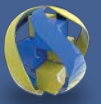


50th Anniversary Celebration Mechanical Engineering UC Santa Barbara

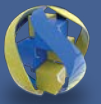
Welcome!





Agenda

- **10:30am-10:35am: Welcome and Introduction**, by *Kim Turner*
- **10:35am: UCSB Mechanical Engineering Today**
 - 10:35am-11:05am: State of the Department by *Francesco Bullo*
 - 11:05am-11:20am: Teaching Themes by *Brad Paden*
 - 11:20am-11:25am: Break
 - 11:25am-12:00pm: Research Reports by *ME Faculty*
- **12:00pm-12:15pm: Welcome**, by *Dean Rod Alferness*
- **12:15pm-2:00pm: Lunch Reception and Poster Session**
- **2:00pm-2:10pm: Remarks**, by *Chancellor Henry Yang*
- **2:00pm-2:40pm: History Panel**
 - ME History by *John Bruch, Gene Lucas, Bob Odette and Kim Turner*
 - Student Perspectives by *Dave Messner, Greg Dahlen, and Nora Dakessian*
- **2:40pm-4:00pm: Alumni Perspectives “Careers in Mechanical Engineering”**
 - Keynote Speaker: *Mihailo Jovanovic*, Professor, University of Minnesota
 - Keynote Speaker: *Kevin Ness*, Founder & CTO, 10X Technologies
 - Keynote Speaker: *Stephen Neushul*, CEO & Founder, iCRco
- **4:00pm-4:15pm: ME Distinguished Alumni Award** by *Carl Meinhardt*
- **4:15pm-4:30pm: Concluding Remarks** by *Francesco Bullo*
- **4:30pm-6:00pm: Networking Reception**



State of the Department

Francesco Bullo, ME Chair

- **A short history of the ME Department**
- Who we are today
- Where we are going



The University of California, Santa Barbara and the Mechanical Engineering Department



- **UCSB founded 1944**
- **Mechanical Engineering Department, founded in 1964!**
- **Reputation for outstanding scientific research**
 - **6 Nobel Prizes, including 2014 Laureate Shuji Nakamura**
- **... and for interdisciplinary research and education**

REVISED FALL CLASS SCHEDULE FOR MECHANICAL ENGINEERING DEPARTMENT *Fall 1967*

<u>ME 1A</u>	Lec	4.0	Bruch, J. C.	Lec 1	TT	900	950	Engr	1104
Engineering Mechanics			Buckey, C. F.	Dis 1	TT	100	150	Engr	3118
			Bruch, J. C.	Dis 2	TT	1100	1150	Engr	3118
			Lockwood, G.	Dis 3	WF	800	900	Engr	3118
			Lingerfelt, J.	Dis 4	WF	1000	1100	Engr	3120
			Bossel, H.	Dis 5	WF	1100	1150	Engr	3114 <i>New</i>
<hr/>									
<u>ME 5</u>	Lec	4.0	Eisenstadt, M.	Lec 1	MWF	900	950	Engr	4107
Materials of Engineering			Eisenstadt, M.	Dis 1	TT	300	350	Engr	3120
<hr/>									
<u>ME 101</u>	Lec	4.0	Mitchell, T. P.	Lec 1	TT	1000	1150	Engr	1124
Intro to Mech Solids			Sennett, R. E.	Lec 2	TT	800	950	Engr	3118
<u>ME 105</u>	Lec	4.0	Kuby, W. C.	Lec 1	MWTF	1000	1050	Engr	3108
Intro to Stat Therm			Eisenstadt, M.	Lec 2	MTWT	1000	1050	Engr	3118
<u>ME 151 A</u>	Lec	4.0	Charters, A.	Lec 1	MTWT	1100	1150	Engr	3120
Thermodynamics			Roemer, R.	Lec 2	MTWT	1100	1150	Engr	2108
<u>ME 153</u>	Lec	4.0	Kuby, W. C.	Lec 1	MTh	100	250	Engr	3120
Heat Transfer									
<u>ME 155B</u>	Lec	3.0	Bossel, H.	Lec 1	MWF	1000	1050	Engr	5120 **
Intro to Vibr									
<u>ME 156A</u>	Lec	3.0	Nordsieck, A.	Lec 1	Tu	100	450	A	1250 A
Design									
<u>ME 160</u>	Lec	4.0	Bonnell, J. M.	Lec 1	WF	100	250	Engr	3114
Gas Dynamics									
<u>ME 163</u>	Lec	3.0	Thomson, W. T.	Lec 1	MWF	900	950	Engr	3114
Engineering Dynamics									
<hr/>									
ME 201	Adv. Dyn.	3.0	Mitchell, T.	Lec.	TTh	200	315	Engr	4107
ME 250	Adv. Thermo.	3.0	Roemer R. B.	Lec.	TTh	330	445	Engr	4107
** COURSE ADDED									



MECHANICAL ENGINEERING FALL SCHEDULE

1968

UNDERGRADUATE COURSES

Page 1

ME 1A	Engineering Mechanics	Kuby	Lec. I	TT	9-950	Engineering	1104
		Lichtbach	Dis. 1	WF	9-950		1124
		Lockwood	Dis. 2	WF	10-1050		1124
		Bruch	Dis. 3	TT	11-1150		1124
		Prichard	Dis. 4	MW	11-1150		1124
		Bucky	Dis. 5	TT	12-1250		1124

ME 5	Materials of Engr.	Eisenstadt	Lec. I	TT	12-1250		1104
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ME 101	Intro to Mech of solids	Sennett	Lec. I	MWTF	1-150		1124
		Connell	Lec. II	MWTF	2-250		3114

ME 151A	Thermodynamics	Roemer	Lec. I	TT	10-1150		3108
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ME 105	Intro to Stat.	Hickman	Lec. I	MWTF	1-150		1132
		Eschenroeder	Lec. II	MWTF	10-1150		3114

ME 130	Aerodynamics	Bossel	Lec. I				
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ME 153	Heat Transfer	Roemer	Lec. I				
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ME 155A	Intro to Vib Control	Connell	Lec. I				
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MECHANICAL ENGINEERING FALL SCHEDULE

1968

UNDERGRADUATE COURSES

ME 156A	Design	Bossel	Lec. I	TT	3-415		3108
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ME 163	Intermed. Dynamics	Thomson	Lec. I	MWF	9-950		2107
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ME 167	Propulsion	Kuby	Lec. I	TTF	10-1050		2107
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GRADUATE COURSES

ME 201	Adv. Dynamics	Mitchell	Lec. I	MW	10-1115		
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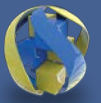
ME 220	Inviscid Fluid Flow	Bruch	Lec. I			TBA	
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ME 231A	Plasma Dynamics	Mitchell	Lec. I	TT	10-1115		5107
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ME 234A	Aero. Struct. Dyn.	Connell	Lec. I			TBA	
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Faculty during the Early Years

							Year	1963-4	1964-5	1965-6	1966	1967	1968	1969
							Dean	Albert G. Conrad						
							Chair	Witzell			Thomson			
	Yrs. Asst	Yrs. Assoc	Yrs. Prof.	Yrs. Chair	Yrs. Emerit.	Total Years								
Otto W. Witzell	0	0	0	3	0	3	Chair	Chair	Chair					
H. Karl Ihrig	3	0	0	0	0	3	Asst.	Asst.	Asst.					
Richard A. Matula	3	0	0	0	0	3	Asst.	Asst.	Asst.					
Kenneth R. Brockman*	3	0	0	0	0	3	Asst.	Asst.	Asst.					
George P. Wilson*	2	0	0	0	0	2		Asst.	Asst.					
Thomas (Hal) Mitchell	0	0	22	6	21	49				Prof.	Prof.	Prof.	Prof.	
William T. Thomson	0	0	5	4	23	32				Chair	Chair	Chair	Chair	
William Kuby	0	15	0	0	0	16				Assoc.	Assoc.	Assoc.	Assoc.	
John M. Bonnel	2	0	0	0	0	2				Asst.	Asst.			
John Bruch	8	4	28	0	9	49				Asst.	Asst.	Asst.	Asst.	
Melvin M. Eisenstadt	4	0	0	0	0	4				Asst.	Asst.	Asst.	Asst.	
Charles T. Devlin	1	0	0	0	0	1				Asst.				
Robert E. Sennett	0	0	0	0	0	3								
Harmut H. R. Bossell	3	3	0	0	0	6				Asst.	Asst.	Asst.	Asst.	
Robert B. Roemer	8	0	0	0	0	15				Asst.	Asst.	Asst.	Asst.	
Alexander Crane Charters	0	0	0	0	0	1				Lect.				
Roy S. Hickman	0	9	13	4	21	47				Assoc. Assoc.				
Gary M. Connell	4	1	0	1	0	6				Asst. Asst.				
Ekkehard Marschall	5	6	1	0	21	46				Asst.				



Engineering Bldg II in March 1987



Watching a scissors-welding robot arm prepare to cut the ribbon opening Engineering Bldg II. From left to right: Robert Mehrabian, Dean of the College, Robert Lagomarsino, (R-CA) and Jack O'Connell (D-Santa Barbara).

UCSB Opens Engineering II

UCSB has been waiting a long time for the new Engineering II building. Originally planned and approved in 1969, 18 years have passed before it was finally completed.

Engineering II, with its 84,000 assignable square feet, will allow the College of Engineering to consolidate its four departments — computer science, electrical and computer engineering, mechanical and environmental engineering and nuclear and chemical engineering — as well as the new graduate program in materials in two buildings.

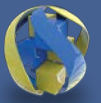
In the past, the college has been forced to work with only 57 percent of the space it needs, but when the new building is fully occupied, UCSB engineers will have 81 percent of the room that is recommended by state guidelines.

Engineering II will house more than 20 new laboratories, including a microelectronics clean room and other semiconductor research labs and laboratories for the processing and characterization of novel materials.

The building, designed by MBT Associates, was constructed at a cost of \$18 million. Equipment cost was \$4.4 million.

At the dedication ceremony Feb. 27, the ribbon cutting was done with a suitably high tech flourish. The shiny silver ribbon was made of an advanced material called a glassy metal, and, to the obvious delight of the large crowd on hand, it was cut cleanly and precisely by a scissor-welding robot arm supplied by the Center for Robotic Systems in Microelectronics.

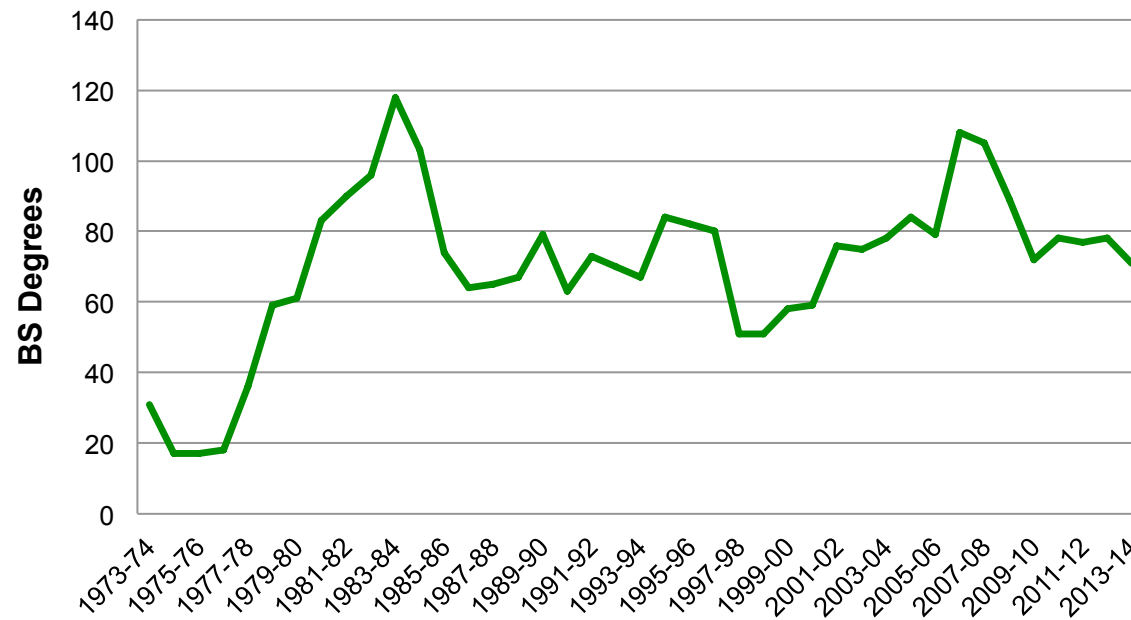
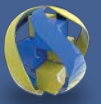
Attending the ceremony were former Chancellor Vernon Cheadle and Chancellor Daniel Aldrich, former Vice Chancellor and Professor of Physics Raymond Sawyer, all the past deans of the College of Engineering, U.S. Representative Robert Lagomarsino (R-California) and State Assemblyman Jack O'Connell (D-Santa Barbara).



