (who recently completed his 3rd year in Mechanical Engineering) for his work on The Fabrication, Characterization and Analysis of a Barium Titanate/Epoxy Resin Nanocomposite sponsored by the NSF-funded Center for Scalable and Integrated NanoManufacturing (SINAM), under the direction of Professor Adrienne Lavine, and mentored by Audrey Pool O'Neal, Mechanical Engineering Ph.D. candidate. Second place was awarded to Brett Lopez (who recently completed his 3rd year in Aerospace Engineering) for his work on Combustion Instability and its Influence on Droplet Flame Behavior in an Acoustically Excited Field sponsored by the UCLA Undergraduate Research Center - Center for Academic and Research Excellence (URC-CARE), under the direction of Professor Ann Karagozian, and mentored by Cristhian Sevilla, currently an MS student in Mechanical Engineering. Third place was awarded to Carlos Sotelo (who recently completed his 2nd year in Computer Science & Engineering) for his work on Realistic Human Simulation sponsored by Cisco, under the direction of Professor Demetri Terzopoulos.

UCLA MAE 2013 Commencement Awards and Honors

2013 CHANCELLORS SERVICE AWARD
Phuong Le Nguyen, B.S., AE, F13

2013 ENGINEERING ACHIEVEMENT AWARD FOR STUDENT WELFARE
Ashly Jarea Ainley, B.S., ME, Sp13
Mackenzie James Booth, B.S., AE, Sp13
James Christopher Burdick, B.S., ME, Sp13
Cesar Quinde, B.S., ME, Sp13
Phuoc Hai Nguyen Tran, B.S., AE, Sp13
Shannon Tan, B.S., AE, Sp14
Christopher Brent Underhill, B.S., ME, Sp13

MAE DEPARTMENT AWARDS
Sarah Caitlin Miller, B.S., AE, Sp13
Ryan Thomas Freeman, B.S., ME, Sp13
Cristhian I. Sevilla Esparza, M.S., AE, Sp13
Felix Yik Lee, M.S., ME, F12
Daniel Robinson Getsinger, Ph.D., AE, F12
Maziar Sam Hemati, Ph.D., ME, W13

OASA SPECIAL CONGRATULATIONS
Cesar Cervantes, M.S., AE, Sp13

Other alumni and students in the news

UCLA MAE Professor Chih-Ming Ho's had two former students become faculty members.

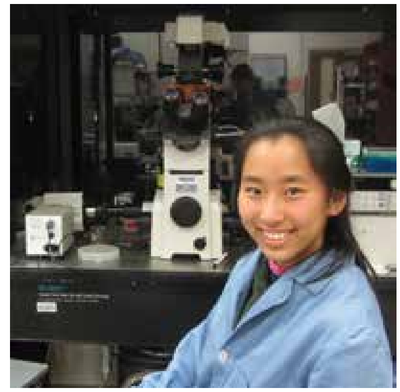
Xianting Ding: Shanghai Jiao Tung University
Hideaki Tsutsui: UC Riverside

Cynthia Yin researches optimal drug cocktails to treat triple-negative breast cancer via Feedback System Control

Cynthia Yin was awarded 4th place in the 2013 Ventura County Science Fair's (VCSF) Senior Division Human Biology category. Yin, a rising senior at Westlake High School, is continuing her third year as a SINAM (Center for Scalable and Integrated Nano-Manufacturing) student researcher in UCLA Micro Systems Laboratory under Mechanical and Aerospace Engineering Professor Chih-Ming Ho. The SINAM Program provides research opportunities in nanotechnology and related fields to encourage students to pursue advanced degrees in engineering. The program is directed by Professor Adrienne Lavine and coordinated by KiMi Wilson. By exposing herself to emerging technologies in Professor Ho's lab, Yin strives to challenge herself beyond the school curriculum.

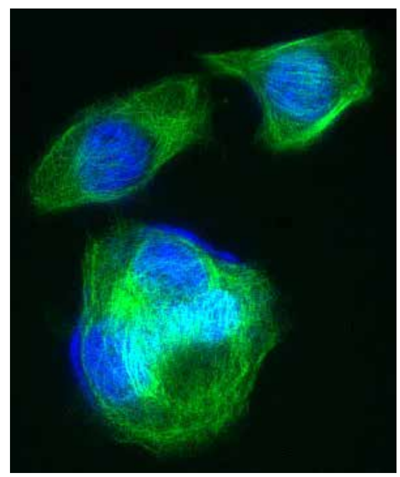
Through the SINAM Summer Research Program in 2012, Yin conducted research on combinatorial drugs for novel treatment of triple negative breast cancer (TNBC) through intervention of cell motility. TNBC accounts for approximately 100,000 breast cancer deaths annually. Because TNBC does not overexpress key membrane receptors that typically distinguish most breast cancers, it cannot be effectively treated with traditional receptor-targeted therapies. In addition to this clinical difficulty, extensive time and costs are required to determine efficacious drug combinations with multiple concentrations. To overcome ineffective treatment, Yin selected drugs to inhibit TNBC cell motility and cancer metastasis. She applied single drug treatment as well as drug cocktails at various concentrations to TNBC cells. Yin also performed fluorescence microscopy to evaluate cytoskeletal integrity in response to drug treatment, and time-lapse microscopy to analyze cell migration. Through these experiments, she proved that drug combinations rather than individual drugs are more effective in treating TNBC. Yin presented her research to UCLA faculty and students at Science Summer Programs for Undergraduate Research (SPUR) poster session at the culmination of the SINAM Summer Research Program.

Continuing her research in Professor Ho's lab during the academic year, Yin applied Feedback System Control (FSC) to efficiently search for optimal drug cocktails for TNBC by eliminating the need to test all drug treatments. As part of FSC, a two-level factorial design determined drug combinations to test. Morphological dynamics of TNBC cells in response to these selected drug treatments were evaluated through time-lapse microscopy. Response surface methodology as part of FSC predicted the entire response surface, based on cell motility measured during time-lapse experiments. From the response surface models, FSC rapidly pinpointed optimal drug cocktails among all possible drug combinations. Yin's results indicated that reduced cell motility was feasible with a combination of several drugs at lower concentration levels rather than one drug applied at a significantly higher concentration. These drug cocktails at low dosages not only limit possible toxic side effects from high dosages, but also eliminate drug resistance by targeting multiple pathways that influence tumor development. FSC can significantly reduce the resources needed to efficiently identify optimal drug cocktails within a large drug library. For her research, Yin earned 4th place in the 2013 VCSF Senior Division Human Biology category.



Cynthia Yin at a fluorescence microscope in Professor Ho's Micro Systems Laboratories.

Through the SINAM Summer Research Program in 2013*, Yin will extend her research on TNBC treatment with an orthogonal array composite design (OACD) as part of FSC. By implementing a two-level factorial design and three-level orthogonal array, OACD selects several drug combinations for evaluation, but reduces the time and resources needed to test all possible drug combinations. She also aspires to explore interdisciplinary fields and make new discoveries through her research. A strong believer in the power of knowledge, Yin expressed her gratitude: "UCLA has really opened up a world of opportunity to me, and I hope to take the skills that I've learned – not just in research, but also in teamwork, leadership, and creativity – towards a career in engineering."

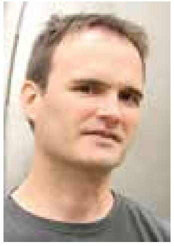


Fluorescence images of TNBC cells after drug treatment by Cynthia Yin. Blue denotes cell nuclei, and green denotes microtubules of the cytoskeleton.

Yin's avid participation and achievements in science and math competitions reveal her profound interest in science, technology, engineering, and mathematics. She encourages interest in STEM by leading Physics Club, Math Club, Mu Alpha Theta Club, and Science Olympiad Team at Westlake High School. Yin has organized club members to compete in VEX Robotics Competition, Science Olympiad Competition, American Mathematics Competition, American Scholastic Mathematics Association contests, Pomona-Wisconsin Mathematical Talent Search, American Regions Mathematics League, California Mathematics League, Log1 contests, and Rocket City. Her excellence in STEM was recognized by US Senator Barbara Boxer, as well as the Society of Women Engineers San Buenaventura Section.

* This article was written prior to Cynthia Yin's participation in the SINAM Summer Research Program in 2013.

MAE 161D: Space Technology Hardware Design



During the 2013 Spring quarter, students in the Department of Mechanical and Aerospace Engineering (MAE) were offered an opportunity to get hands-on experience with spaceflight hardware and earn credit toward their degree in the process. The course, MAE 161D: Space Technology Hardware Design, introduced students to space systems design via weekly lectures by an interdisciplinary group of instructors from UCLA and NASA's Jet Propulsion Laboratory (JPL). Additionally, as a design course, students were required to work in teams to design and build prototype subsystems for a real mission being designed at UCLA. By incorporating hardware, the class combined aspects of both mechanical and aerospace engineering that are critical to the increasingly important aerospace industry.

