Mechanical Engineering News

Newsletter fom the Mechanical Engineering Department, University of California, Santa Barbara
Spring 2008

In this Issue

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Message from the Chair

George "Bud" Homsy
Professor and Chair of Mechanical Engineering

With this — our first newsletter that anyone can remember — the Mechanical Engineering Department is inaugurating an annual feature in which we bring our friends and alumni up-to-date about activities and accomplishments here at UCSB. I have just recently been appointed as Chair, and it's an honor to serve such a dynamic department. With full knowledge that it's an over-worked word in this election year, the thing that most characterizes the Department is *"change"*. The faculty is full of new(er) faces that may be unfamiliar to you from your previous connections with the Department, the Pavilion in the courtyard of Engineering II will soon be opened as a new graduate student center, improvements in the curriculum are always on our minds, and new research areas are generating a lot of attention — we highlight many of these changes in the ensuing pages. We hope that you enjoy the newsletter, that you will fill out the questionnaire (page 7) so that we can keep in touch with you in the years to come, and that we see you at one or more of the upcoming events this Spring.

Upcoming Events – Save the Dates!

Mohammed Dahleh Distinguished Lecture
May 5, 2008 / 4:00 pm

Chaitan Khosla, the Wells H. Rauser and Harold M. Petiprin Professor of Chemistry, Chemical Engineering, and (by courtesy) Biochemistry, and Chair of the Chemical Engineering Department at Stanford University, will deliver the 8th annual Mohamed Dahleh Distinguished Lecture. He will speak on **"Celiac Sprue: Fundamental and Translational Investigations into an Orphan Disease"**

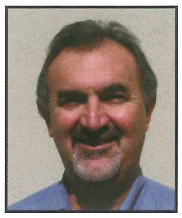
2008 UCSB All Gaucho Reunion / April 24 – 27, 2008

Great Place! Great People! Great Times! The 2nd Annual All Gaucho Reunion will take place on the UCSB campus. Visit www.ucsbalum.com/All_Gaucho_Reunion for details and for registration information. Plus, the Mechanical Engineering Department will be hosting a lecture/reception on **Friday, April 25, from 4:00 – 6:00 pm.** We will be posting further details on our website.

2008 Capstone Projects Poster Competition / June 6, 2008

All of this year's undergraduate projects will be on display along with student teams. Event will take place in the Engineering II Courtyard. See Page 2 for more info!

Undergraduate Capstone Design Course and Industry Partner Program



Steve Laguette
Academic Coordinator / Lecturer

ME alums of any vintage can remember long nights in the student shop, sanding, grinding, and working on a variety of senior design projects. While the old shop in the WW II Building that was politely referred to as Engineering III is history, the shop has moved and the senior design experience lives on in a new and revitalized way. In September 2004, the Department made the transition to a Capstone Design course required of all seniors. The course grew out of the old project course and was reconfigured to provide all our majors with opportunities to address a practical and significant design problem and implement their designs by building the device or project.

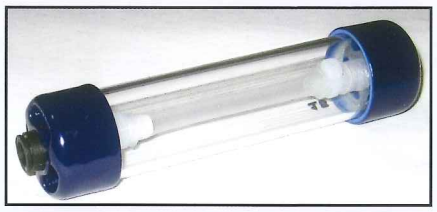
Students work in teams of three to five under the direction of a faculty advisor, and engineering communication, such as reports and oral presentations are integrated into the project and course deliverables.

In 2005, an Industry Partner program was successfully introduced, the cornerstones of which are significant industry support, together with input during the year from ME design engineers from the sponsoring company. The Industry Partner program has now grown to include participation with major corporations in a variety of industries and technologies, including ATK Space Systems, Medtronic Neurosurgery, Raytheon, Northrop Grumman, Boston Scientific, Inogen and Conmed Linvatec. Typical industrially sponsored projects might be small projects that may have been delayed by other priorities, novel test fixtures, product line extensions, or product improvements.

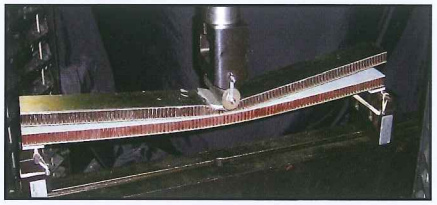
The grand finale of the year is the annual poster presentation, which takes place in the Engineering II Courtyard. The event draws from the industrial sponsors, the ME faculty, and showcases the ME UG program to the rest of the College. A panel of judges selects the winning presentations.