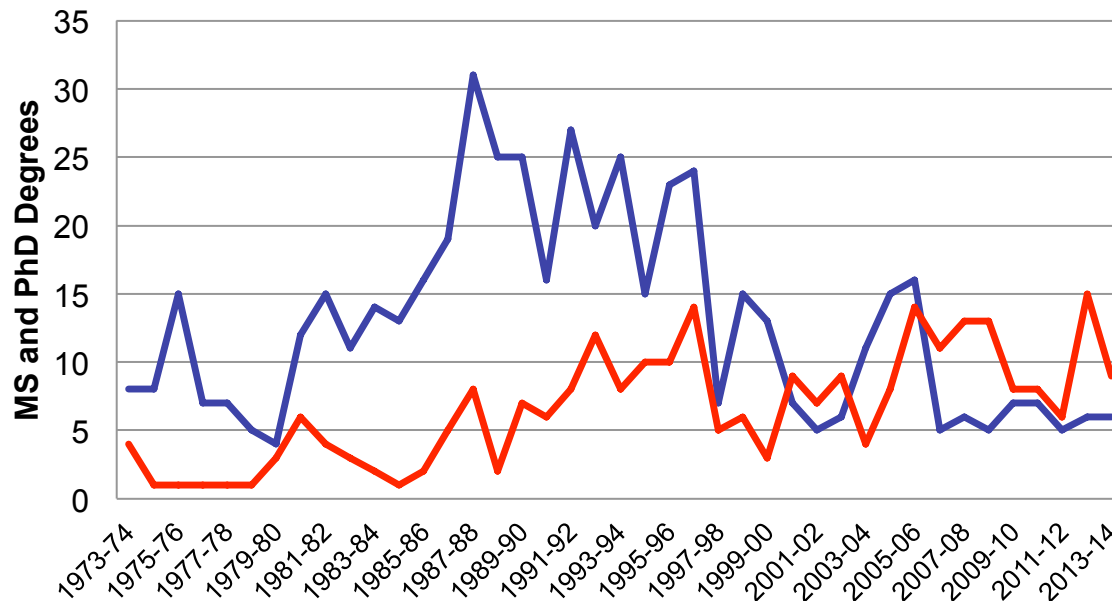
1989 La Cumbre Yearbook



Above: Mechanical Engineering Front Row: Ekkehard Marschall. **Second Row:** Thomas Mitchell, Fred Leckie, chairman; Fred Milstein, and Brad Paden. **Back Row:** Steve McLean, James Vanyo, John Bruch Jr., Yoshihiko Nakamura, and Eric Matthys.



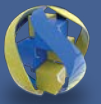
BS, MS, PhD Degrees 1974-2014



In summary:

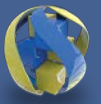
- **BS: 2,886**
- **MS: 527**
- **PhD: 268**

... not
counting
1964-1974



Outstanding Students over the Years

- **Incomplete List of Awards:**
 - NSF GRF, Canadian NSERC, DARPA SMART, DoE Fellowships
 - UCSB Fellowships: GradDiv, IEE, CCDC
 - Ford Foundation Fellowship, Fullbright, MacArthur Genius
- **Incomplete Placement Information:**
 - i. Universities: UC campuses, USC, Stanford, Iowa, Minnesota, Michigan, Illinois, University of Washington at Seattle, Washington University at St Louis, Delaware, ETH Zurich, Waterloo
 - ii. Corporations: ATK Space Systems, Boeing, Raytheon, United Technology, Raytheon, Agilent, Kiva/Amazon, Numerica Corporations, Bosch, Exxon Mobil, Chevron, Hewlett-Packard, Lockheed Martin, Northrop Grumman, Apple Computer, TRW Space & Electronics, Pacific Gas & Electric
 - iii. Research Labs: PARC, UTRC, Los Alamos, JPL, Sandia, NASA
 - iv. Local Companies and Startups: Toyon, Spectrafluidics, Cynvenio Biosystems
- Three keynote speakers today:
 - *Mihailo Jovanovic*, Professor, University of Minnesota
 - *Kevin Ness*, Founder & CTO, 10X Technologies
 - *Stephen Neushul*, CEO & Founder, iCRco



Outstanding Faculty over the Years

National Academy of Engineering

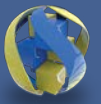
Current Faculty

- McMeeking, Robert
- Petzold, Linda
- Yang, Henry



Former Faculty

- Astrom, Karl
- Clarke, David
- Evans, Anthony
- Homsy, Bud
- MacDonald, Noel
- Majumdar, Arun
- Mehrabian, Robert
- Miller, Richard K.
- Suo, Zhigang
- Theofanous, Theo
- Tulin, Marshall

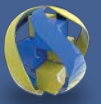


Mohammed Dahleh (1961-2000)



Anthony G. Evans (1942-2009)



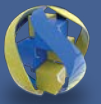


State of the Department

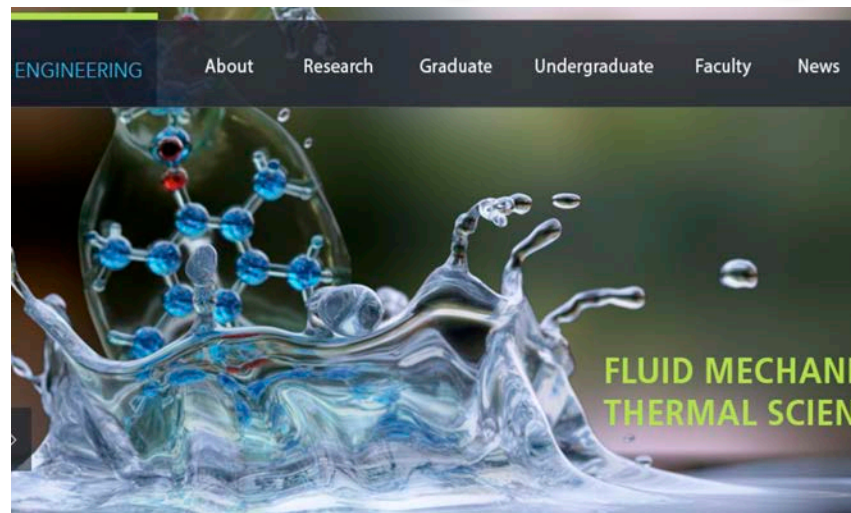
Outline

- A short history of the ME Department
- **Who we are today**
 - Overview
 - Teaching Themes
 - Research Reports
- Where we are going

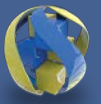




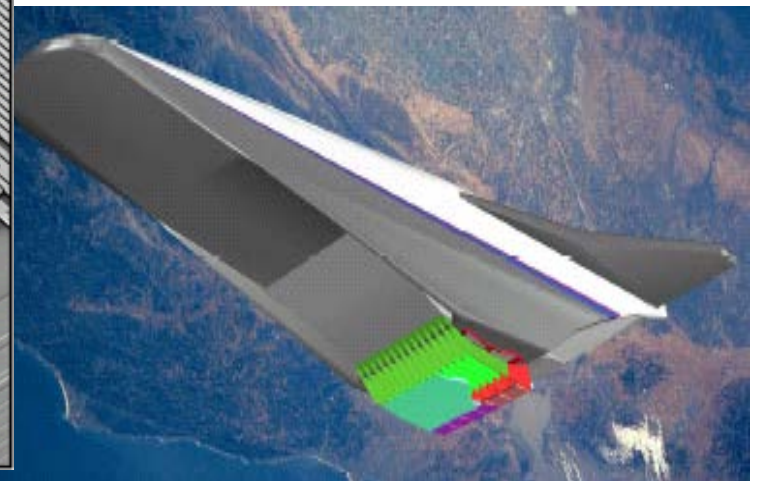
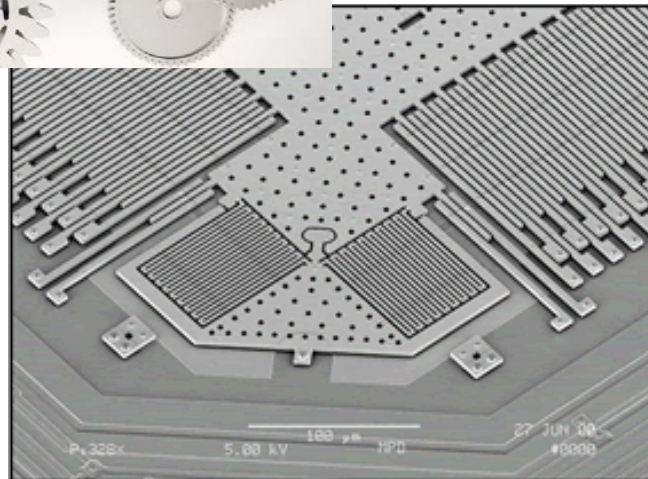
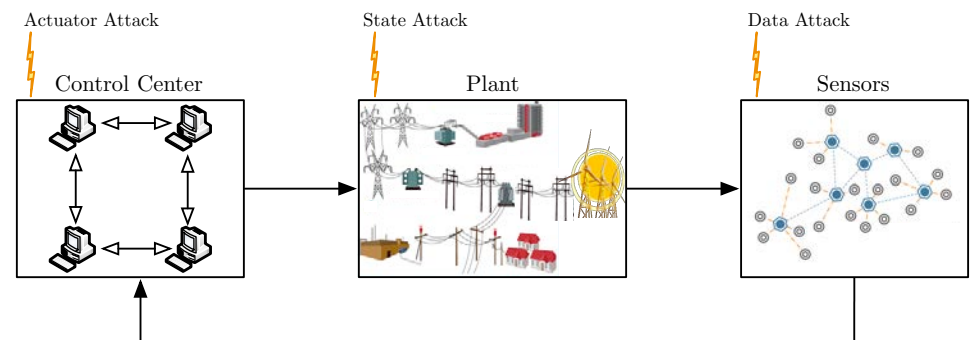
Mechanical Engineering at UCSB

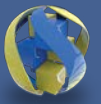


- **Research, Teaching and Service Missions**
- Offer: BS, MS, and PhD degrees
- 332 undergraduate students
- 73 graduate students (~70% PhD)
- 21 faculty members
- 6 lecturers, 6 engineers, and 10 staff



From principles of Mechanical Sciences to Technologies that better people's lives!