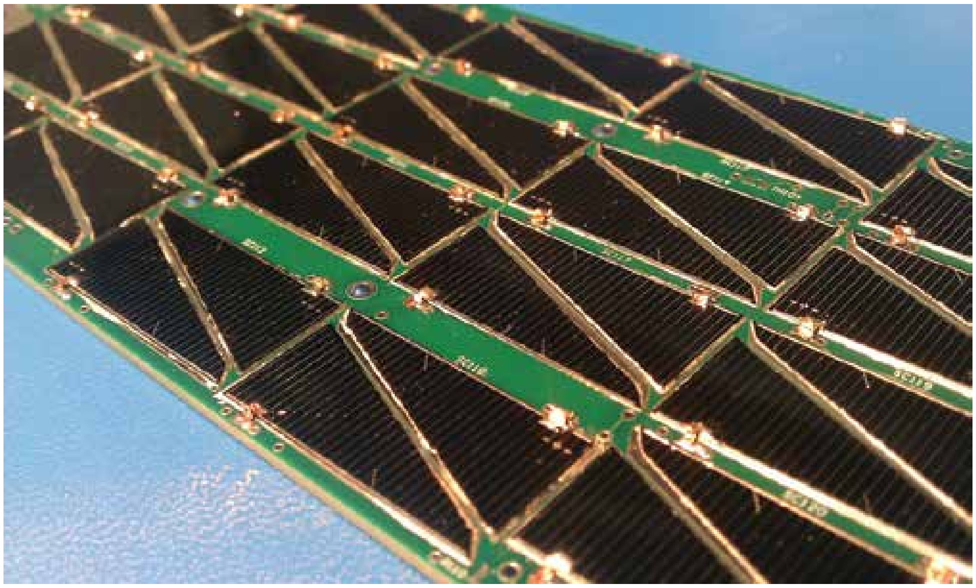
During the first week of classes, MAE 161D students were introduced to the Electron Losses and Fields INvestigation (ELFIN) mission, which is being designed by students and professionals in UCLA's Department of Earth, Planetary, and Space Sciences. The Principle Investigator of ELFIN, Prof. Vassilis Angelopoulos of UCLA's Institute of Geophysics and Planetary Physics (IGPP), served as the official "customer" for the class' design projects, provided this introduction. ELFIN is a 3U CubeSat mission, using a standardized set of satellite requirements, one of which limits the full satellite size to only 10cm x 10cm x 30cm, or about the size of a loaf of bread. CubeSats are ideal for education and several universities have successfully launched and operated student-designed and -led CubeSat missions. Thus, MAE 161D provided UCLA engineering students with an opportunity to enter the exciting, interdisciplinary, and educational world of CubeSats.

The class promotes teamwork and team management experience. The students were split into teams of 3-4 and assigned design challenges from several of the ELFIN subsystems. Throughout the course, students were introduced to the many stages of spacecraft and hardware design, manufacturing, and testing. Students were also required to incorporate systems engineering and good management practices by maintaining various documents throughout the project, such as requirements spreadsheets, interface control documents, testing procedures, budgets, and schedules.

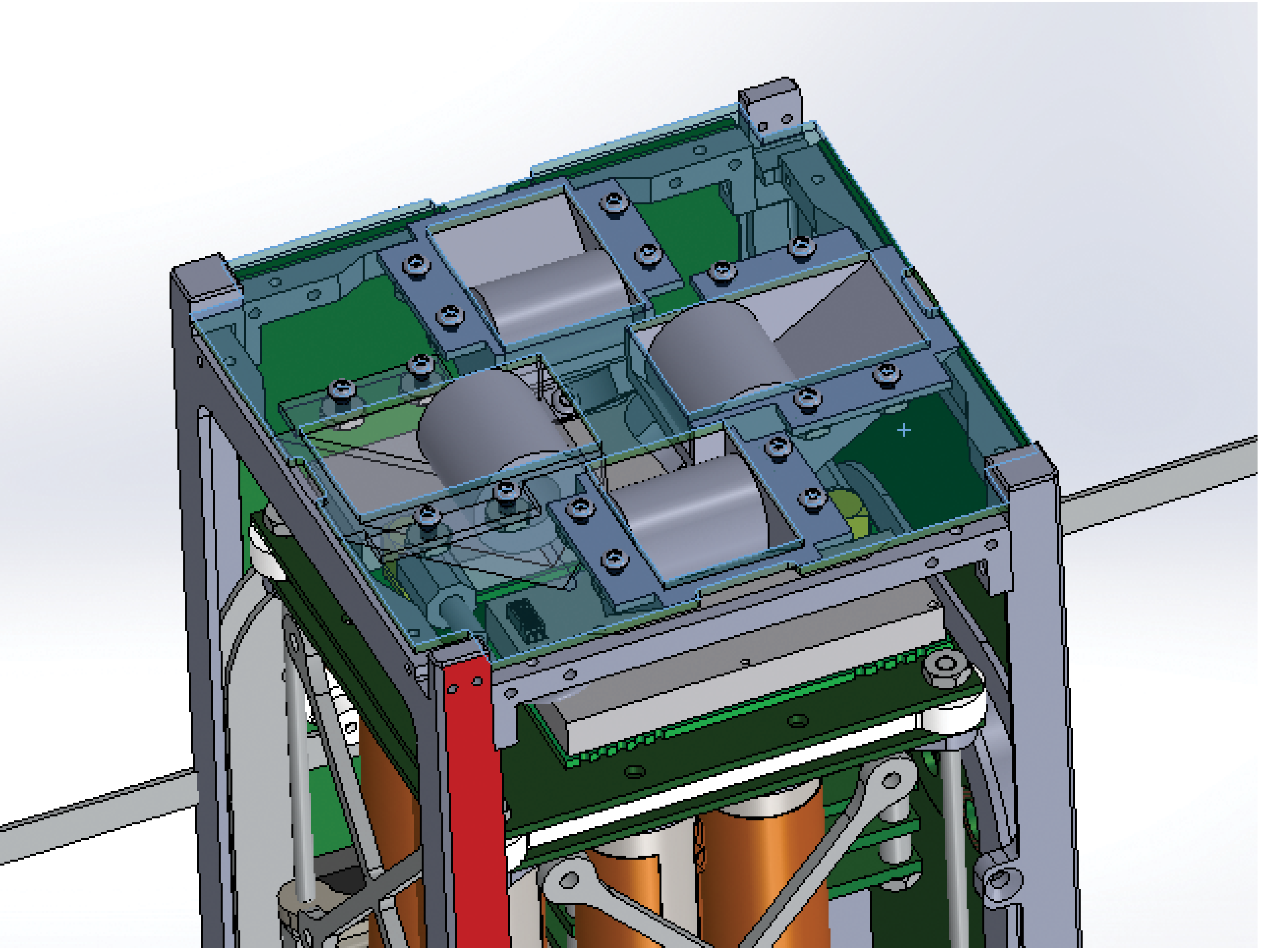
An exciting and unique aspect of the course was its JPL, which allowed students the unique opportunity to work with and learn from professional NASA engineers. Students also visited JPL twice during the quarter for a tour and to participate in two professional-style aerospace design reviews, preliminary (PDR) and critical (CDR), which served as their midterm and final exams, respectively. At these design reviews, student teams presented their subsystem designs, trade studies, and test results to a panel of JPL engineers.

Overall, MAE 161D provided students with an excellent opportunity to gain invaluable teamwork and hands-on experience in space systems engineering. Such experience allows UCLA students to be more competitive in the aerospace industry, which is a major high-tech employer in Southern California.

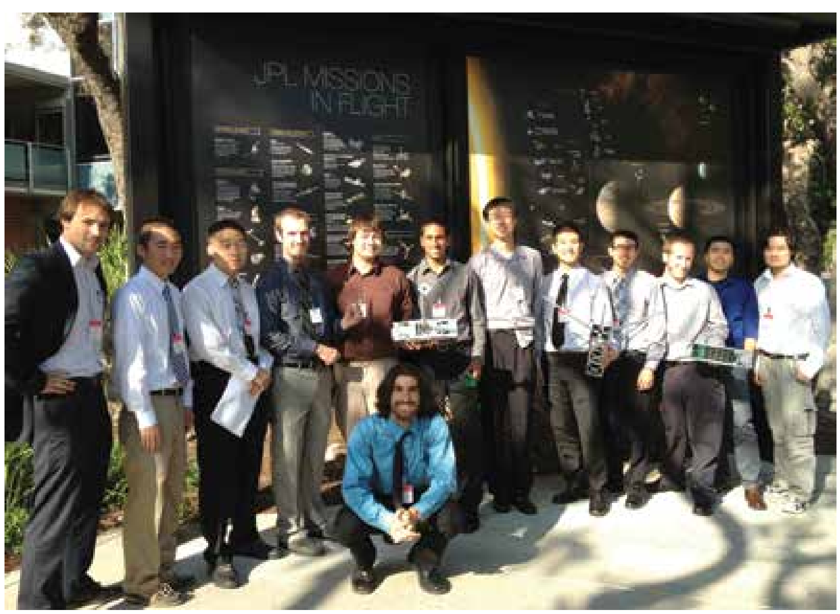
The MAE 161D course, which has not been offered in over a decade, was revived by UCLA Asst. Prof. Richard Wirz and JPL Senior Research Dr. Dan Goebel, and enabled by the tireless efforts of Dr. Drew Turner (UCLA IGPP) and Mr. Jared Lang (JPL).



CubeSat solar panel assembled and tested by MAE 161D students.



SolidWorks assembly of a magnetically clean antenna deployment system designed, built, and tested by MAE 161D students.



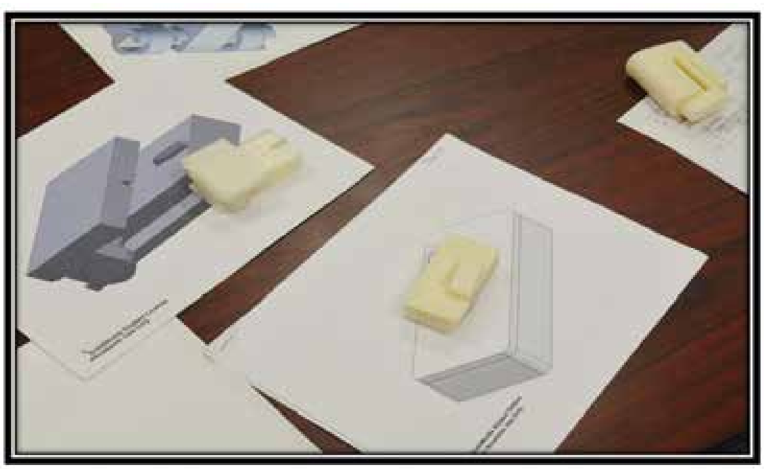
161D students and future engineers enjoying their visit to JPL.