Last year's winning Senior Capstone Projects included:

Most Innovative Design: Rechargeable Solar Powered Refrigeration



Most Marketable Design: Nasal Cannula Acoustic Pulse Attenuation



Best Technical Presentation: Sandwich Structure Performance Evaluation

2006 Most Innovative Design: Cranial Closure System

The 2008 Capstone Projects Poster Competition is planned for Friday, June 6, 2008. All of this year's projects will be on display with the student teams. Please add this to your calendar and join us for the event!

If you would like to learn more about the Industry Partner program please visit www.me.ucsb.edu/projects

For more information, please contact Steve Laguette
Tel: 805-893-2652 / laguette@engineering.ucsb.edu

Student Team:
Nasal Cannula Acoustic Pulse Attenuation

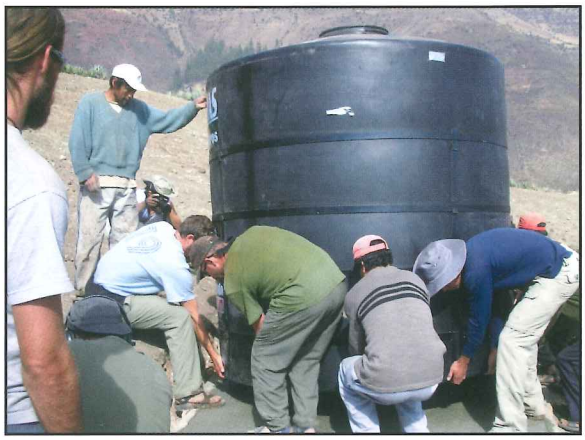
Mechanical Engineering Students Making a Difference

Recently Mechanical Engineering students from UCSB have helped repair water pumps in Mali, installed solar lighting systems and water treatment systems in Peru, designed and built a septic system for a school in Thailand, and built a solar-powered computer lab in southern Baja, California. This definitely isn't Isla Vista anymore!

Engineers Without Borders Homebuilding Team in Tijuana, Mexico

View of Araypallpa, Puru

Mechanical Engineering Students Dancing in Tabakoro, Mali



Installing a Water Filter in Araypallpa, Puru

These projects – and new ones in Kenya, Tijuana and Sonora, Mexico are being completed through UCSB's chapter of Engineers Without Borders. EWB-USA is a non-profit humanitarian organization that was established to develop partnerships between students and professional engineers in the US with communities worldwide. The partnerships generate solutions to important problems in the communities, and the students learn to apply their academic knowledge to important problems. Student teams are responsible for all phases of the projects from the initial assessment, design, fundraising, logistical planning, implementation and follow-up.

The Mechanical Engineering Department is at the center of EWB-UCSB's work. Ours is one is the most active of the 200 chapters in the country. We recently won EWB's prestigious ***Boulde Reach Award*** as the outstanding project in EWB for its ongoing work in Araypallpa, Peru, where student have been working since 2004 on energy, lighting, and education projects. The chapter's advisors – Mary Dinh and David Bothman, are both staff engineers in the Department, and many of our undergraduate and graduate students are active on project teams. EWB has members from many departments at UCSB, and the interdisciplinary makeup really strengthens the teams.

Would you like to get involved in Engineers Without Borders?

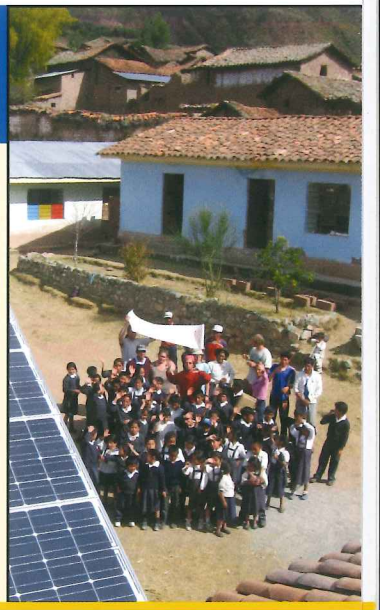
The chapter is always looking for professional mentors, contacts and project ideas, as well as sponsors for their projects.