Mechanical Science and Engineering

Core Scientific Areas:

- BioEngineering and Systems Biology (BESB)
- Computational Science and Engineering (CSE)
- Control and Dynamical Systems (CDS)
- Fluid Mechanics and Thermal Sciences (FTS)
- Micro/Nano Science and Technology (Micro/Nano)
- Solid Mechanicals, Materials and Structures (SMMS)

Application Areas:

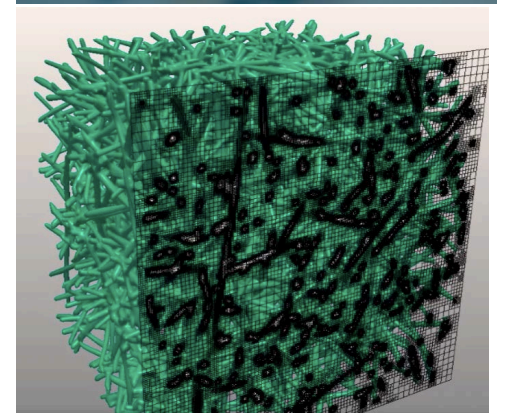
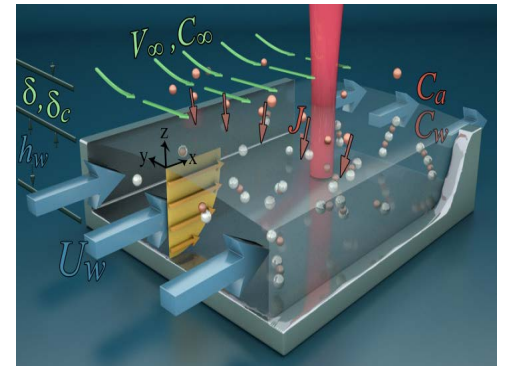
BioMedical: Therapy, Diagnostics

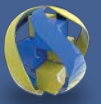
Aerospace and Transportation

Energy and Sustainability

Manufacturing Processes

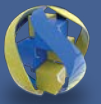
Robotics and Autonomy





Distinguished Faculty – recent awards

1. Bassam Bamieh: DCR, 2013 IEEE TAC Axelby Outstanding Paper Award
2. Matt Begley: SMMS, 2014 Fraunhofer-Bessel Research Award, Humbolt
3. Glenn Beltz: SMMS, Associate Dean Undergraduate Studies
4. Ted Bennett: TFS, 2014 ME Outstanding Faculty Member
5. Francesco Bullo: DCR, 2014 IFAC Automatica Best Paper Prize
6. Otger Campas: BEBS, Mellichamp Chair
7. Frederic Gibou: CSE, Sloan Fellow, ViceChair and Chair of Graduate Program
8. Carlos Levi: SMMS, 2013 Fellow, American Ceramic Society
9. Eric Matthys: TFS, 2010 UCSB Sustainability Champion Award
10. Robert McMeeking: SMMS, 2014 Timoshenko Medal
11. Eckart Meiburg: TFS, 2014 Fellow of American Society of Mechanical Engineering
12. Carl Meinhardt: MEMS, 2014 Fellow of American Physical Society
13. Igor Mezic: DCR, Director the Center for Energy Efficient Design
14. Jeff Moehlis: DCR, Sloan Fellow, NSF Career
15. Brad Paden: DCR, Fellow IEEE, AIMBE and ASME
16. Sumita Pennathur: MEMS, 2011 PECASE Award
17. Linda Petzold: CSE, 2014 SIAM/ACM Prize in Computational Science & Engineering
18. Tom Soh: MEMS, 2014 Fellow of American Institute for Medical and Biological Engineering
19. Kim Turner: MEMS, 2014 Fellow of American Society of Mechanical Engineering
20. Megan Valentine: BEBS, 2012 NSF Career Award
21. Henry Yang: SMMS, 7 honorary doctorates, NAE and a Fellow of AIAA, ASEE, and ASME.

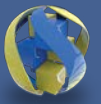


US National Research Council Current Ranking

- **NRC Quality Measure & Research Productivity**
- **Source: phd.org**

Rank	Program	Survey Quality	Research Product
<input type="checkbox"/> 1-1	Brown University ENGINEERING: Solid Mechanics	1-3	1-1
<input type="checkbox"/> 2-8	California Institute of Technology Applied Mechanics	1-5	2-16
<input type="checkbox"/> 2-5	Northwestern University Mechanical Engineering	2-5	2-7
<input type="checkbox"/> 2-6	Stanford University Mechanical Engineering	1-5	2-9
<input type="checkbox"/> 3-12	Princeton University Mechanical and Aerospace Engineering	4-11	3-16
<input type="checkbox"/> 3-15	University of Michigan-Ann Arbor Mechanical Engineering	4-11	3-21
<input type="checkbox"/> 5-14	University of California-Santa Barbara Mechanical Engineering	5-15	3-17
<input type="checkbox"/> 5-17	Johns Hopkins University Mechanical Engineering	7-20	3-16
<input type="checkbox"/> 5-17	University of California-San Diego Mechanical and Aerospace Engineering	6-19	3-17
<input type="checkbox"/> 6-19	Massachusetts Institute of Technology Mechanical Engineering	5-14	7-27
<input type="checkbox"/> 5-22	University of California-Berkeley Mechanical Engineering	5-16	5-27
<input type="checkbox"/> 6-23	University of Illinois at Urbana-Champaign Mechanical Engineering	6-22	5-25

☀ Top 7



US National Research Council Current Ranking

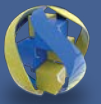
- **NRC Quality Measure & Research Productivity + Student Outcome**
- **Source: phd.org**

<u>Rank</u>	<u>Program</u>	<u>Survey Quality</u>	<u>Research Product</u>	<u>Student Outcomes</u>	<u>Profes Devel</u>
<input type="checkbox"/> 1-1	Brown University ENGINEERING: Solid Mechanics	1-3	1-1	12-71	17
<input type="checkbox"/> 2-8	Northwestern University Mechanical Engineering	2-5	2-7	5-27	15
<input type="checkbox"/> 2-11	Princeton University Mechanical and Aerospace Engineering	4-11	3-16	3-17	16
<input type="checkbox"/> 2-16	California Institute of Technology Applied Mechanics	1-5	2-16	2-10	12
<input type="checkbox"/> 2-15	University of California-Santa Barbara Mechanical Engineering	5-15	3-17	10-47	17
<input type="checkbox"/> 2-16	University of Michigan-Ann Arbor Mechanical Engineering	4-11	3-21	35-71	18
<input type="checkbox"/> 3-17	Stanford University Mechanical Engineering	1-5	2-9	17-49	13
<input type="checkbox"/> 4-24	Massachusetts Institute of Technology Mechanical Engineering	5-14	7-27	44-88	18
<input type="checkbox"/> 3-27	University of California-Berkeley Mechanical Engineering	5-16	5-27	36-75	18
<input type="checkbox"/> 4-26	University of California-San Diego Mechanical and Aerospace Engineering	6-19	3-17	58-94	18
<input type="checkbox"/> 4-28	Johns Hopkins University Mechanical Engineering	7-20	3-16	54-93	17

★ Top 5

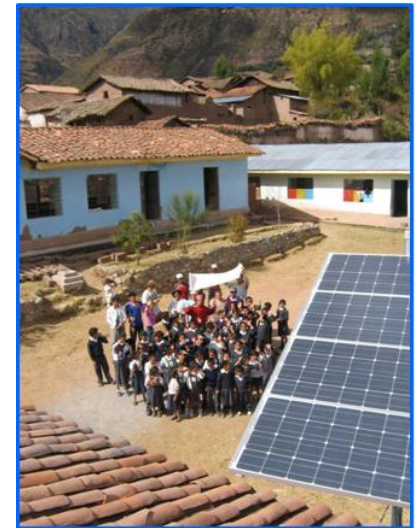
Distinguished Students

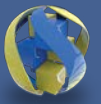
Academic Year	Average High School GPA*	Average Math SAT (800)	Average Total SAT (2400)	Number of new students enrolled
2013-14	4.21	726	2045	80
2012-13	4.11	694	1880	85
2011-12	4.02	713	1981	80
2010-11	4.07	698	1897	61
2009-10	3.98	685	1874	101



Thriving Student Organizations

Society of Automotive Engineers
American Society of Mechanical Engineers
Society of Women Engineers
Engineers Without Borders
National Society of Black Engineers
Los Ingenieros
Tau Beta Pi, among others

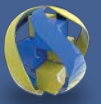




Recent Initiatives and Improvements

- **Ongoing faculty searches**
 - Nanoscale Heat Transfer and ThermoElectric Materials
 - Fluids Mechanics and Wind Energy
 - Mechanical Engineering Design
- **Combined 5-year BS/MS Graduate Program**
- **Online Course Structural Analysis, ME 167**
- **Instructional Laboratory Upgrades**
 - Microfluidics Laboratory (2013)
 - Robotics and Mechatronics Laboratory (2014, expansion and upgraded equipment)
 - Machine Shop (2014)
 - Capstone Design Laboratory (pending)
 - ME Classroom (modern teaching technology)
- **Curriculum Improvements**
 - Engr 3 “Intro to Programming”
 - ME 15 “Strength of Materials”
 - ME 17 “Mathematics for Engineering”
 - ME 105 “Mechanical Engineering Laboratory”
 - ME 141 “MEMS processing and fabrication”
 - ME 179L, P and D: Robotics Curriculum





State of the Department

Outline

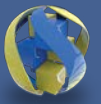
- A short history of the ME Department
- **Who we are today**
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 - Research Reports
- Where we are going



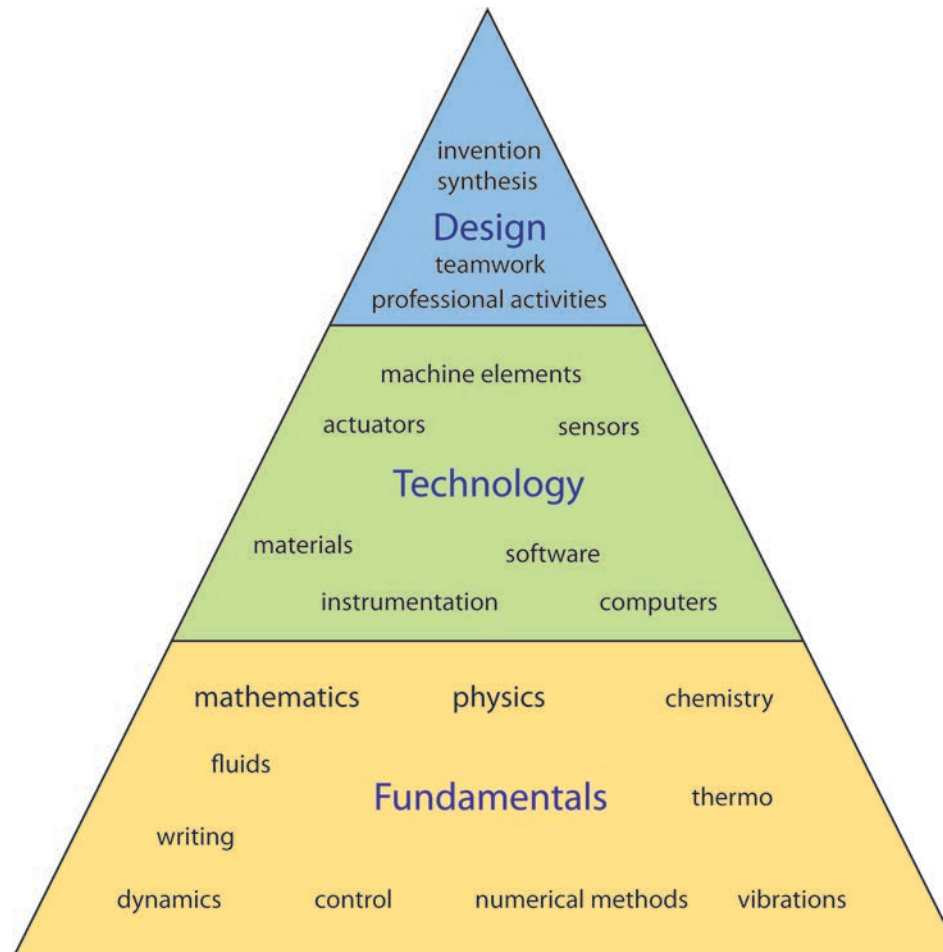
Themes in the ME Undergraduate Program

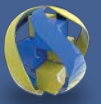
Brad E. Paden

Director, Undergraduate Program



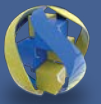
Themes



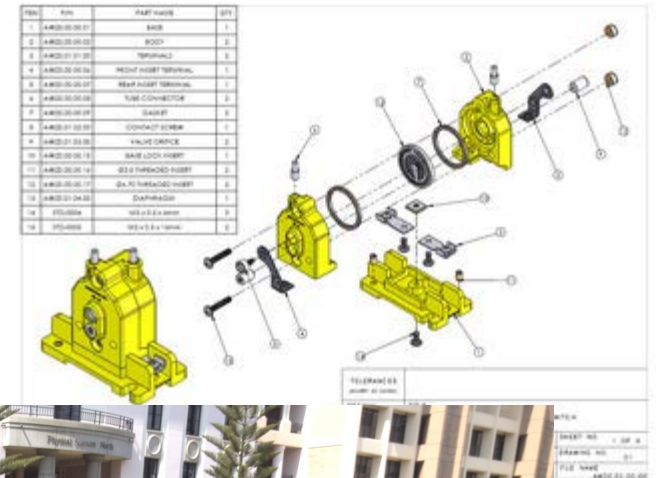
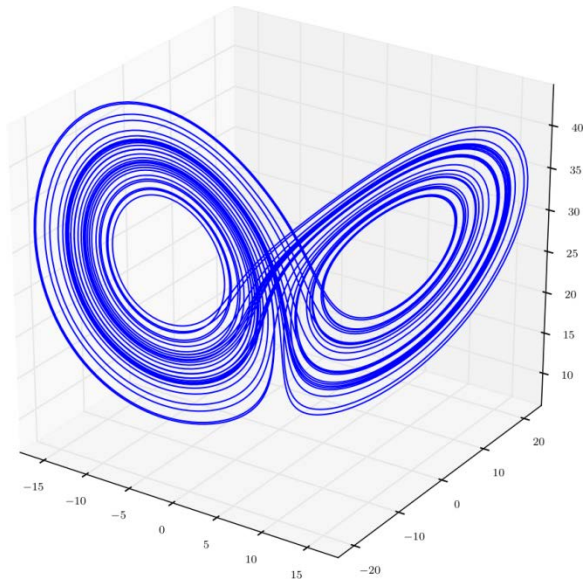