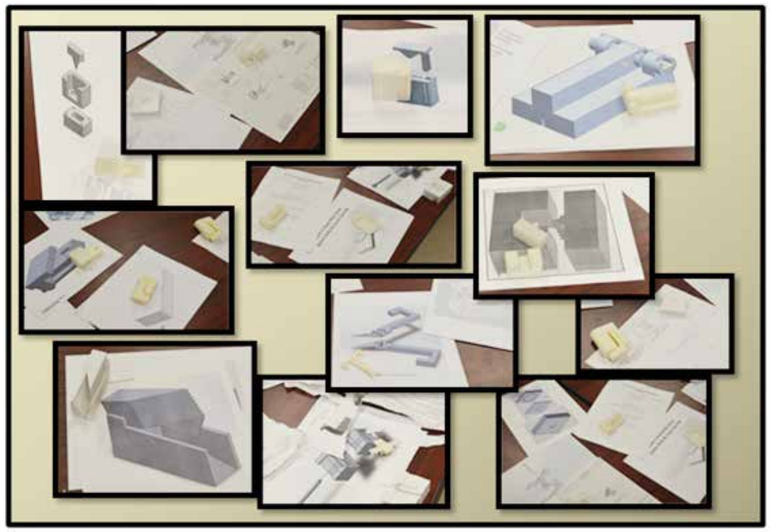
MAE Rapid Prototyping Competition

The Mechanical and Aerospace Engineering (MAE) sophomore course in Computer Aided Design (CAD) and Drafting (MAE-94), taught this quarter (Fall 2012) by Prof. Robert Shahram Shaefer introduced a new item to the curriculum. Until this year, students performed all matters of computer aided design in the virtual world, using commercial CAD software, such as SolidWorks or Autocad. To provide the students with a better design experience, the student were given the opportunity to manufacture and realize their virtual design project. The students were to use Rapid Prototyping devices, which are capable of replicating a digital CAD solid model into a free-standing 3-dimensional structure made of ABS-plastic (Lego® plastic). The devices are generally called "3-D Printers," because similar to an inkjet printer they "print" an object by continuously depositing a fine string of molten plastic, layer by layer resulting in a 3-D object. Upon deposition, the molten plastic rapidly solidifies and thus a new layer can be deposited on top of a lower one.

Twenty two teams were formed to promote and build camaraderie and competition among students. The assignment was to create a device, which is capable of splitting a single sheet of paper using only parts that were fabricated by the rapid prototype device (Makerbot®). Design requirements were given to challenge the students by limiting the total size of the device to fit within a 1 x 2 x 3 inch^3 volume and to cut a minimum length of 10 mm. Additionally, the teams were told that following demonstration of design requirements, a competition would be held to cut as large a stack of papers as possible. The top three winning teams would receive a "Certificate of Winning" and extra credit.

Twenty two different and innovative designs were developed. The devices had a minimum of 2 parts and some had as many as six. The "printing" experience was everything but smooth. Because this was the first time the new Rapid Prototype devices were being used (they had arrived just weeks before the quarter started), a number of unexpected performance issues had to be resolved. However, the students were persistent; some teams spent as much as 8 hours in the CAD lab to produce just a single part. Several teams had to redesign their device, due to the limitations of





the "printer" and some had to redo their parts due to unexpected fabrication flaws.

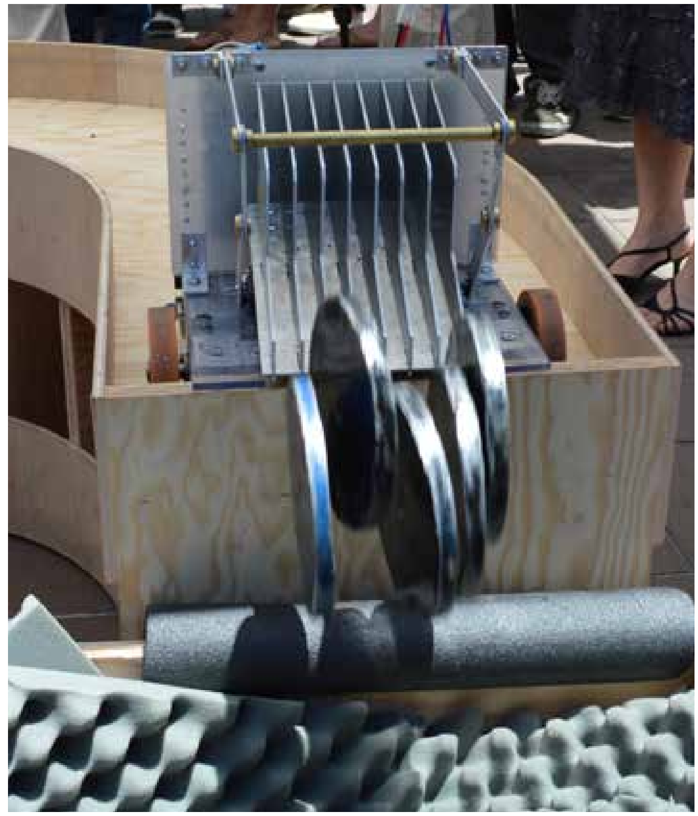
On the day of competition, Dec. 14th 2012 (last day of Finals week), 22 eager teams gathered in 54-127 Engineering-IV. They displayed their products along with a paper printout of their CAD models. The teams then demonstrated the device by cutting a single piece of paper, thereby fulfilling the primary design requirement. Following the demonstration the competition took place. The large variety of designs resulted in a wide spread in the maximum number of papers that could be cut by each device. All teams were able to cut at least 2 papers. However, the first place winning team cut 32 pieces of paper all at once. The second place winning device cut 28 and the third winning team cut 22 papers, all to a minimum length of 10 mm. Because the parts were made of plastic, some of the devices broke during the competition and for the most part, the small size of the device and the fact that teams could only use muscle power to engage the device made cutting a very arduous endeavor.

The vice-chair of the MAE department, Adrienne Lavine along with other faculty members was present during the competition. Judging from the excitement, it became apparent that the competition at the end of the quarter was a great motivation and celebration of the students' work.

In the end, the process of concept innovation, designing and modeling of parts, overcoming fabrication challenges, re-designing, and spending a lot more time manufacturing than expected, provided the students the opportunity to experience a near real-life product development process.

Clockwise from top left: Prof. Shaefer, 1st place winners Mark Warwick and Derek Wun, and Ph.D. student Christopher Kang; 2nd place winners James Song and Parisa Dashti; 3rd place winners Joseph Marks and Aurora Garcia; a variety of paper cutting designs; 3-D models on the table; students Dylan Aramburu, Matthew Friedman, and Alexander Berry; Alan Kinoshita and Jonathan Law demonstrate their design; close up of some 3-D models.

MAE Annual Capstone Design Competition



The Mechanical and Aerospace Engineering 3rd Annual Capstone Design Competition (MAE162D/E) was held on June 14, 2013 and winning teams received plaques in recognition of their excellent design. This year's senior mechanical engineering design project was an "Autonomous Unloading Material Transporter," which needed to navigate a pre-designed pathway and be able to unload a payload of at least three 6-inch diameter lead (Pb) discs into a collection bin at the end of the path. The first prize went to Team-9, whose vehicle delivered 56 discs (336 lb), the second prize went to Team-11 with 40 discs (240 lb) and the third prize winner was Team-7 with 16 discs (96 lb).

The MAE162D/E Capstone Design course spans over two quarters. In the first quarter, students are provided with the tools they need to perform the design project (software and hardware) and in the second quarter, they focus on finalizing their design, then building and testing it. This sequence offers an essential experience for up-and-coming engineers. The courses introduce students to mechatronics, the combination of electronics with mechanical devices, which is extremely important in today's engineering world. Industry is very interested in students who've taken hands-on design courses like MAE162D/E. These two courses are practical and provide the valuable hands-on learning experience. The sequence also encourages teamwork in design, fabrication, and resource management, in documenting, and presentations as well as in competition. Therefore it also encourages camaraderie and cooperation, all of which are essential for a successful career.

Leading the charge for this year sequence (MAE162D/E) was Professor Robert Shaefer, who taught the course with two other co-instructors, Dr. Herrick Chang and Dr. Sarah Warren. Instruction for the first term focused on conceptual design with topics ranging from mechanical component design and mechatronics. Lab work included CAD (computer-aided design), CAD analysis, mechatronics and conceptual design for individual projects. Students began designing their projects in 162D in their CAD and Mechatronics lab. Then in 162E, they were provided with opportunities for fabrication and testing, project demonstration and finally competition with their fellow classmates.

The 2013 class had 90 students who worked in groups of five or six throughout the two course series. Each of the 17 teams were given a control board (courtesy of National Instruments) and a budget of $350 to design and build an autonomous vehicle. Students were given a set of high level design requirements that their design needed to fulfill, which included navigation along a pre-determined wooden ramp, to transport and unload at least 3 lead discs autonomously, along with other prerequisites like how the vehicle should be powered, its size, its movement along the pathway, and

the limited budget. Students were also provided with a detailed description of the pathway (three platforms and two inclined ramps and three 900 smooth turns).

The allotted time during competition was 5 minutes and final scores for teams on competition day was the weight of the transported discs minus all penalties incurred (i.e. accidentally or deliberately touching the pathway or receiving bin during the 5-minute race resulted in a 5% penalty each). In the end, the winning team delivered 336 lb, the second best was 240 lb, and the third highest delivered weight was 96 lb.

Students enjoyed the competition element of the course, because it gives motivation to the students to produce the best vehicle. It brings the students' spirits into the project and that desire to be the best helps in motivating students to give their best.

This was the third year of the capstone design competition, which is becoming a year-end tradition in the UCLA Mechanical and Aerospace Engineering Department.

Clockwise from top left: Andrew Pang and Amir Ahmad Bukhari get their robot ready; three different robots unload their weight; Prof. Shaefer, 1st place winners Alex Merryman, David Kuciejczyk-Kernan, Siyan Dong, Ashly Ainley, Elise Riner, and Philip Shen, with Prof. Tsao; 2nd place winners Cameron Djokovich, Alec Fredriksson, James Burdick, Joseph Pan, Joseph Marks, and Alexander Browne; 3rd place winners Aaron Christian, Peter Felton, Steven Krause, Matt rywcun, and Phillip Lesui (not shown); and Dr. Chang, Prof. Shaefer, and Dr. Warren; Luke Lighthizer actually becomes a robot.