For more information, please visit EWB-UCSB's website:

www.engineering.ucsb.edu/~ewb-ucsb

or e-mail:

bothman@engineering.ucsb.edu



Francesco Bullo
Associate Professor
Chair of the Graduate Program, Mechanical Engineering

Autonomous robotic vehicles are an emerging technology of great importance. A number of companies are now developing and marketing robotic vehicles, such as aircraft and rovers, that autonomously execute high-level commands such as "patrol a certain area" or "monitor groups of persons". Examples include the famous Predator aircraft, widely used in Afghanistan, and smaller vehicles such as the aerial vehicle "Raven" (shown right). These new robotic systems pack an impressive amount of smarts. They have fast computer processors, accurate sensors (cameras, GPS, range finders, etc), powerful antennas to maintain communication among them, and are increasingly lighter and more agile.

Raven aircraft manufactured by AeroVironment of Monrovia, CA.

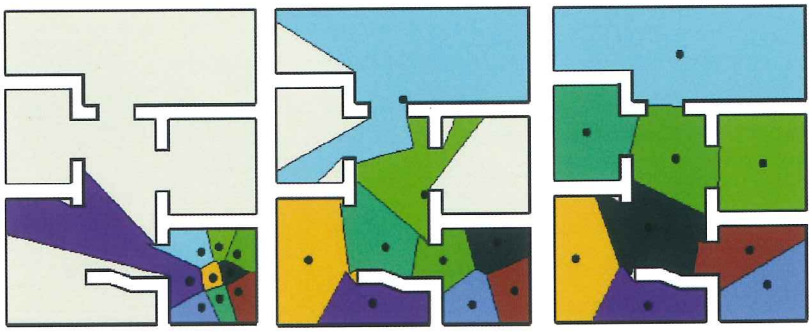
Professor Francesco Bullo's research work is all about designing smart algorithms and intelligent behaviors for these robotic systems. He and his students study how the robots should move, what information should they transmit and what sensors should they use. His group works towards various promising scenarios:

1. In disaster sites, robots will spread throughout the entire environment, will search for victims and gather useful information;

2. Groups of moving and stationary sensors will monitor large swaths of territory, e.g., country borders along deserts or above oceans, and will search for stranded persons or objects of interest;

3. Groups of underwater vehicles will perform scientific investigations, measuring concentration of oxygen and other biochemicals of biological interest.

Bullo's group takes an integrated approach to these problems merging ideas and methods from multiple disciplines. They use classic control methods from Mechanical Engineering as well as optimization strategies from Computer Science and communication protocols from Electrical Engineering. As a first example, recent PhD graduate Ketan Savla (now a PostDoc at MIT) developed algorithms to fly a group of autonomous aircraft to visit a collection of sites of interest in minimum time – the solution is a mix of geometric methods to "order" the sites and control strategies to fly shortest paths between sites. Recent PhD graduate Sara Susca (now a senior engineer with Honeywell) designed methods to monitor the moving boundary of an unknown phenomenon such as a wild fire or an oil spill – the solution here was a combination of interpolation theory and communication strategy. Finally, recent PhD student Anurag Ganguli (now a senior engineer at UtopiaCompression in LA) developed methods to deploy robots in indoor environments. His work is illustrated in the figure (shown left).



Robots move out of a single room and, measuring the position of walls surrounding them with a laser range scanner, they deploy themselves autonomously to cover the entire floorplan.

Announcing Our New Faculty Members!

Sumita Pennathur
Assistant Professor

Professor Sumita Pennathur began teaching at UCSB in the Mechanical Engineering Department in July, 2007. Her research group focuses on using fundamental fluidics knowledge at both micro- and nano-scales to create novel devices for practical applications. Major efforts include creating and developing enabling tools to identify and characterize biological substances, improving current bionalaytical devices, and designing/engineering entire systems for point-of-care usage. Prior to coming to UCSB, Dr. Pennathur taught at University of Twente. She has held multiple positions at various companies and schools such as: Sandia National Laboratories, Stanford University, National Institute of Standards and Technology, Tigris Corporation, and Lockheed Martin. She is the recipient of the Stanford Graduate Fellowship (2002-2005), the National Defense Science and Engineering Graduate Fellowship (2000-2001), the James Mean Memorial Award for Excellence in Space Systems Engineering (2000), and is a member of the Phi Beta Kappa National Honor Society.