1st Year – Mix it up

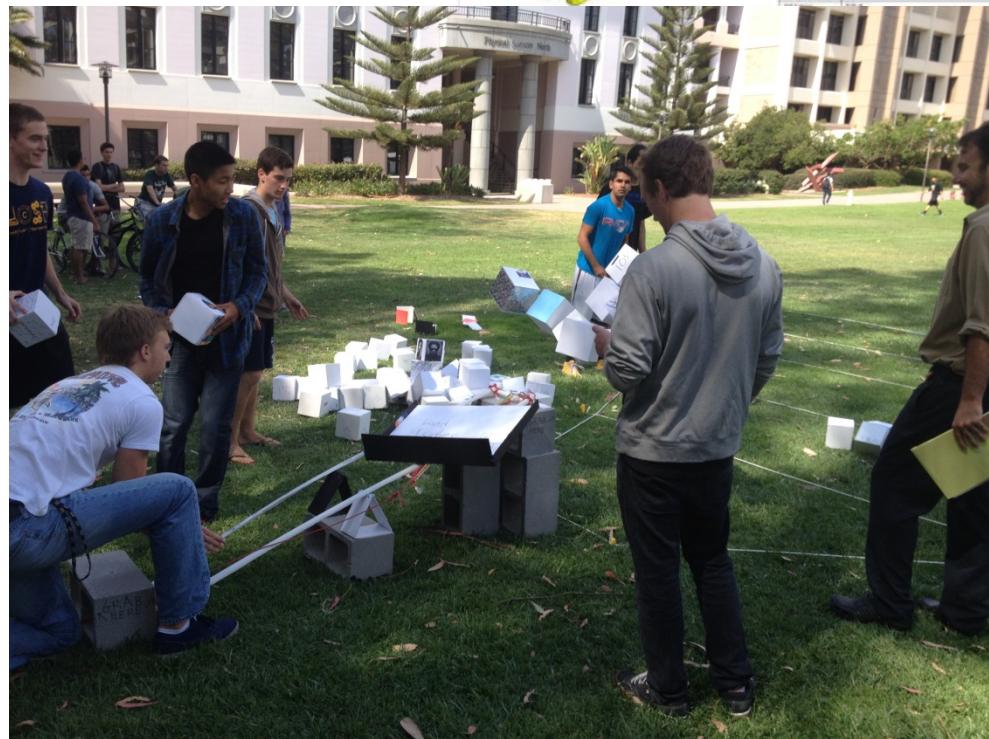
- Fundamentals
 - Mathematics
 - Chemistry
 - Physics
 - Writing
- Design & Technology (Motivation!)
 - ME10 – Graphics & Design using Solidworks™
 - ENGR3 – Programming using Matlab™
 - ME11 – Seminar
 - ME12S – Shop



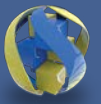
1st Year



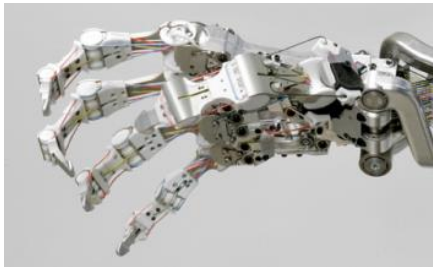
Matlab is a powerful programming
& visualization tool



ME10 – we like to create!



1st Year

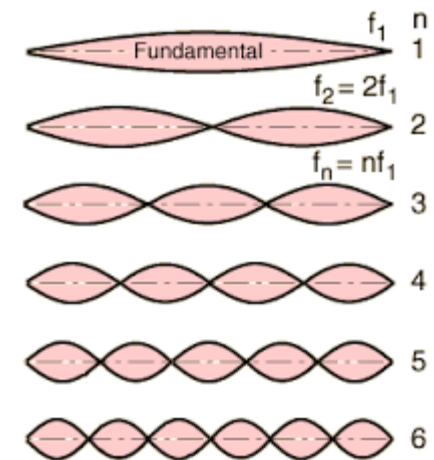
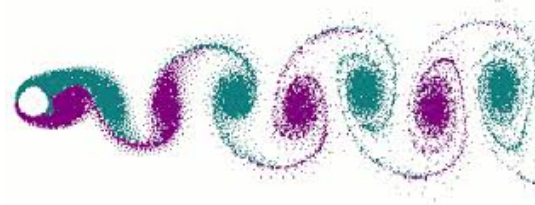
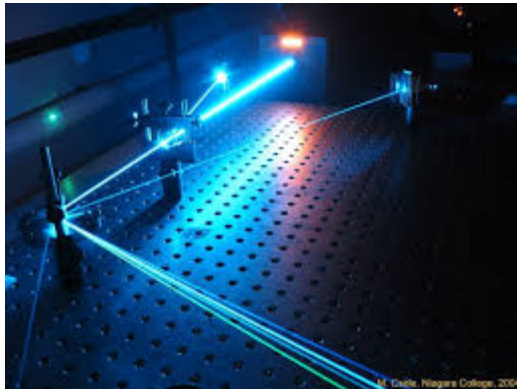


ME11 – Seminar Series
on Mechanical Engineering

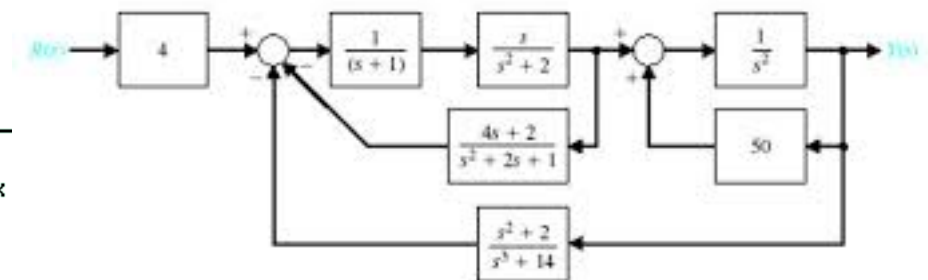
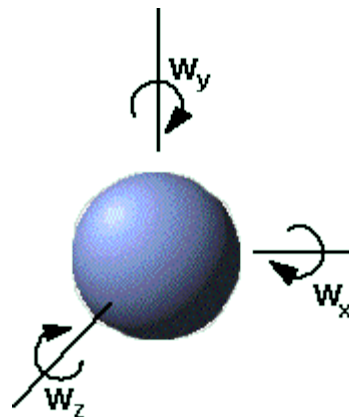


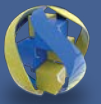
ME12S – making an air motor

2nd and 3rd year – focus on the fundamentals

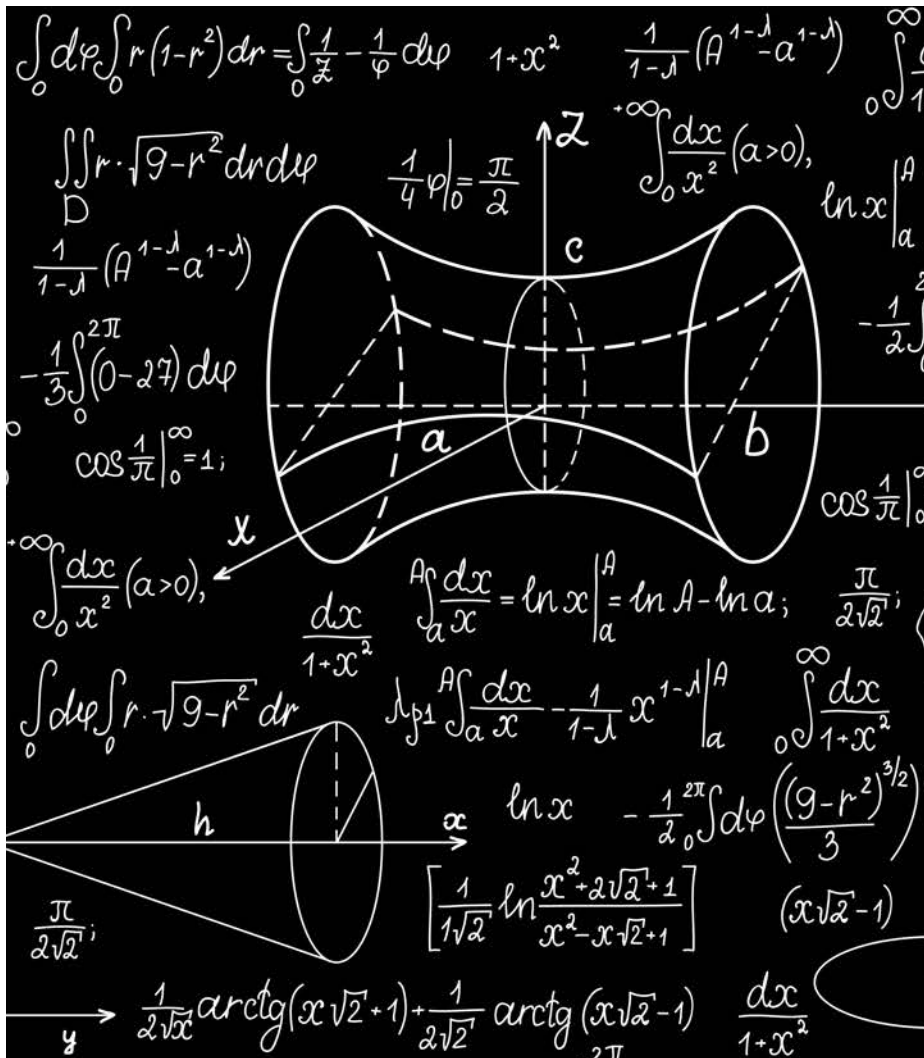


$$\begin{aligned}\nabla \cdot \mathbf{E} &= \frac{\rho}{\epsilon_0} \\ \nabla \cdot \mathbf{B} &= 0 \\ \nabla \times \mathbf{E} &= -\frac{\partial \mathbf{B}}{\partial t} \\ \nabla \times \mathbf{B} &= \mu_0 \mathbf{J} + \mu_0 \epsilon_0 \frac{\partial \mathbf{E}}{\partial t}\end{aligned}$$

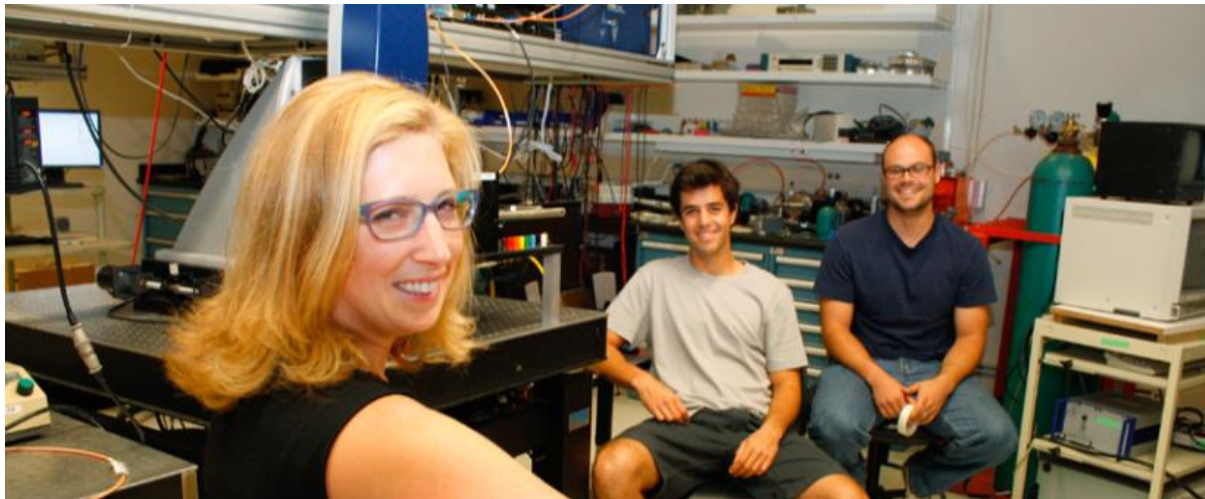




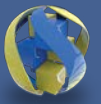
2nd and 3rd year – focus on fundamentals



2nd and 3rd year – focus on the fundamentals

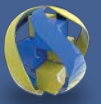


Many students get involved in research at this time...