UCLA Supermileage team takes 2nd place in SAE "Design Report" competition

By Stephen Chow

UCLA Supermileage team (from left to right: Joseph Lee, Stephen Chow, Christopher Underhill, and David Cropp) wins 2nd in design at SAE Supermileage competition in Marshall, Michigan.

UCLA's SAE Supermileage team took second place in the "Design Report" competition for their vehicle design, which featured their innovative carbon-fiber monocoque external vehicle shell, at the SAE Supermileage Competition. A first-hand report from team member Stephen Chow follows.

For the Supermileage team, 2012-2013 was a year of new beginnings, unique challenges, novel solutions, and renewed spirit. The new team that we built last year was itching to be put to the test and leave their own permanent mark in the history of the team. Wide-eyed and hopeful, we set out at the beginning of the year with ambitious new designs that both built upon the experiences of years past, but were also innovative and groundbreaking. Armed with the classroom theory of the engineering school and the practical experience of these now veteran team, each member's ambition and determination drove them to accomplish tasks and overcome challenges that no one in the team has ever done before. This outpouring of fresh ideas, careful engineering, and passionate tenacity got us noticed by the judges at the SAE Supermileage competition, earning us a cool 2nd place in design out of 28 teams.

One of our major goals this year was to design and fabricate a carbon-fiber monocoque. In a monocoque design, the external shell of the vehicle and the structural load-bearing chassis are one and the same. We put our composites engineering knowledge to use and after many, many man hours, materials testing, and the help of a manufacturing company called Performance Composites, we successfully fabricated UCLA Supermileage's first monocoque vehicle. While in many ways using carbon fiber wasn't new to us, we had never used them so extensively and in such critical applications. Our SolidWorks software wasn't powerful enough to accurately simulate the stresses on monocoque due to its exotic material and complex, aerodynamic curves, so we did our own load tests on many different home-made composite pieces to guide us in our design. Our final body ended up being lighter and sleeker than even we expected.

This was only just the beginning though. We worked on projects both new and old. From previous years, we worked on implementing our overhead valve engine modification and electronic fuel injection upgrade. With the help of a few dedicated electrical engineering students, we began developing a throttle-by-wire system and implementing circuitry to sense information about engine performance. We also worked on creating a dynamometer to give us a way to measure the engine's horsepower in a controlled environment.

Together, these projects did something greater than the sum of their individual goals. They allow us to better analyze our vehicle's performance data, work with new and complex technologies, and ultimately design and engineer a better product.

Unfortunately, many of the projects were not completed in time for our first competition. At the Shell Eco-Marathon, we faced unforeseen challenges that arose from our inexperience with the carbon-fiber composites and the inability to accurately model the materials with the software we had. Some critical parts broke on the track and the time spent fixing the vehicle left little room for anything else going wrong, so we couldn't get a run in. In our SAE Supermileage competition, despite our vehicle arriving eight hours after the beginning of the competition due to shipping complications and using a reserve driver 40lbs overweight, we got a run in at 407mpg and won 2nd place in the Design Report category. Crossing the finish line marked a new beginning for our club and reignited the hope for an amazing new year.

UCLA Racing / Baja SAE Places at Western Regional Competition

By Jessica Leung

With mud still clinging to both car and students, UCLA Racing /Baja SAE recently returned from the Western Regional competition hosted in Bellingham, Washington with a strong overall finish. The competition spanned from May 16th to May 19th and tested the car to its limit.

Sponsored by the Society of Automotive Engineers (SAE), Baja SAE is an international collegiate design competition and racing series. Each team of students is given one year to design, fabricate, and race an off-road vehicle prototype. At the annual competition, the vehicle is judged on safety, design, and marketability before being put to the test in a grueling four-hour endurance race.

This year, UCLA Racing took a different approach in building their car than in years past. Instead of altering and rebuilding every part of the vehicle, the team focused on key weak points and chose to allocate more time testing and tuning existing systems. The general gearbox design was simplified, but a manual differential and reverse gear were added for increased maneuverability. Revised steering geometry and a custom steering wheel mounted turning brake ensured handling was precise regardless of terrain. The result was an overall package with excellent performance, drivability, fit, and finish. For the first time in five years, UCLA Racing completed all four dynamic events, including the dangerous and exciting rock crawl.

A total of seventy-two teams competed in this year's Western Baja SAE competition and UCLA Racing's results are listed:

Overall: 18th Place

Static Events: 12th Place
- Cost Report: 19th Place
- Design Report: 13th Place
- Sales Presentation: 4th Place

Dynamic Events: 9th Place
- Acceleration: 28th Place
- Maneuverability: 22nd Place
- Rock Crawl: 8th Place
- Hill Climb: 12th Place

Endurance Race: 36th Place

UCLA Racing provides a real-world, team-oriented, engineering experience for students of all majors. Learning starts from the very beginning through a structured, student-run design and machining tutorial. Besides manual machining, they also become familiar with CNC milling, abrasive waterjet cutting, wire EDM, carbon fiber composites, and welding. In offering these unique opportunities, UCLA Racing fosters engineers with high levels of initiative and ability.

As a student run organization, UCLA Racing depends entirely on sponsors for the resources to continually improve and excel at competition. This year, UCLA Racing received generous support from over 30 sponsors, namely A&H Wire EDM, Accel Biotech, Associated Gear, Edwards Air Force Research Laboratory, Earle M. Jorgensen Company, Joseph Beggs Foundation for Kinematics, Kaiser Aluminum, Lockheed Martin, Raytheon, R.M. Body Shop, Valley Metal Treating and last but certainly not least, the Mechanical and Aerospace Engineering Department—without its support, the team could not exist.

UCLA's Formula SAE team sees tremendous growth during the 2012-2013 school year

By Alec Fredriksson

UCLA's Formula SAE team saw tremendous growth during the 2012-2013 school year, its first full year of operation. Just one year ago, the team consisted of only a handful of students. The organization had zero assets to its name and its car design was nonexistent. Fast forward to the present, though, and the team has progressed immensely. Now, the organization has more than 60 registered members, 20 sponsors, and a fully designed car that is in the final stages of manufacturing.

To get to this point, however, required the hard work of Formula SAE's members. In the beginning of the year, students worked to create a car design in Solidworks entirely from scratch. This proved to be a lengthy process, as the team did not have the luxury of referring to past designs like more established teams can do. Because of time constraints, the team opted to create a simple but reliable design for their first car. The chassis consists of a steel tube spaceframe with double a-arm suspension. This was relatively straightforward to design and manufacture when compared with other alternatives. The car is powered by a carbureted single cylinder engine donated by Honda. This engine then drives a solid rear axle.

While some of these components were purchased from suppliers, many were manufactured in house by the team. By machining parts in the student machine shop, members could be involved in the entire engineering process, from concept to completion. This helped students to gain a better appreciation of designing for cost and manufacturability, which are both important concepts in academia and industry.

In the next year, Formula SAE will continue the development of its inaugural car. With manufacturing and assembly scheduled to be completed early in Fall Quarter, the team will be able to spend a significant portion of the year testing and optimizing the car for competition next spring.

UCLA BEAM selected by Volunteer Center Fellows to receive the Spring 2013 Mongelli Award for Excellence in Civic Engagement

By UCLA Volunteer Center Fellows

Building Engineers and Mentors (BEAM) at UCLA was selected by the Volunteer Center Fellows to receive the Spring 2013 Mongelli Award for Excellence in Civic Engagement. Building Engineers and Mentors is a group of students who are not only interested in science, technology, engineering and math, but also have a passion for bringing science and engineering to Los Angeles schools. Founded at UC Berkeley in 2008, BEAM's core values are passion, diversity, and leadership: "We believe that community service builds strong, empathetic leaders."

BEAM started at UCLA in the 2010-2011 academic year and was created with the purpose of providing K-12 students engaging activities that promote interest in science, technology, engineering, and math (STEM). As an after school program serving Los Angeles schools, UCLA students have the opportunity to go to the schools and teach a hands-on science and engineering lesson. Throughout the six weeks every quarter, UCLA students are able to inspire students at the 9dots Program at Selma Avenue Elementary School, Young Oak Kim Academy, and Aspire Junior Collegiate Academy. A future goal of BEAM is to expand to over 5 locations in a few years.

Mentors pride themselves on their ability to engage students with their fun hands-on activities. Students are able to learn new and exciting science and engineering concepts through the lesson plans that are developed by UCLA students. These mentors are overseen by the Curriculum Team, who not only design new lesson plans and discuss strategies for writing effective lessons, but also brainstorm new ways to provide educational STEM resources to the community.

What is most unique about BEAM is that the lesson plans are personally developed by UCLA students from their personal interests in a certain subject. For example, the lesson plan "Roller Coasters" involves learning about kinetic and potential energy by building marble roller coasters. This lesson plan was developed through the UCLA mentor's personal interest in roller coasters, and after conducting research on the scientific background, the mentor applied it to the project. According to Jennifer Choi, current Treasurer of BEAM, the mentors "get a lot of liberty on what they want to focus on" – allowing them to demonstrate their passion for science and engineering. A great aspect of these lesson plans that not only are their available to be downloaded for home use but for those who are unable to attend site visits are still able to be involved in the lesson writing process.

With a time commitment of about 4 hours a week (1 hour meeting at UCLA, 3 hours mentoring – including transportation), the BEAM mentors are able to make a huge impact on student lives. Key features that enable such impact are the personal attention that students are able to get from the high mentor-to-student ratio, as well as the consistency of the same mentor for the entire quarter. Another feature is the hands-on learning advocated through the lesson plans. According to BEAM Mentors, it is "amazing how much insight the students have at the age." The students are able to engage in numerous activities, sparking their own personal interest in science and engineering.

With collaborations with many other science groups on campus, BEAM is able to plan a variety of different lessons for the students. BEAM mentors are now able to receive upper course credit upon demonstration of volunteering and a lesson plan. BEAM hopes to inspire younger students to achieve their goals and further their interest in science and engineering. Learn more about BEAM at their website http://beam.ucla.edu/ and follow their Tumblr blog at http://beam-ucla.tumblr.com/.