Megan Valentine
Assistant Professor

Professor Megan Valentine will be joining the Department as an Assistant Professor in July, 2008. Dr. Valentine received a Ph.D. in Physics from Harvard University in 2003, training in the laboratory of Dr. David Weitz. She is currently completing a post-doctoral fellowship in the Department of Biological Sciences at Stanford University under the mentorship of Dr. Steven Block. Dr. Valentine's interdisciplinary research focuses on understanding the mechanical properties of biological materials on a range of length scales, from that of single proteins to that of intact living cells. The Valentine Lab will use a wide range of physical and biological experimental approaches paired with advanced technologies, including high-resolution optical trapping, fluorescence microscopy, and microrheometry, to probe the biophysical and biochemical properties of cellular materials. The lab's initial work will focus on how forces are generated and modulated by motor proteins when cells divide. While at Stanford, she was the recipient of a Damon Runyon Cancer Research Fellowship and a Burroughs Wellcome Career Award at the Scientific Interface.

Announcing Our Newly Tenured Faculty!

Jeff Moehlis
Professor

Professor Moehlis received his Ph.D. in Physics at the University of California, Berkeley, and then was a postdoctoral researcher in the Program in Applied and Computational Mathematics at Princeton University. He joined the UCSB Mechanical Engineering faculty in 2003. His research interests include applying dynamical systems techniques to understand the response dynamics of neural populations, the dynamics of natural and artifical swarms, the nature of shear flow turbulence, and the dynamics of individual and coupled MEMS devices. He is the recipient of the National Science Foundation CAREER Award (2006-2011), Alfred P. Sloan Research Fellowship in Mathematics (2005-2007), UCSB Regents' Junior Faculty Fellowship (2004), and the Bernard Friedman Memorial Prize in Applied Mathematics for Outstanding Doctoral Dissertation, University of California, Berkeley (1999).

Tom Soh
Professor

Professor Soh received his B.S. with a double major in Mechanical Engineering and Materials Science with Distinction from Cornell University, and Ph.D. in Electrical Engineering from Stanford University. Prior to joining UCSB in 2003, Dr. Soh served as the technical manager of MEMS Device Research Group at Bell Laboratories and MEMS R&D group at Agere Systems. His current research interests are in analytical biotechnology, especially in high throughput screening, directed evolution and integrated biosensors. He is affiliated with the Institute for Collaborative Biotechnologies and the California Nanosystems Institute. He is the recipient of the MIT Technology Review's "TR 100" Award (2002), ONR Young Investigator Award (2004), and Beckman Young Investigator Award (2005).

2006 – 2007 Faculty Awards

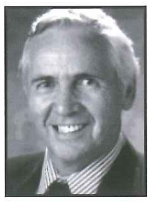
Karl Astrom
Awarded an Honorary Doctorate from Tokyo Denki University

Sanjoy Banerjee
Donald Q. Kern Award of the AIChE

Tony Evans
Elected Fellow of the Royal Academy of Engineering

Frederic Gibou
Sloan Research Fellowship

Bud Homsy
Elected to the National Academy of Engineering



Keith Kedward
Named Fellow of the Society for the Advancement of Material and Process Engineering (SAMPE)
Outstanding Faculty Member in Mechanical Engineering for 2005-06 and 2006-07

Mustafa Khammash
Elected Fellow of the IEEE

Robert McMeeking
Brown Engineering Alumni Medal
Talbot Lecturer at UIUC, Urbana-Champaign

Jeffrey Moehlis
NSF Career Award

Brad Paden
Fellow of the American Institute for Medical and Biological Engineering

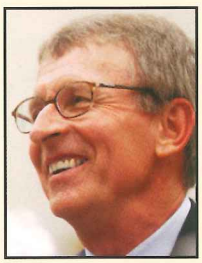
Linda Petzold
Richard C. DiPrima Lecturer, RPI
Australian Mathematical Sciences Institute (AMSI) Annual Lecturer

Kimberly Turner
Elected to the President's Council of Alumnae at Michigan Tech
Outstanding Young Alumni – Michigan Technology Univ.