Technology: 2nd and 3rd years also incorporate labs

- Circuits Lab
- Mechatronics Lab
- Mechanical Engineering Lab
- ...and then back to design!
ME153 – Intro to ME Design

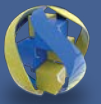


ME Capstone Design Projects



Steve Laguette

- Capstone Course created in Sept 2004
- Class size is between 65 and 110 students
- Typically 14 to 22 projects and teams
- 2 Interdisciplinary Projects in 2013 with FLIR and ECE teams
- 838 senior ME Capstone students
- 174 ME Capstone project teams



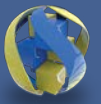
ME Capstone Design Projects

- **Industry Partner** – projects supported by gifts to the program
- **Research Partner** – projects supported by research funding
- **Design Competitions** and **Student Organizations** – projects supported by ME department funding
- **Student and Faculty created projects** – projects supported by ME department funding

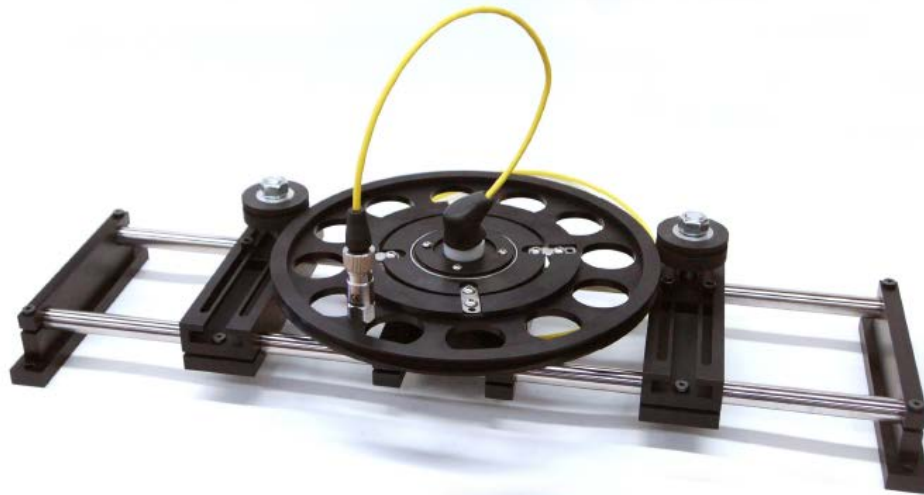
Capstone Design (2005-2014)

- Finalist for Best Paper 2008 ASEE DEED
 - Stephen W. Laguette, "Integration of Industry Partners into a Capstone Design Program." *Proceedings of the 2008 ASEE Annual Conference & Exposition*.
- 26 Industry partners & 66 Industry partnered teams
- Raised over \$325,000 in gift funds to support projects
- Medtronic (9yrs), ATK (8 yrs), Northrop Grumman (6 yrs), Raytheon (5 yrs)

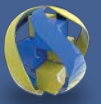




Capstone Design



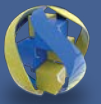
Composite Rod Defect Detection



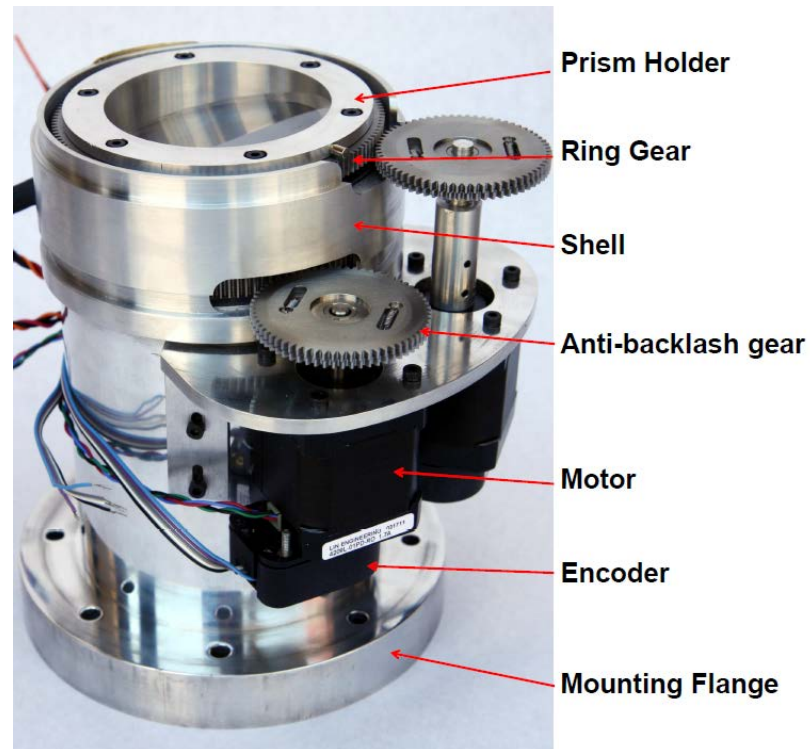
Capstone Design



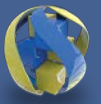
Human Powered Submarine



Capstone Design



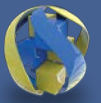
Computer-Controlled Optical Dispersion Corrector



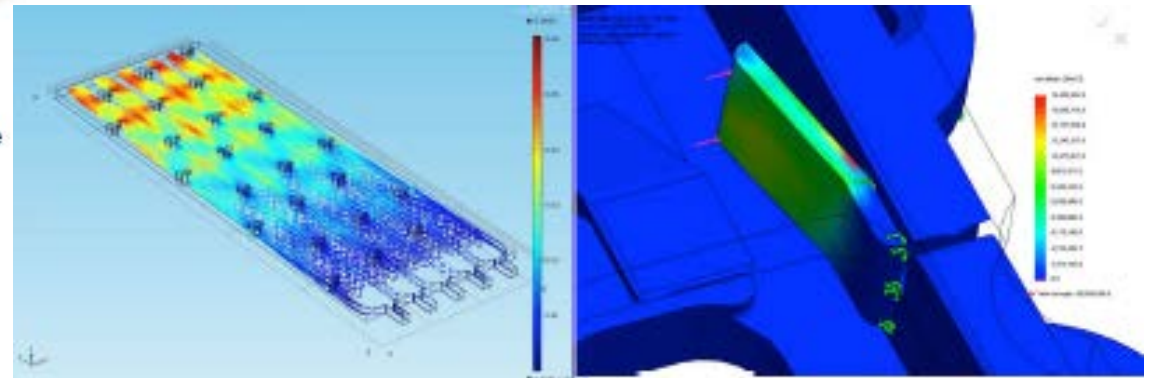
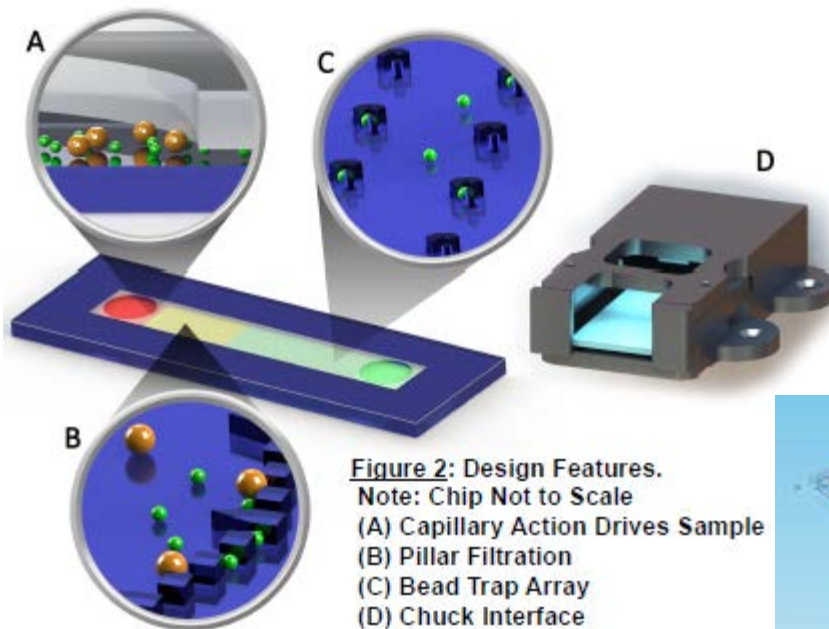
Capstone Design