AIAA - UCLA Design-Build-Fly 2012-13

By Edward Barber

Design-Build-Fly at UCLA (DBF) is a student-run engineering group based around the American Institute of Aeronautics and Astronautics' annual Design-Build-Fly competition. Co-hosted by Cessna and Raytheon Missile Systems, the competition gives engineering students the opportunity to apply their theoretical studies to a physical application, in the form of an RC airplane. The aircraft is designed and built by students in order to complete missions outlined in the contest rules. A new set of rules and requirements are released each year, necessitating an entirely new design to be created during that season. Students of 80+ universities from around the globe then convene in either Wichita, KS or Tucson, AZ to compete.

In the 2012-13 season, students were tasked with building a joint-strike fighter type aircraft. Designs were scored based on weight, size, speed, the number of internal and external stores carried, and the overall quality of the corresponding written report. Aircraft were also allowed only 30ft to take off – much shorter than the 100ft requirement seen in previous years.

During the past year, UCLA DBF sought to improve our production efficiency, with the goal to produce three prototypes before competition. Although UCLA has historically built no more than two prototypes per year, top-placing universities often build upwards of four prototypes before finalizing their designs. To achieve our goal, we began design analysis as soon as the rules were released in August, in order to maximize the time available to complete our design iterations. Unfortunately, unexpected manufacturing delays and restrictions due to team organization negated the time we previously gained – by competition only two prototypes had been completed.

Without the time to build another prototype, we were unable to fully address several major issues discovered during testing, specifically with instability in our landing gear arrangement. Due to these issues, we were unable to fly at competition and ultimately placed 56th. However, our design report took 3rd place, which is better than UCLA DBF has ever achieved before.

In the upcoming year we hope to streamline our manufacturing process and reorganize our team to better realize our previous goals, whilst maintaining our current strengths. We have already implemented Spring Quarter recruiting and training, which will better prepare incoming members for the year ahead, and expanded our manufacturing sub-team to provide a more consistent build effort.

AIAA UCLA Rocket Project (URP) **By Zachary Forster**

The AIAA-UCLA Rocket Project is a student engineering organization, which provides all types of students with the opportunity to engage in the field of aerospace through high-powered amateur rocketry. This pulls together a wide breadth of engineering disciplines, including: Aerospace, Mechanical, Chemical, Materials Science, and Electrical to name a few. Each year, with the help of generous industry sponsors and insight from advisors, this dedicated team, averaging about 30 members, designs, builds, and tests a complete rocket from the ground up.

During the past year, the Rocket Project's objective was to design and build a rocket capable delivering a 10lb payload to 25,000 feet for use in the Experimental Sounding Rocket Association's 8th Annual Intercollegiate Rocket Engineering Competition's (ESRA 8th IREC) advanced category. The team continued development of its Hybrid Propulsion Experiment (HyPE) custom hybrid rocket engine with the HyPE 1B2, which is a variant of the second design iteration, the HyPE 1B. The team also developed a composite aerobody, avionics, and remote launch infrastructure in parallel with engine design.

The team saw improvements and innovations in all areas of the project as the HyPE 1B2 came to fruition. The team was able to make continued refinements to the engine design and made large steps forward in the reliability of remote launch operations systems.

In mid-June 2013, team members brought the completed HyPE 1B2 rocket to Green River, Utah for the ESRA 8th IREC. The judges were very impressed with the team's technical and procedural knowledge, design improvements, and safety-minded attitude. Although the rocket was ready to fly, a major setback occurred when rocket support device on the launch pad broke off, resulting in damage to the HyPE 1B2's nozzle. This damage occurred when the team no longer had sufficient time to make repairs. As a result, the rocket was not able to fly.

In the coming year, the Rocket Project hopes to continue learning about hybrid rockets both through use of commercial systems and through the continued research and development of the HyPE line of rocket engines.

Mohamed A. Abdou

HEAT AND MASS TRANSFER
MANUFACTURING AND DESIGN
PLASMA AND FUSION
Fusion, nuclear, and mechanical engineering design, testing, and system analysis; thermomechanics; MHD thermofluids; neutronics, material interactions; blankets and high heat flux components; experiments, modeling and analysis.
Fellow, American Nuclear Society, 1990
Fellow, TWAS, 1989

Oddvar O. Bendiksen

DYNAMICS
STRUCTURAL AND SOLID MECHANICS
Classical and computational aeroelasticity, structural dynamics and unsteady aerodynamics.
Associate Fellow, AIAA, 1995

Gregory P. Carman

MANUFACTURING AND DESIGN
MEMS AND NANOTECHNOLOGY
STRUCTURAL AND SOLID MECHANICS
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

Ivan Catton

HEAT AND MASS TRANSFER
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

Yong Chen

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

Pei-Yu Chiou

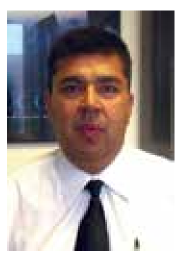
MEMS AND NANOTECHNOLOGY
Biophotonics, nanophotonics, BioMEMS/NEMS, electrokinetics, microfluidics and biofluidics, guided self-assembly, high throughput single cell analysis.

Vijay K. Dhir

HEAT AND MASS TRANSFER
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

Jeff D. Eldredge

FLUID MECHANICS
Bio-inspired locomotion in fluids; Numerical studies of high-speed flows; Development and application of computational tools for unsteady flow physics and flow-structure interaction; Generation and control and aerodynamic sound; Biomedical flows.

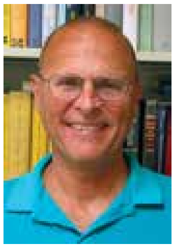


Rajit Gadh

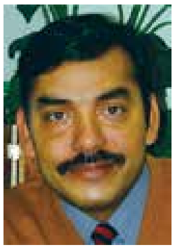
MANUFACTURING AND DESIGN
Smart Grid - Communication and control, Electric Vehicle aggregation for Smart Grid Integration, Vehicle to Grid and Grid to Vehicle, Automated Demand Response, Micro-grid modeling, Smart grid for renewable integration, Radio Frequency Identification (RFID), Wireless Internet of Artifacts, Reconfigurable Wireless Sensing and Networking Systems, Wireless Multimedia Architectures, CAD/CAM/VR/Visualization.
Fellow, ASME, 2011

Nasr M. Ghoniem

MANUFACTURING AND DESIGN
STRUCTURAL AND SOLID MECHANICS
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
Fellow, American Academy of Mechanics, 2010



James S. Gibson
DYNAMICS
SYSTEMS AND CONTROL
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.



Vijay Gupta
MEMS AND NANOTECHNOLOGY
STRUCTURAL AND SOLID MECHANICS
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
MEMS AND NANOTECHNOLOGY
Molecular fluidic phenomena, nano/micro-elector-mechanical-systems, bio-molecular sensors, control of complex systems.
Member, National Academy of Engineering, 1997
Academician, Academia Sinica, 1998
Fellow, American Physical Society, 1989
Fellow, AIAA, 1994

Jonathan B. Hopkins
MANUFACTURING AND DESIGN
STRUCTURAL AND SOLID MECHANICS
SYSTEMS AND CONTROL
Design, analysis, and fabrication of sophisticated flexible structures that possess extraordinary capabilities.

Tetsuya Iwasaki
SYSTEMS AND CONTROL
Neuronal control mechanism of animal locomotion, nonlinear oscillators, and robust/nonlinear control theory and its applications to mechanical, aerospace, and electrical systems.
Fellow, IEEE, 2009

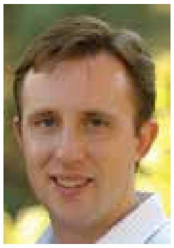
Y. Sungtaek Ju
HEAT AND MASS TRANSFER
MANUFACTURING AND DESIGN
MEMS AND NANOTECHNOLOGY
Micro- and nanoscale thermosciences, energy, bioMEMS/NEMS, nanofabrication.

Ann R. Karagozian
FLUID MECHANICS
Fluid mechanics and combustion, with applications to improved engine efficiency, reduced emissions, alternative fuels, and advanced high speed air breathing and rocket propulsion systems.
Fellow, AIAA, 2004
Fellow, American Physical Society, 2004
Fellow, ASME, 2013

H. Pirouz Kavehpour
FLUID MECHANICS
HEAT AND MASS TRANSFER
MEMS AND NANOTECHNOLOGY
Microfluidics and biofluidics, biofuel cells, cardiovascular flow, complex fluids, interfacial physics, micro-tribology, non-isothermal flows, drug delivery systems, and artificial organs.

Chang-Jin "CJ" Kim
MEMS AND NANOTECHNOLOGY
Microelectromechanical systems (MEMS), surface-tension-based microactuation, nanotechnology for surface control, microdevices including microfluidic applications, full spectrum of micromachining technologies.
Fellow, ASME, 2011

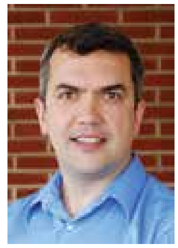
John Kim
FLUID MECHANICS
Numerical simulation of transitional and turbulent flows, turbulence and heat-transfer control, numerical algorithms for computational physics.
Member, National Academy of Engineering, 2009
Fellow, American Physical Society, 1989



William Klug

STRUCTURAL AND SOLID MECHANICS

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



Laurent G. Pilon

HEAT AND MASS TRANSFER

MEMS AND NANOTECHNOLOGY

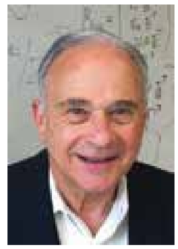
Radiation transfer, biomedical optics, photobiological fuel production, sustainable energy, nanoscale thermoscience, foams.

Adrienne Lavine

HEAT AND MASS TRANSFER

Solar thermal energy storage, thermal energy harvesting, thermal control of nanoscale manufacturing, thermomechanical behavior of shape memory alloys, thermal aspects of manufacturing processes including machining and plasma thermal spray.