Henry Yang
AIAA Structures, Structural Dynamics and Materials Award

Congratulations to all of our award recipients!

Emeriti Faculty News & Notes: John C. Bruch, Jr.



On July 1, 2006, I became Professor Emeritus after 40 enjoyable years of teaching and research in the ME Department. Since then I have maintained a research presence in the Department. One of my grad students, Chris Spier, received his Ph. D. this past June. Several ME Ph.D. Committee obligations and continuing to submit papers for publication are still on my agenda. A moving experience for me will be this upcoming May. Virginia Tech is having a conference celebrating the 100th anniversary of their Department of Engineering Science and Mechanics. I will be presenting an invited paper in a special session honoring Professor Liviu Librescu who died, successfully defending his students, on April 16, 2007 in the senseless killings that took place on their campus. Professor Librescu and I crossed paths professionally multiple times over the years and it is a privilege to be a part of this remembrance of his career and sacrifice. Other conferences are planned in the future but my life is now shared with one of my passions that I have returned to after many years on hold: golf. I recently became a member of Birnam Wood Golf Club which has enabled me to access a course that is all but across the street from where I live. My handicap is a work in progress and I've enjoyed playing as much as I can. As many of you know golfing presents a whole other arena for problem solving. Finally, remodeling our house and garden are other on-going projects that make me wonder where all the "free" time is that one is supposed to have in retirement. It is also most enjoyable having occasional visits and contacts from UCSB alums both from engineering and mathematics, as well as from the UCSB Chapter of InterVarsity Christian Fellowship which my wife and I mentored for 30 years. Life is good!

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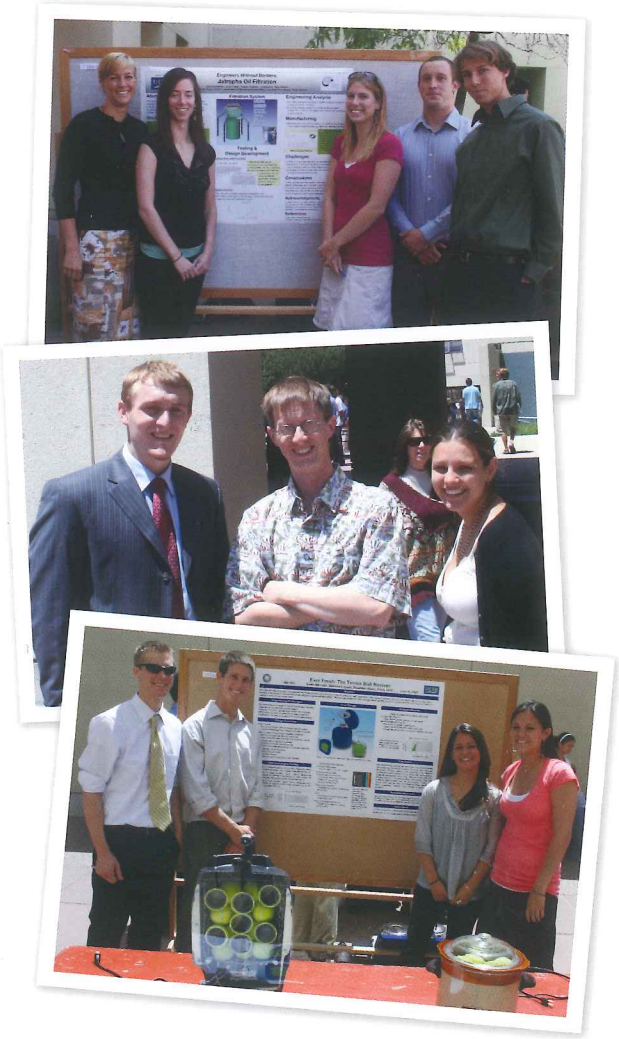
UCSB

4th Annual Mechanical Engineering
Graduate Convocation & Research Symposium
Wednesday, October 3, 2007



Mechanical Engineering Undergraduate
Capstone Design Project Poster Competition
Friday, June 8, 2007

See more event photos & info on our website! www.me.ucsb.edu

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