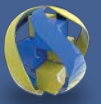
Lunar Rover



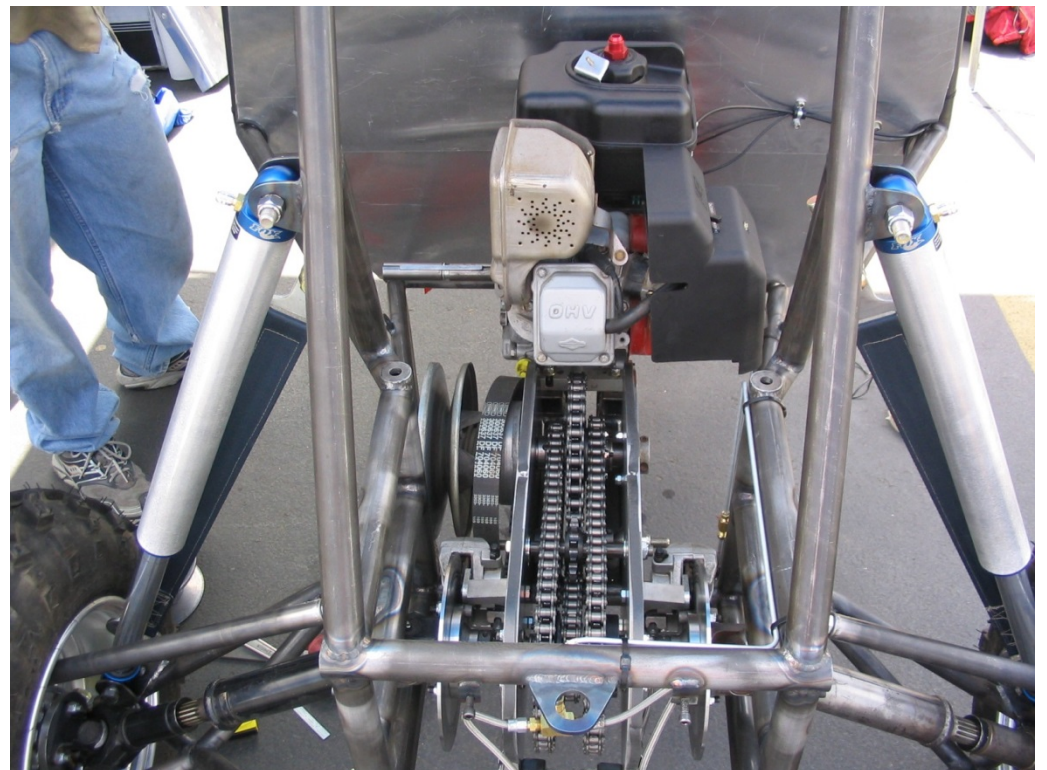
Capstone Design



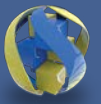
Magnetic Bead Cytometer



Capstone Design



Mini Baja Competition

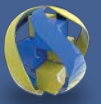


Capstone Design

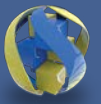


Engineers Without Borders
Water Project in Peru





**Many accomplishments
and great memories!**

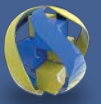


State of the Department

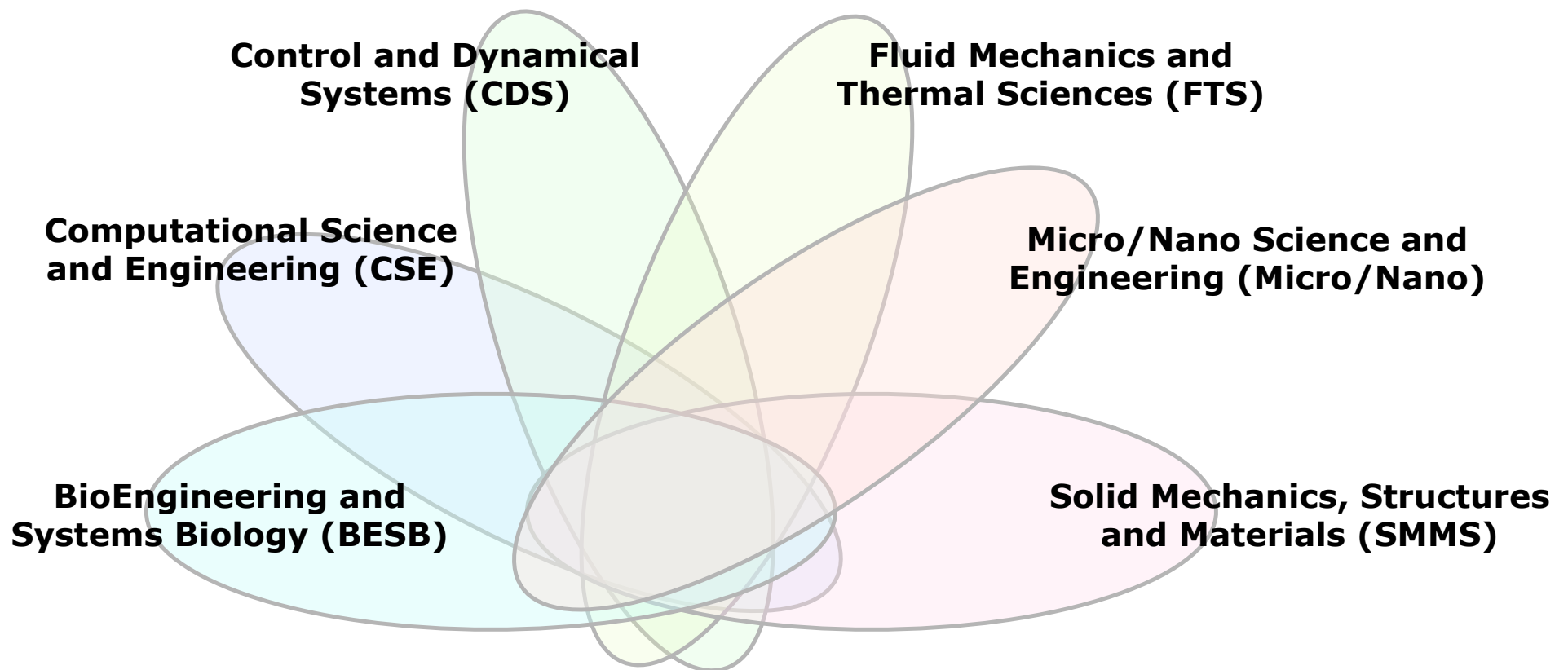
Outline

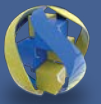
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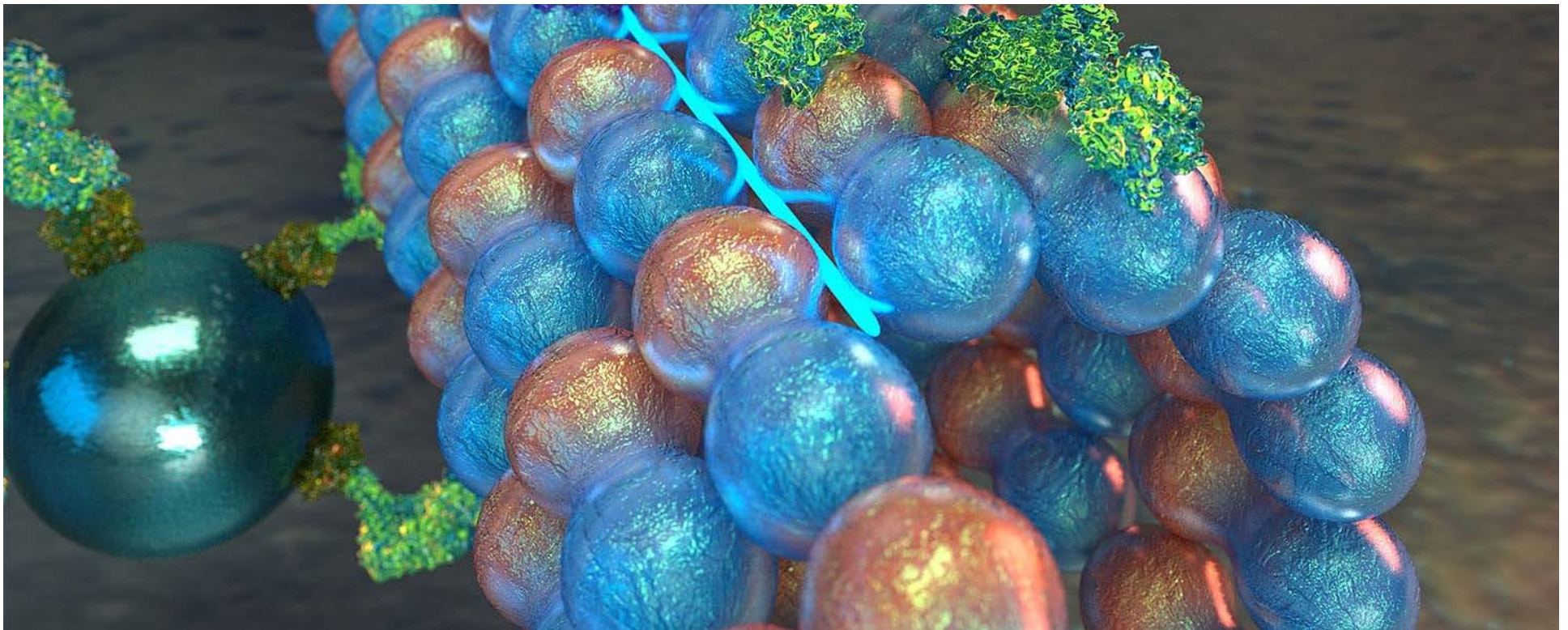


Research Reports: An overview of ME Research Areas



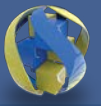


BioEngineering and Systems Biology (BESB)



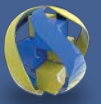
BioEngineering and Systems Biology (BESB)

- *Paul Atzberger – Biophysics, Computational Biology*
- *Matthew Begley – Bio-inspired materials, Bioadhesives*
- *Otger Campas – Morphogenesis, Cell Biophysics*
- *Robert McMeeking – Cell mechanics, Bio-inspired materials*
- *Carl Meinhart - Biosensors*
- *Igor Mezic – Biosystem dynamics, Biosensor control*
- *Jeff Moehlis - Control of neural systems, Swarming behaviors*
- *Sumita Pennathur - Biosensors*
- *Linda Petzold - Computational Biology, Cell Polarization*
- *H. Tom Soh - Biosensors, Diagnostics, Evolving molecules in vitro*
- *Kimberly Turner - Bioadhesives*
- *Megan Valentine – Molecular/cellular biomechanics, Bioadhesives*

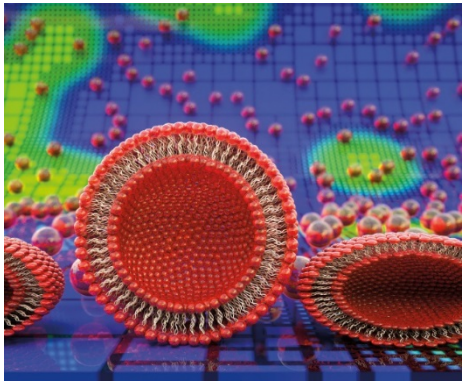


Notable Features of the BESB Program

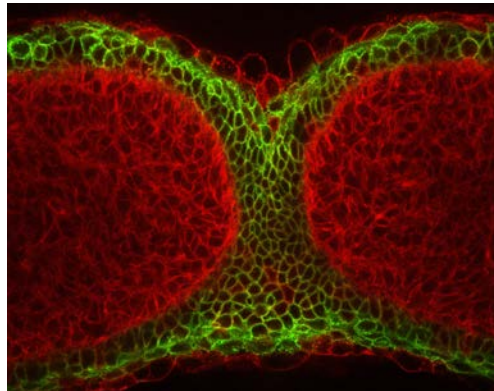
- Highly interdisciplinary, combines experiment, theory and computation, very collaborative
- Driven by fundamental discovery and applications: better materials, better diagnostics/treatments, new understanding of diseases
- Center for BioEngineering (CBE)
Campas, Pennathur, Petzold, Soh, Valentine
- Graduate Emphasis in Bioengineering
- Program for Dynamical Neuroscience (*Moehlis*)



Some Research Projects in BESB



Lipid Bilayer Mechanics



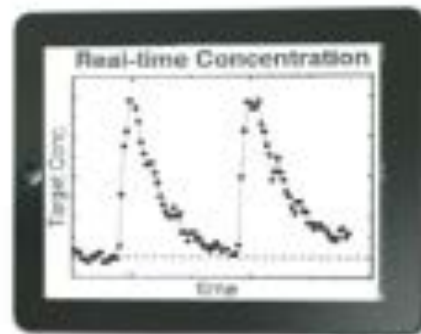
Morphogenesis



Bio-inspired
Adhesives

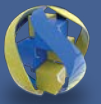


Real-time drug
monitoring in
animals

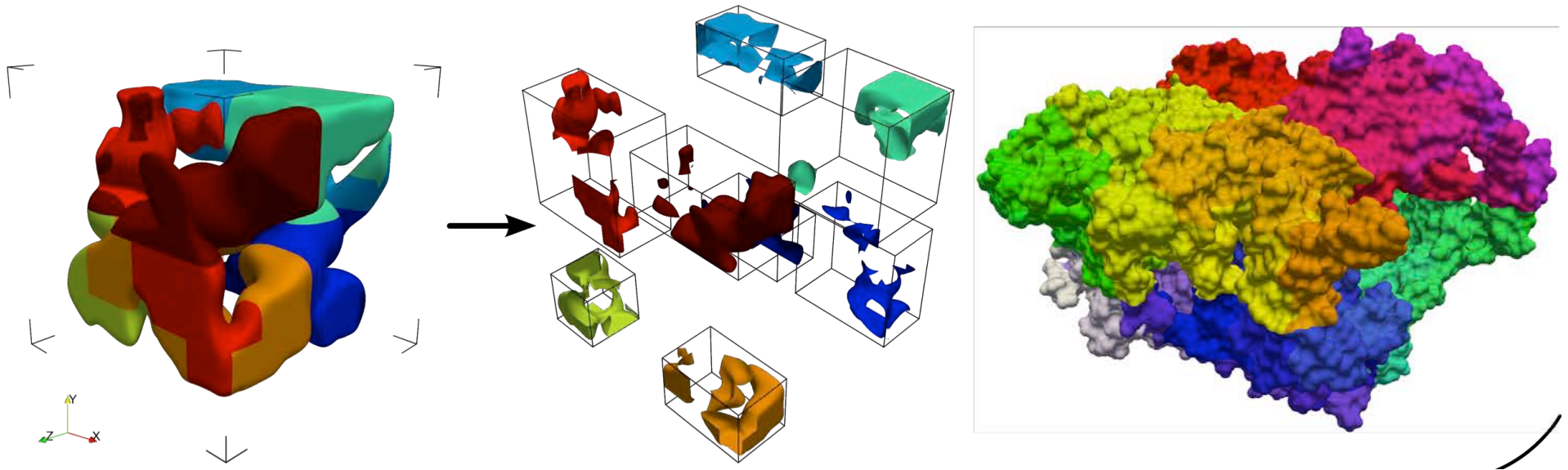


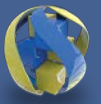
Circadian Rhythms





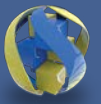
Computational Science & Engineering





Computational Science & Engineering

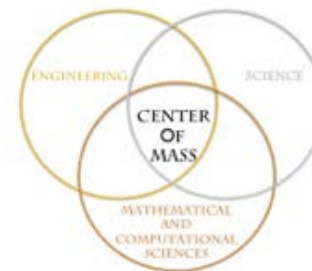
- CSE focuses on the development and application of simulation techniques for understanding outstanding problems in science and engineering.
- Faculty: Matt Begley, Frederic Gibou, Eckart Meiburg, Igor Mezic and Linda Petzold.
- Examples of research topics: multiscale modeling, high resolution simulations and parallel computing.