Fellow, ASME, 1999



Jason Speyer

APPLIED MATH

SYSTEMS AND CONTROL

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

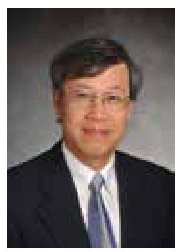
Fellow, AIAA, 1985

Christopher Lynch

STRUCTURAL AND SOLID MECHANICS

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

Fellow, ASME, 2004



Tsu-Chin Tsao

MANUFACTURING AND DESIGN

SYSTEMS AND CONTROL

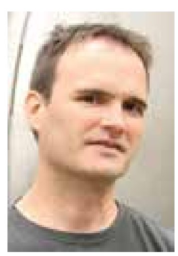
Modeling and control of dynamic systems with applications in mechanical systems, manufacturing processes, automotive systems, and energy systems, digital control; repetitive and learning control, adaptive and optimal control, mechatronics.

Fellow, ASME, 2011

Robert T. M'Closkey

SYSTEMS AND CONTROL

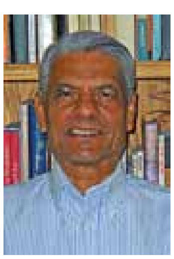
Nonlinear control theory and design with application to mechanical and aerospace systems, real-time implementation.



Richard Wirz

FLUID MECHANICS

Electric and micro propulsion, low temperature plasma and plasma discharges, spacecraft and space mission design, alternative energy generation and storage.



Ajit K. Mal

STRUCTURAL AND SOLID MECHANICS

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

Xiaolin Zhong

FLUID MECHANICS

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

LECTURERS

Amar, Ravnesh
Aryafar, Hamarz
Chang, Herrick
Chatterjee, Amiya
Chu, Kevin Christopher
Chung, Walter
Colonno, Michael
Crosby, Tamer
Davitian, Juliett
Deo, Ravindra B.
Getsinger, Daniel
Golub, Alex
Goyal, Vinay
Jain, Sanjeev
Kinsey, Robert
Kipp, Kristina A.
Lih, Shyh-Shiuh
Lim, Christopher
Liu, Xinmin
Majlessi, Abdi
Marner, Webb
Mathur, Atul
Or, Arthur
Orzechowski, Pawel
Perotti, Luigi
Po, Giacomo
Purohit, Ghanshyam P.
Rahim, Faranak
Roughen, Kevin
Schwartz, David
Sepulveda, Abdon
Shaefer, Robert
Shane, Judy
Shugar, Theodore
Swider, Jan
Tesch, Jonathan
Toohey, Damian
Wang, Xiaowen
Warren, Sarah
Warrier, Gopinath
Yang, Daniel
Zucchetti, Massimo

PROFESSORS EMERITI

Friedmann, Peretz
Hahn, H. Thomas
Kelly, Robert
Mills, Anthony
Mingori, D. Lewis
Schmit, Lucien
Smith, Owen
Yang, Daniel

ADJUNCT PROFESSORS

Goebel, Dan
Lackman, Les M.
Marner, Webb
Morley, Neil
Sepulveda, Abdon
Warrier, Gopinath

JOINT APPOINTMENTS

Carnesale, Albert (Professor, Public Policy Department)
Chen, Jiun-Shyan (Professor, Civil and Environmental Engineering Department)
Liou, K. N. (Professor, Atmospheric and Oceanic Sciences Department)

STAFF

Heejin Baik	Faculty Support Staff
Samantha Becker	Purchasing
Angie Castillo	Student Affairs Officer
Coral Castro	Fund Manager
Duy Dang	Management Services Officer
Alexander Duffy	Web and Publications Manager
Evgenia Grigorova	Staff Personnel/Payroll
Lance Kono	Facilities Manager
Abel Lebon	Student Affairs Officer
Annie Lee	Faculty Support Staff
Miguel Lozano	Senior Laboratory Mechanician
Mary Ann Macaso	Business Office Manager
Jennifer Ono	Fund Manager
Benjamin Tan	Senior Development Engineer
Marcia Terranova	Academic Personnel/Payroll

Aerospace Engineering Ph.D.

Summer 2012

Murray, Emmanuell Antwan (Speyer, J.), "Multiple-Fault Detection and Isolation Based on Disturbance Attenuation Theory."

Repupilli, Massimiliano (Ghoniem, N.), "A Robust Method for Beam-to-Beam Contact Problems Based on a Novel Tunneling Constraint."

Fall 2012

Cole, Lord Kahil (Karagozian, A.), "Combustion and Magnetohydrodynamic Processes in Advanced Pulse Detonation Rocket Engines."

Getsinger, Daniel Robinson (Karagozian, A.), "Shear Layer Instabilities and Mixing in Variable Density Transverse Jet Flow."

Winter 2013

Mao, Hann-Shin (Wirz, R.), "Plasma Structure and Behavior of Miniature Ring-Cusp Discharges."

Mechanical Engineering Ph.D.

Summer 2012

Chattopadhyay, Arunabh (Gadh, R.), "RFID Asset Management Solution with Cloud Computation Service."

Warren, Sarah Elizabeth (Yang, D.), "New Rotary Engine Designs by Deviation Function Method."

Fall 2012

Bai, Mo (Klug, W.), "Modeling the Mechanics of the Cytoskeleton."

Chang, Herrick Lin (Tsao, T.), "High Sampling Rate Dynamic Inversion - Digital Signal Processing, Filter Realizations and Applications in Digital Control."

Hsu, Chin-Jui (Carman, G.), "Engineering Magnetic Anisotropy in Nano-structured 3d and 4f Ferromagnets."

Prince, Stephen William (Tsao, T.), "Design and Manufacture of a Laparoscopic Telesurgical and Telementoring Robot Manipulator."

Tang, Yujie (Ju, Y.), "Microfluidic Brain Slice Chambers and Flexible Microelectrode Arrays for in vitro Localized Stimulation and Spatial Mapping of Neural Activities."

Vetcha, Naveen (Abdou, M.), "Study of Instability and transition in MHD flows as applied to liquid metal blankets."

Winter 2013

Hemati, Maziar Sam (Eldredge, J.), "Vortex-Based Aero- and Hydrodynamic Estimation."

Huang, Kuo-Wei (Chiou, P.), "A Unified Approach for Integrated Computer-Aided Design and Manufacturing."

Lee, Euntaek (Pilon, L.), "Light Transfer Simulation Tools in Photobiological Fuel Production."

Valadez Perez, Juan Carlos (Lynch, C.), "Characterization and modeling of ferroelectric materials for high pressure, high temperature applications."

Spring 2013

Gariffo, James Michael (Bendiksen, O.), "Generalized Reduced Order Modeling of Aeroservoelastic System."

Geb, David (Catton, I.), "Hierarchical Modeling for Population-Based Heat Exchanger Design."

Huang, Bin (Yang, D.), "A Unified Approach for Integrated Computer-Aided Design and Manufacturing."

Kim, Kyunghyun (Chen, Y.), "Spike Neuromorphic Carbon Nanotube Circuits."

Krishnamoorthi, Shankarjee (Klug, W.), "Computational Modeling of Cardiac Electromechanics."

Navarro, Artemio, Jr (Gupta, V.), "Laser-Generated Shockwaves for the Disruption of Bacterial Biofilms."

Reilly, Sean William (Catton, I.), "Optimization of Phase Change Heat Transfer in Biporous Media."

Aerospace Engineering M.S.

(all are comprehensive unless paper title is listed)

Fall 2012

Bannier, Amaury (Eldredge, J.), "Immersed boundary method for coupled fluid-structure interaction problems."
Edoh, Ayaboe (Karagozian, A.)
Gemmill, Kelly (Eldredge, J.)

Winter 2013

Su, Juexiao (Kim, C.-J.)

Spring 2013

Cervantes, Cesar (Eldredge, J.)
Cho, Jaeyoon (Wirz, R.)
Gould, Max (Mal, A.)
Sevilla, Cristhian Israel (Karagozian, A.), "Oscillatory Flame Response in Acoustically Coupled Fuel Droplet Combustion."
Turner, Ross Elliott (Wirz, R.)
Wong, Raymond (Lynch, C.)

Mechanical Engineering M.S.

(all are comprehensive unless paper title is listed)

Summer 2012

Che, Edward (Tsao, T.)
Chu, Emily (Wirz, R.), "External Mass Injection to Reduce Energetic Ion Prduction in the Discharge Plume of High Current Hollow Cathodes."
Demoulin, George William (Kim, J.)
He, Hong (Ju, Y.), "A Magnetomechanical Thermal Energy Harvester with a Reversible Liquid Interface."
Lee, Berwie V. (M'Closkey, R.)
Wagner, Michael C. (Gadh, R.)

Fall 2012

Agah, Elmira (Mal, A.)
Cui, Jizhai (Lynch, C.)
Gilbert, James Matthew (Iwasaki, T.)
Huang, Jiayuan (Ju, Y.)
Jastrzebski, Mark (Klug, W.)
Lee, Felix Yik (Pilon, L.)
Liao, Sze-Han (Zhong, X.)
Sinh, Jahnavee Bhupendrasinh (Lynch, C.)
Tsuchiya, Nolan Eizo (Gibson, J.)
Welch, Daniel Stephen (Klug, W.)
Yao, Qi (Catton, I.)
Zhou, Yi (Kim, C.-J.)

Winter 2013

Chang, Hung-Li (Catton, I.)
Chen, Yen-Jen (Tsao, T.)
Esfandi, Niloufar (Tsao, T.)
Huang, Tiana Rae (Wang, Y.)

Karaelias, Elaine Dawn (Klug, W.)
Stubblebine, Michael James (Catton, I.)
Tojo, Lauren-Ashly Rika (Yang, D.)
Wang, Jennifer Lee (Eldredge, J.), "Effects of Surface Roughness and Finlets on the Swimming Performance of Two Pelagic Marine Fishes: A Robotic Model Study."
Zhang, Wenjie (M'Closkey, R.)