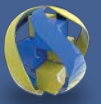


Computational Science & Engineering

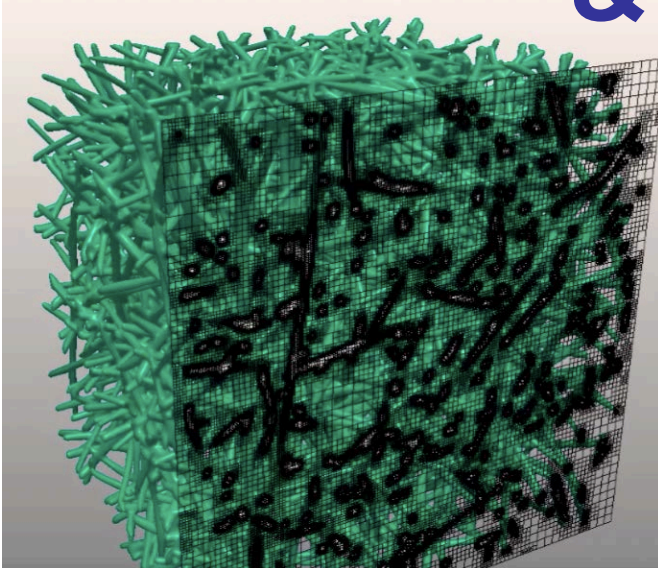
- Interdisciplinary research - Effective Research collaborations with Bio, ChemE, ECE, CS, Math, Materials, Physics, ...
- Balance between algorithm development and applications
- Core CSE course curriculum - Graduate Emphasis in CSE.
- New Center of MASS (Multiscale modeling, Analysis, Simulation and Software) regroups faculty across campus (Math, CS, Materials, ChemE, etc.)

**CENTER FOR MULTISCALE MODELING,
ANALYSIS, SIMULATION AND SOFTWARE**

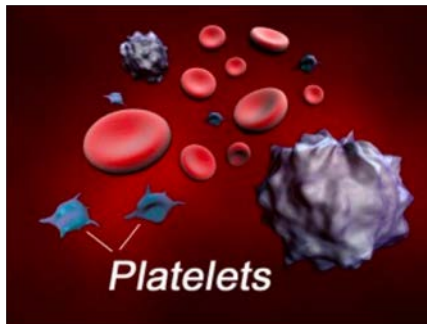




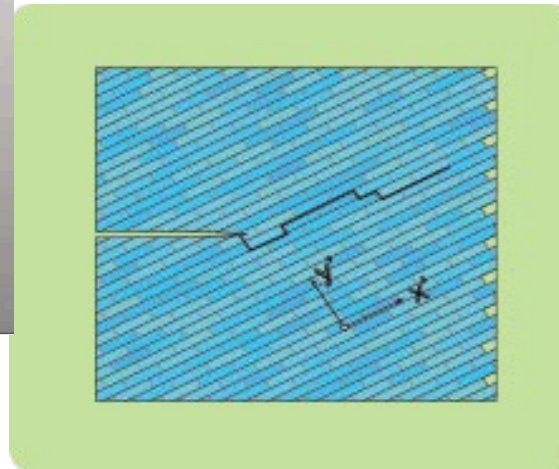
Computational Science & Engineering



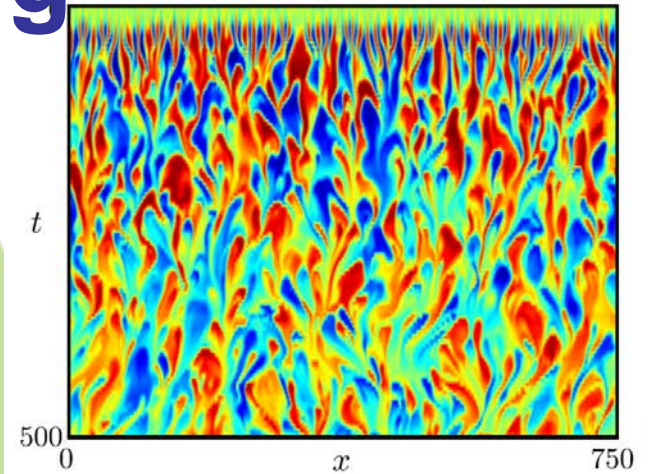
Simulations of charging porous electrodes



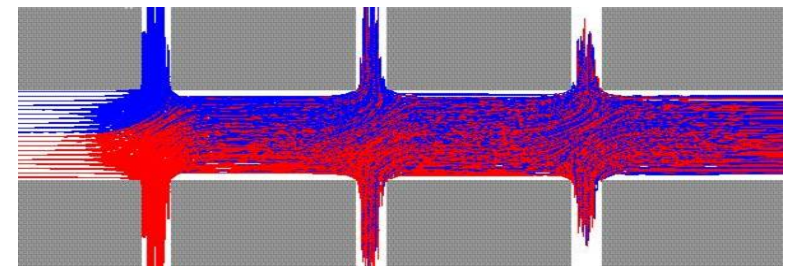
Study of coagulopathy



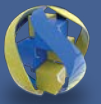
Simulations of crack dynamics



Simulation of double-diffusive sedimentation

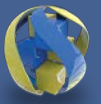


Simulations of micro-mixing



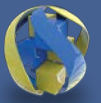
Control and Dynamical Systems (CDS)





CDS Faculty

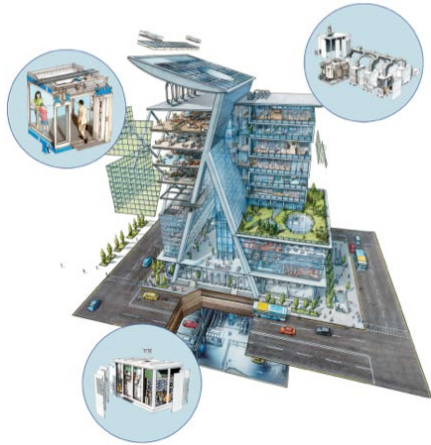
- **Bassam Bamieh** – *distributed control, networks, flow control, Stirling engines and thermoacoustics*
- **Francesco Bullo** – *motion planning/coordination, distributed & adaptive control, network science*
- **Otger Campas** – *morphogenesis and self-organization in living systems*
- **Igor Mezic** – *nonlinear dynamical systems, complex networked dynamical systems*
- **Jeff Moehlis** – *dynamical systems, fluid dynamics, neuroscience, swarming, MEMS*
- **Brad Paden** – *MEMS, artificial hearts, magnetic levitation*
- **Kimberly Turner** – *Solid mechanics, dynamics of MEMS devices, biomimetic surfaces, friction and adhesion*
- **Henry T. Yang** – *aircraft structures, structural dynamics*



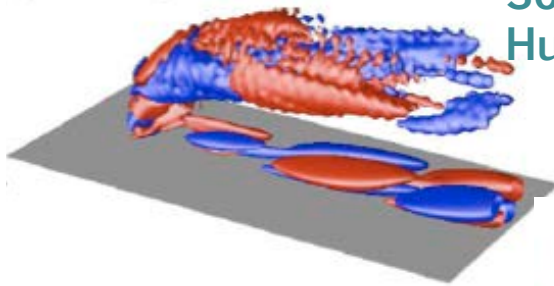
Energy and Building Efficiency

CDS

Smart Grids



Social Networks and Human-Machine Interaction



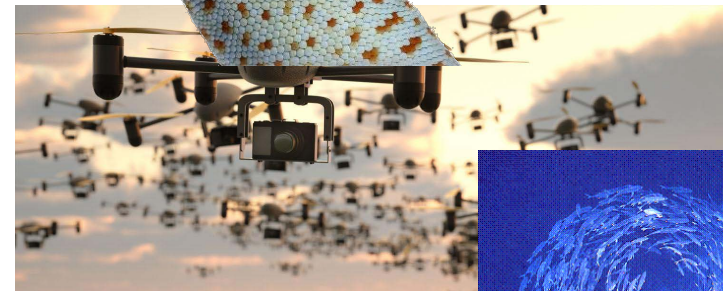
Flow Control



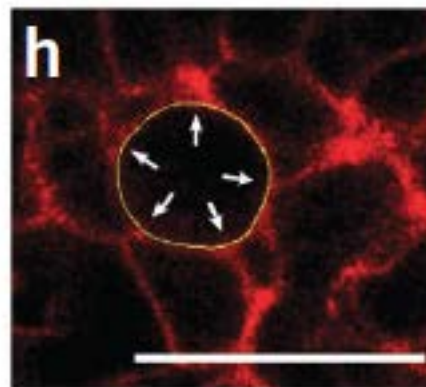
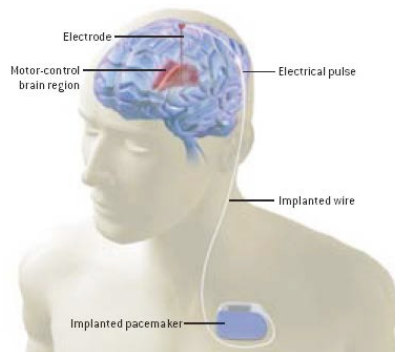
Bioinspired Adhesives and robotics



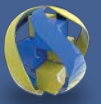
Swarming and Cooperative Control



Neuroscience



Mechanics of living tissues



CDS: Features, Family and Friends

- Fundamental rigorous methods in dynamical systems and control coupled with wide-ranging interdisciplinary applications.
- Streamlined set of courses in Dynamical Systems and Control leading to cutting-edge research in the field
- Center for Control, Dynamical Systems and Computation
- Relation with Institute for Energy Efficiency
- CCDC Seminar Series, CCDC Best PhD Award
- Industrial connections: Ford, United Technologies...
- University collaborations: Princeton, Caltech...

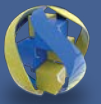


**United
Technologies**



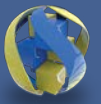
the **INSTITUTE** for
ENERGY EFFICIENCY

UC SANTA BARBARA



Solid Mechanics, Structures and Materials (SMMS)



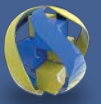


Solid Mechanics, Structures and Materials (SMMS)

- Matt Begley – Multilayered devices, coatings, MEMS
- Glenn Beltz – Fracture, stresses in optoelectronic thin films
- Otger Campas – Systems biology, self-organization of living matter
- Frederic Gibou – Multiscale computational materials science
- Keith Kedward – Composite Materials
- Carlos Levi – Advanced materials systems and processing
- Gene Lucas – Mechanical Properties
- Bob McMeeking – Solid and computational mechanics
- Bob Odette – Microstructural Processes, Deformation
- Kimberly Turner – MEMS, solid mechanics
- Megan Valentine – Biomaterials, cell mechanics
- Henry Yang – Finite element, smart structures & controls

Some Notable Features of the SMMS Program

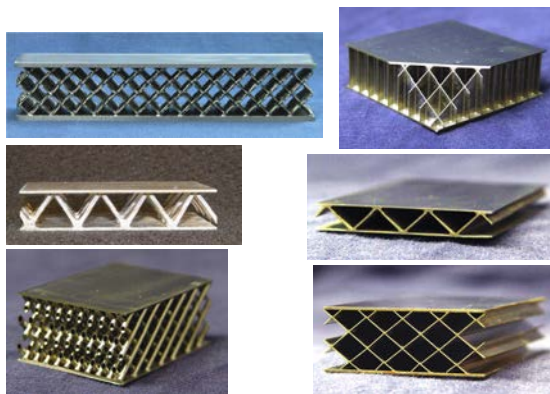
- Intellectual diversity and broad range of faculty expertise
- Cross disciplinary ties – especially with the Materials Department
- Research programs involving multiple faculty
- Balanced integrated modeling – experimental approach
- Access to world class experimental facilities
- Leadership role in a large network of national and international collaborations