Spring 2013

Aktinol, Eduardo (Dhir, V.)
Alcid, Eddson Eddson Alcid (M'Closkey, R.)
Ballestero, Michael (Tsao, T.)
Chen, Daniel (Eldredge, J.)
Chiang, Juinjay (Abdou, M.)
Croshal, Gary Justin (Mal, A.)
Crozier, Harris Ching (Chiou, P.)
Gambardella, Anthony Lococo (Mal, A.)
Gould, Alexander Robert (Carman, G.)
Graf, William Henry (Wirz, R.)
Kim, Do-Hun (Gadh, R.)
Kohli, Sunny (Mal, A.)
Lin, Yizhou (Klug, W.)
Litton, Andrew (Zhong, X.)
Mai, Wei-Lun (Ju, Y.)
Marshall, Benjamin Wilson (Gadh, R.)
McGuigan, Joshua Thomas (Yang, D.)
Murray, Stephen Joseph (Abdou, M.)
Ponnaluri, Aditya Venkatasatish (Klug, W.)
Rosetti, Leonardo (Ghoniem, N.)
Sagara, Brandon Mitsuo (Speyer, J.)
Sutton, Adam Donald (Mal, A.)
Timotius, Andrew (Chiou, P.)
To, Hoson (Gupta, V.)
Tran, Vincent Vu Hoang (Gupta, V.)
Tucker, Justin Reed (M'Closkey, R.)
Weng, Zilu (Iwasaki, T.)
Wu, Danny Wen Li (Catton, I.)
Yu, Olivia Princeton (Lavine, A.)
Zaky, Zeyad (Ju, Y.)
Zhou, Shao Bo (Gibson, J.)
Zhou, Zhengliu (Chen, Y.)

Bachelor of Science

Abed, Abdullah B.
Abrantes, Richard June Espino
Abreu, Matthew A.
Ainley, Ashly Jarea
Allen, Ryan Kurt
Almanza, Ernesto
Bakhshi, Jason
Bennett, James Edward
Booth, Mackenzie James
Brady, Michael Sean
Browne, Alexander David
Burdick, James Christopher
Burns, Jeffrey Ellery
Chandra, Praphulla
Chen, Kelvin Akira
Choi, William Ywonchang
Chow, Stephen
Christian, Aaron Bryce
D'Amico, Dana Whitney
Diego, Earvin Matt Vea
Dinh, David Huy
Djokovich, Cameron Thomas
Edwards, William Thomas
Felton, Peter Kenji
Filimonova, Olga Sergeevna
Folick, Daniel Charles
Freeman, Ryan Thomas
Frischer, Daniel R.
Galbo, Misho A.
Gault, Mark Pao
Geraldi
Go, Aaron Kong
Gradel, Kirsten Anne
Gupta, Nishal Aloke
Gwynn, John Anthony
Ha, Taewoo
Haag, Jonathan Ryan
Hahm, Hyoung Baik
Harrison, Jonathan Vincent
Helali, Joseph A.
Hochberg, Spencer I.
Hosking, Joshua Gordon
Hou, David Muqing
Houck, Andrew Careaga
Huang, Qiao
Iyer, Kedar Prakash
Jeong, Peter Inuk
Jew, Matthew Gregory
Jong, Eric Robert
Kang, Young Wook
Kephart, Taron Bao
Krause, Steven Michael
Krywcun, Matthew Vadim
Kuciejczyk-Kernan, David
Kuo, Andy Ting-Yu
Lai, Kit San
Lam, Wilson
Lee, Daniel Dohyun
Lee, Dennis Inhwan
Leong, Devon
Liang, Michael
Lighthizer, Luke Cole
Lin, Edward
Lin, Jason A.
Liu, Austin
Ly, Maximilian Dieu-Tan
Marks, Joseph Thomas
Matson, James Andrew
Merryman, Alex Christopher
Miller, Sarah Caitlin
Min, Christopher Hyongsok
Most, Matthew Isaac
Munoz, Andrew Manuel
Nader Esfahani, Nima
Nekota, Justin Kenji
Ng, Kalun
Ngo, Vu An Dinh
Noe, Alexandra Louise
Oh, Isaac Jaikeun
Omcikus, Neboysa
O'Neil, Brian Christopher
Ono, Douglas Hiromitsu
Palmas, Ricardo
Pan, Joseph Joseph Pan
Papadopoulos, Helen Christina
Peng, Xinzhi
Phan, Ryan Hung Tai
Quinde, Cesar
Reichert, Peter Joseph
Ross, David Alexander
Russo, Eric Daniel
Sakai, Kimberlee Robin
Salahuddin, Ali
Salfity, Jonathan
Sarkissians, Alen
Schroeder, Katherine Rene
Scott, Michael Baran
Scott, Sean Ray
Sebade, Matthew Keith
Sepulveda, Nathaniel Barrido
Sivaram, Surya
Smith, Alexander Everett
Sung, Aaron Nicholas
Teh, Kai Sheng
Thameem, Raqeeb Muddassir
Timsit, Matthew Thierry
Tran, Justin Sheldon
Tran, Phuoc Hai Nguyen
Tse, Tik Fung
Underhill, Christopher Brent
Vandenberg, Cole Matthew
Vashchenko, Yana
Wada, Daryl Brent
Wakida, Alan Hayato
Wang, Michael Sung Ping
Wofford, Matthew Charles
Yak, Kian Ming
Yang, Albert I-Hau
Yang, Daniel Kai
Yau, Yik Lam
Yoon, Jeong Hwan
Yu, Gabrielle Miu-Yin
Yuan, Tao
Zulch, Matthew C.

(Note: There were 136 2012-13 BS graduates. 124 are listed here. 12 are omitted for privacy.)

Journals

Fluid Mechanics

Calkins, M.A., Aurnou, J.M., Eldredge, J.D., and Julien, K., "The influence of fluid properties on the morphology of core turbulence and the geomagnetic field," Earth and Planetary Science Letters, 359-260:55-60 (2012).

Chong, K., Kelly, S.D., Smith, S., and Eldredge, J.D., "Inertial particle trapping in viscous streaming," Phys. Fluids, 25, 1-21 (April 2013).

Wang, C. and Eldredge, J.D., "Low-order phenomenological modeling of leading-edge vortex formation," Theoretical and Computational Fluid Dynamics, 1-22 (August 2012).

Cole, L.K., Karagozian, A.R., and Cambier, J.-L., "Stability of Flame-Shock Coupling in Detonation Waves: 1D Dynamics," Combustion Science and Technology, 184(10-11):1502-1525 (2012).

Getsinger, D., Hendrickson, C., and Karagozian, A.R., "Shear Layer Instabilities in Low Density Transverse Jets," Experiments in Fluids, 53(3):783-801 (2012).

Guillen, G.R., Ramon, G.Z., Kavehpour, H.P., Kaner, R.B., and Hoek, E.M.V., "Direct Microscopic Observation of Membrane Formation by Nonsolvent Induced Phase Separation," Journal of Membrane Science, 431:212-220 (March 2013).

Sharif-Kashani, P., Nishida, K., Kavehpour, H.P., Schwartz, S.D., and Hubschman, J.P., "Effect of Cut Rates on Fluidic Behavior of Chopped Vitreous," Retina, 33(1):166-169 (January 2013).

Kim, J., "Progress in Pipe and Channel Flow Turbulence, 1961-2011," Journal of Turbulence, 13(N45) (2012).

Kim, J., "Studying turbulence using numerical simulation database--XIV," Physics of Fluids, 24 (October 2012).

Park, H., Park, H., and Kim, J., "A numerical study of the effects of superhydrophobic surface on skin-friction drag in turbulent channel flows," Physics of Fluids, 25 (2013).

Araki, S.J. and Wirz, R.E., "Ion-Neutral Collision Modeling Using Classical Scattering With Spin-Orbit Free Interaction Potential," Plasma Science, IEEE Transactions on, 41(3):470 - 480 (March 2013).

Chu, E., Goebel, D., and Wirz, R.E., "External Mass Injection to Reduce Energetic Ion Production in the Discharge Plume of High Current Hollow Cathodes," Journal of Propulsion and Power, AIAA, 29(5):115-1163 (2013).

Conversano, R. and Wirz, R.E., "Mission Capability Assessment of CubeSats Using a Miniature Ion Thruster," Journal of Spacecraft and Rockets, AIAA, (2013).

Lakeh, R.B., Lavine, A.S., Kavehpour, H.P., Ganapathi, G.B., and Wirz, R.E., "Effect of Laminar and Turbulent Buoyancy-Driven Flows on Thermal Energy Storage using Supercritical Fluids," Numerical Heat Transfer, Part A: Applications: An International Journal of Computation and Methodology, 64:12, 955-973 (2013).

Mao, H.-S. and Wirz, R.E., "Quasi-equilibrium electron density along a magnetic field line," Applied Physics Letters, 101(22):2241061 - 2241064 (November 2012).

Roth-Johnson, P. and Wirz, R.E., "Aero-structural investigation of biplane wind turbine blades," Wind Energy, Wiley, 1-15 (December 2012).

Tarzi, Z., Speyer, J., and Wirz, R.E., "Fuel Optimum Low-Thrust Elliptical Transfer using Numerical Averaging," Acta Astronautica, Elsevier, 86:95-118 (May 2013).

Duan, L., Wang, X., and Zhong, X., "Stabilization of a Mach 5.92 Boundary Layer by Two-Dimensional Finite-Height Roughness," AIAA Journal, 51(1):266-270 (2013).

Heat and Mass Transfer

Giancarli, L.M., Abdou, A., Campbell, D.J., Chuyanov, V.A., Ahn, M.Y., Enoeda, M., Pan, C., Poitevin Y., Kumar, E.R., Ricapito, I., Strebkov, Y., Suzuki, S., Wong, P.C., and Zmitko, M., "Overview of the ITER TBM Program," Fusion Engineering and Design, 87(5-6):395-402 (2012).

Hunt, R.M., Goods, S.H., Ying, A., Dorn, C.K., and Abdou, M., "Diffusion bonding beryllium to Reduced Activation Ferritic Martensitic steel: Development of processes and techniques," Fusion Engineering and Design, 87(9):1550-1557 (2012).

Kunugi, T., Smolentsev, S., Yokomine, T., Li, F.-C., Ueki, Y., Yuki, K., Aoyagi, M., Sketchley, T., and Abdou, M., "Current Status of TITAN Task 1-3 Flow Control and Thermofluid Modeling," Journal of Applied Nuclear Science and Technology, 5(Supplement):72-75 (2012).

Smolentsev, S., Kunugi, T., Messadek, K., Yokomine, T., Young, J., Yuki, K., Ueki, Y., Sketchley, T., Li, F.-C., Morley, N., and Abdou, M., "Status of "TITAN" Task 1–3 Flow Control and Thermofluid Modeling," Fusion Engineering and Design, 87(5-6):777-781 (2012).

Smolentsev, S., Li, F.-C., Morley, N., Ueki, Y., Abdou, M., and Sketchley, T., "Construction and initial operation of MHD PbLi facility at UCLA," Fusion Engineering and Design, 88(5):317-326 (2013).

Smolentsev, S., Saeidi, S., Malang, S., and Abdou, M., "Numerical study of corrosion of ferritic/martensitic steels in the flowing PbLi with and without a magnetic field," Journal of Nuclear Materials, 432(1-3):294-304 (2013).

Vetcha, N., Smolentsev, S., Abdou, M., and Moreau, R., "Study of instabilities and quasi-two-dimensional turbulence in volumetrically heated magnetohydrodynamic flows in a vertical rectangular duct," Physics of Fluids, 25(2), 024102 (2013).

Wong, C.P.C., Abdou, M., Morley, N., Merrill, B., Smolentsev, S., Marriott, E., Sawan, M.E., Youssef, M., Katoh, Y., Kurtz, R.J., Pint, B.A., Lumsdaine, A., Willms, S., and Williams, B., "Progress on DCLL Blanket Concept," Fusion Science and Technology, 64(3):623-630 (2013).

Ying, A., Liu, H., and Abdou, M., "Analysis of Tritium/Deuterium Retention and Permeation in FW/Divertor Including Geometric and Temperature Operating Features," Fusion Science and Technology, 64(2):303-308 (2013).

Zhang, H., Ying, A., and Abdou, M., "Impact of Pressure Equalization Slot in Flow Channel Insert on Tritium Transport in a DCLL-Type Poloidal Duct," Fusion Science and Technology, 64(3):651-656 (2013).

Geb, D., Ge, M., Chu, J., and Catton, I., "Measuring Transport Coefficients in Heterogeneous and Hierarchical Heat Transfer Devices," Journal of Heat Transfer, 135(6), pp. 061101-061101 (2013).

Geb, D., Zhou, F., DeMoulin, G., and Catton, I., "Genetic Algorithm Optimization of a Finned-Tube Heat Exchanger Modeled With Volume-Averaging Theory," Journal of Heat Transfer, 135(8), pp. 082602-082602 (2013)

Aktinol, E. and Dhir, V.K., "Numerical Simulation of Nucleate Boiling Phenomenon Coupled with Thermal Response of the Solid," Microgravity Sci. Technol., 24(4):255-265 (September 2012).

Dhir, V.K., Warrier, G.P., Aktinol, E., Chao, D., Eggers, J., Sheredy, W., and Booth, W., "Nucleate Pool Boiling Experiments (NPBX) on the International Space Station," Microgravity Sci. Technol. (July 2012).

Marner, W.J., "75 Years of Progress: A History of the ASME Heat Transfer Division," in both ASME Journal of Thermal Science and Engineering Applications, 5(2), 020501 (May 17, 2013); also published in ASME Journal of Heat Transfer, 135(6) (2013).

Marner, W.J., "75 Years of Progress: A History of the ASME Heat Transfer Division," Mechanical Engineering, 135(5), 52-60, (2013). (Adapted from an article published in the June 2013 issues of the Journal of Heat Transfer and the Journal of Thermal Science and Engineering Applications).

Chin, T., Lee, F.Y., McKinley, I.M., Goljahi, S., Lynch, C.S. and Pilon, L., "Direct Thermal to Electrical Energy Conversion Using 9.5/65/35 PLZT Ceramics in the Ergodic Relaxor Phase," IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, 59(11):2373-2385 (November 2012).

Fang, J. and Pilon, L., "Tuning thermal conductivity of nanoporous crystalline silicon by surface passivation: A molecular dynamics study," Applied Physics Letters, 101(1):011909 (July 2012).

He, X., Lee, E., Wilcox, L., Ramakanth, R. and Pilon, L., "A High-Order Accurate GPU-Based Radiative Transfer Equation Solver for Combustion and Propulsion Applications," Numerical Heat Transfer, Part B: Fundamentals, 63(6):457-484 (May 2013).

Attia, J.A, McKinley, I.M, Moreno-Magana, D. and Pilon, L., "Convective Heat Transfer in Foams in Under Laminar Flow in Pipes and Tube Bundles," International Journal of Heat and Mass Transfer, 55(25-26):7823-7831 (December 2012).

Kandilian, R., Lee, E. and Pilon, L., "Radiation and Optical Properties of Nannochloropsis oculata Grown Under Different Irradiances and Spectra," Bioresource Technology, 137:63-73 (June 2013).

Lee, E., Heng, R.-L. and Pilon, L., "Spectral Optical Properties of Selected Photosynthetic Microalgae Producing Biofuels," Journal of Quantitative Spectroscopy and Radiation Transfer, 114:122-135 (January 2013).

Lee, F.Y., Jo, H.R., Lynch, C.S. and Pilon, L., "Pyroelectric Energy Conversion Using PLZT Ceramics and the Ferroelectric-Ergodic Relaxor Phase Transition," Smart Materials and Structures, 22(2):025038 (January 2013).

McKinley I.M. and Pilon, L., "Phase Transitions and Thermal Expansion in Pyroelectric Energy Conversion," Applied Physics Letter, 102:023906 (January 2013).

Moreno, R.C., James, B.A., Navid, A., and Pilon, L., "Pyroelectric Energy Converter For Harvesting Waste Heat: Simulations versus Experiments," International Journal of Heat and Mass Transfer, 55:4301-4311 (July 2012).

Wang, H. and Pilon, L., "Mesoscale Modeling of Electric Double Layer Capacitors With Three-Dimensional Ordered Structures," Journal of Power Source, 221:252-260 (January 2013).

Manufacturing and Design

DiBiasio, C.M. and Hopkins, J.B., "Sensitivity of Freedom Spaces During Flexure Stage Design via FACT," Precision Engineering, 36(3):494-499 (2012).

Hopkins, J.B. and Panas, R.M., "Design of flexure-based precision transmission mechanisms using screw theory," Precision Engineering, 37(2):299-307 (2013).

Hopkins, J.B., "Precision Flexure Bearing Design: On the Use of Freedom and Constraint Topologies," Mikroniek Professional Journal on Precision Engineering, 52(5):34-39 (2012).

Hopkins, J.B., "Synthesizing Parallel Flexures That Mimic the Kinematics of Serial Flexures Using Freedom and Constraint Topologies," Journal of Mechanisms and Robotics, 5(4):041004-04113 (2013).

Hopkins, J.B., Lange, K.J., and Spadaccini, C.M., "Designing Microstructural Architectures With Thermally Actuated Properties Using Freedom, Actuation, and Constraint Topologies," Journal of Mechanical Design, 135(6):061004-061014 (March 2013).

Panas, R.M., Hopkins, J.B., Lustrino, M., Panas, C.W., and Watral, A., "An instrument to characterize the dynamic compliance of skin," Measurement, 46(3):1094-1100 (April 2013).

MEMS and Nanotechnology

Chen,C.-L., Kim, K., Truong, Q., Shen, A., and Chen, Y., "A Spiking Neuron Circuit Based on a Carbon Nanotube Transistor," Transistor Nanotechnology, 23(27):275202-275208 (2012).

Lee, T. and Chen, Y., "Organic Resistive Nonvolatile Memory Materials," MRS Bulletin, 37(02):144-149 (2012).

Chen, Y., Wu, T.-H., and Chiou, P. -Y., "Scanning Laser Pulses Driven Microfluidic Peristaltic Membrane Pump," Lab on a Chip, 12, pp. 1771-1774 (2012).

Chen, Y., Wu, T.-H., Kung, Y.-C, Teitell, M. A., and Chiou, P.-Y., "3D pulsed laser-triggered high-speed microfluidic fluorescence-activated cell sorter," Analyst (2013).

Chiou, P.-Y. and Teitell, M. A. "Photothermal nanoblade for super-sized cargo delivery into living cells," SPIE Newsroom (2013).

Fan, Y.-J., Wu, Y.-C., Chen, Y., Kung, Y.-C., Wu, T.-H., Huang, K.-W., Sheen, H.-J., and Chiou, P.-Y.,"3D microfluidics with implanted microball lens array for parallel and high throughput multicolor fluorescence detection," Biomicrofluidics (2013).

Huang, K.-W., Su, T.-W., Ozcan, A., and Chiou, P. -Y., "Optoelectronic tweezers integrated with lensfree holographic microscopy for wide-field interactive cell and particle manipulation on a chip," Lab on a Chip, 13, 2278-2284, (2013). (Front Cover)

Huang, K.-W., Wu, Y.-C., Lee, J. A., and Chiou, P.-Y.," Microfluidic Integrated Optoelectronic Tweezers for Single-cell Preparation and Analysis," Lab on a Chip, 13, 3721-3727, (2013).

Riahi, R., Dean, Z., Wu, T.-H., Teitell, M.A., Chiou, P.-Y., Zhang, D. D., and Wong, P.K. "Detection of mRNA in living cells by double-stranded locked nucleic acid probes," Analyst, 138, 4777-4785, (2013). (Inside front cover)

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Catton, Ivan, Invited Keynote Speaker, CHT-12 Advances in Computational Heat Transfer, an International Symposium in Bath, England.

Dhir, Vijay K., Honorary Member, ASME.

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Gadh, Rajit, Keynote Speaker - 2nd Annual IEEE Energy Efficiency Symposium.

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Ho, Chih-Ming, Honorary Professor, National Sun Yat-Sen University.

Karagozian, Ann – Elected Member, Congress Committee of the International Union of Theoretical & Applied Mechanics, 2012.

Kim. John, Engineer of the Year Award, Korean-American Scientists and Engineers Association.

Speyer. Jason L., Honorary Doctorate, Technion.

Speyer. Jason L., The Ronald and Valerie Sugar Chair in Engineering, UCLA.

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