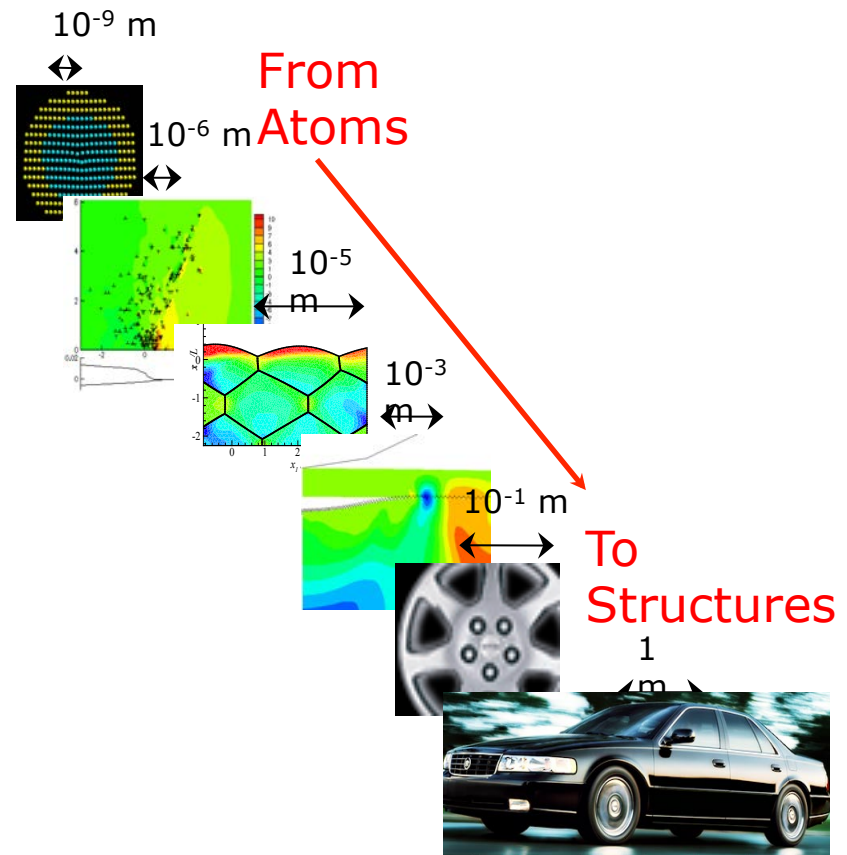
Some Research Projects in SMMS



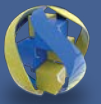
Hypersonic flight vehicles



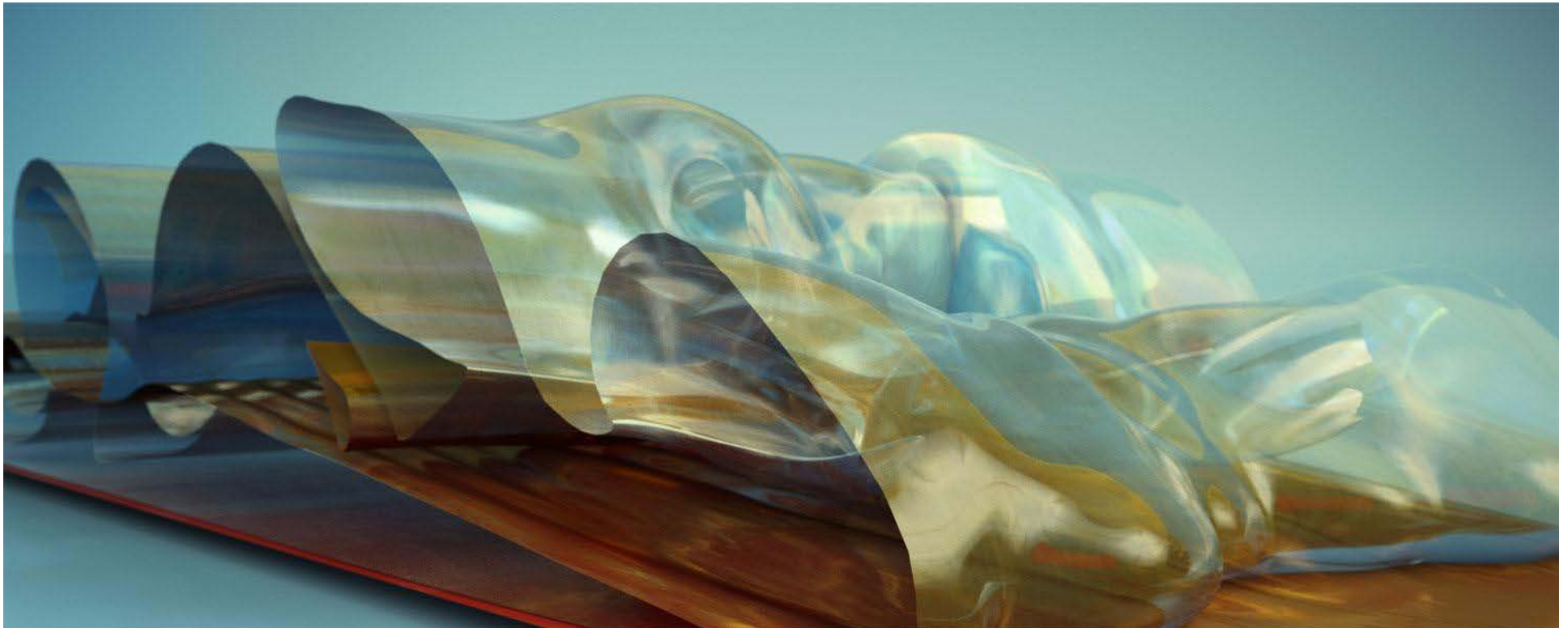
Blast-resistant
structures

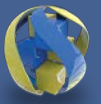


Multiscale modeling



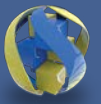
Fluids Mechanics and Thermal Sciences (FTS)





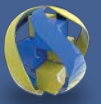
TFS Faculty

- **Ted Bennett** - *thermal processing, thermal barrier coatings*
- **Eckart Meiburg** - *computational & geophysical fluid dynamics*
- **Eric Matthys** - *polymer fluid mechanics, drag reduction*
- **Carl Meinhart** - *microfluidics*
- **Sumita Pennathur** – *electrokinetics, nanofluidics*
- **Jeff Moehlis** - *reduced order modelling of turbulence*
- **Igor Mezic** - *mixing in microgeometries, flow control*
- **Bassam Bamieh** - *transition to turbulence, flow control*
- **Frederic Gibou** – *high-resolution simulations*

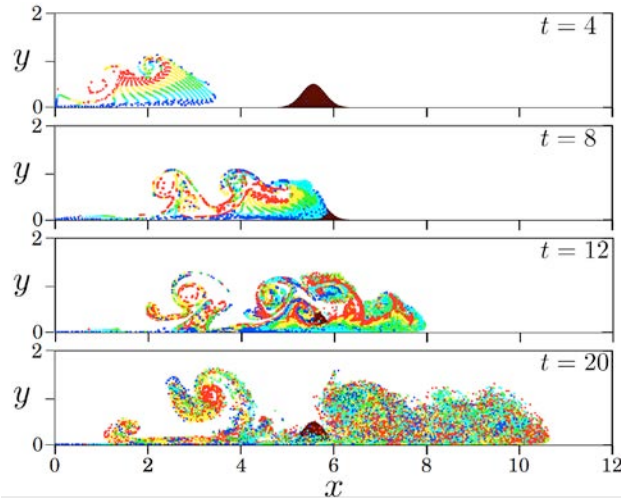


Center for Interdisciplinary Research in Fluids (CIRF)

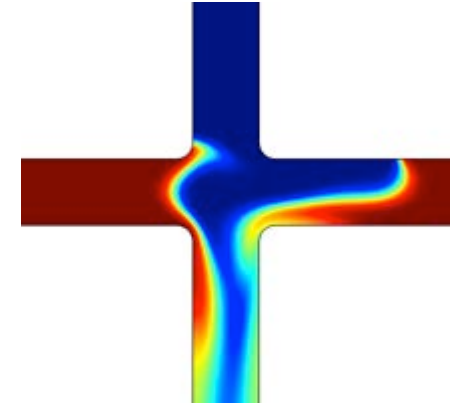
- *brings together mechanical engineers, chemical engineers, physicists, mathematicians, marine scientists, geographers...*
- *weekly interdisciplinary seminar series*
- *fundamental fluid mechanics, turbulence*
- *multiphase flows: bubbly, droplet-laden, particulate flows*
- *environmental and geophysical fluid dynamics*
- *flow control*
- *micro- and nanofluid mechanics*
- *non-Newtonian fluid dynamics*
- *theoretical and computational methods*



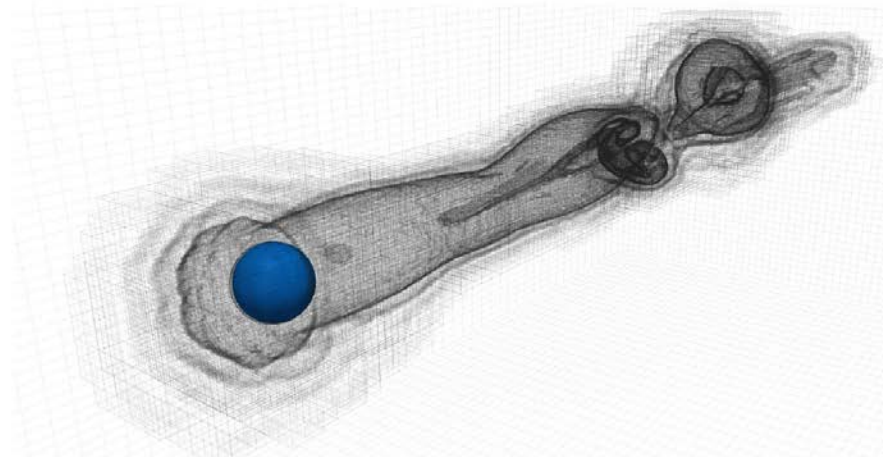
Fluid Mechanics & Thermal Sciences



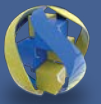
Environmental fluid mechanics



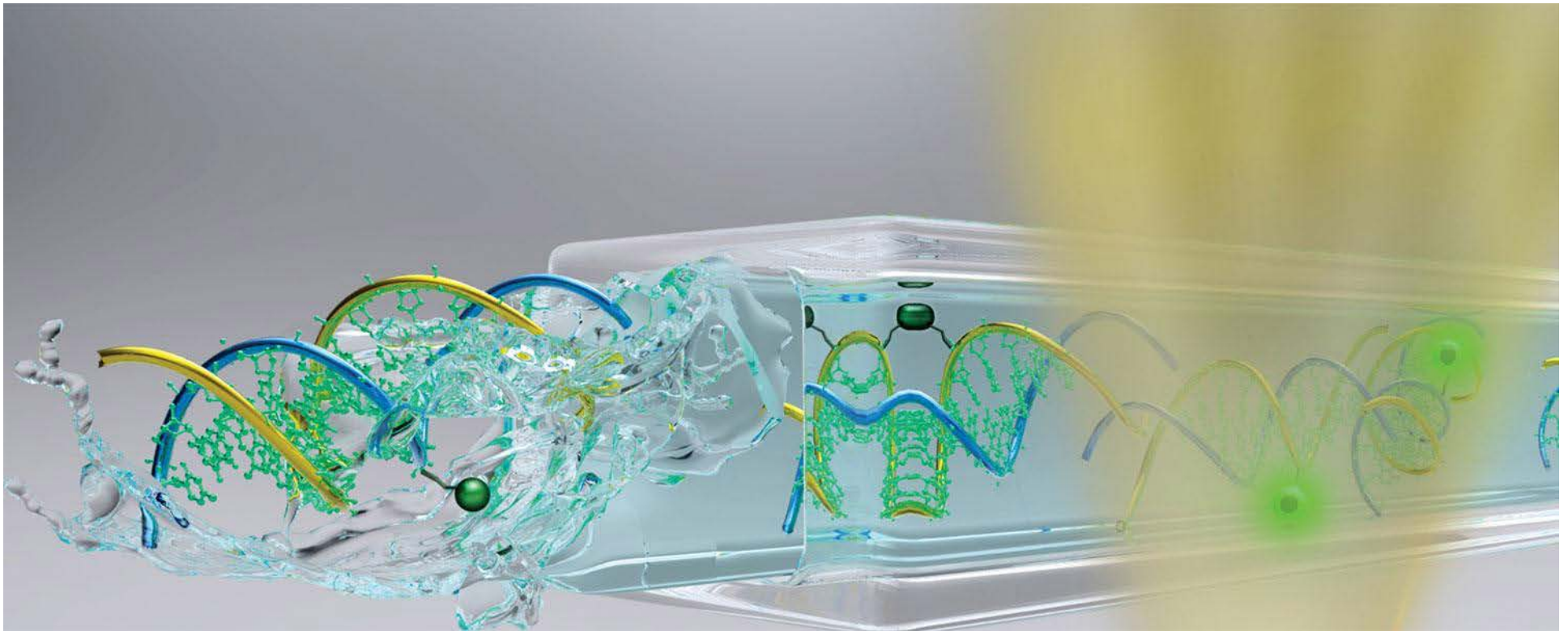
Electrokinetic injection into
nano-fluidic cross channel

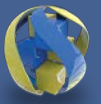


High-resolution simulation of vortex ring formation



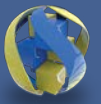
Microscale and Nanoscale Science & Engineering (MEMS)





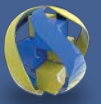
Microscale and Nanoscale Engineering (Micro/Nano)

- **Igor Mezic** – *Fluid mechanics, micromixing, DNA dynamics and bioseparations*
- **Carl Meinhardt** – *Fluid mechanics, microfluidics, molecular recognition, electrokinetics*
- **Sumita Pennathur** – *Fluid mechanics, micro- and nano-fluidics, nanoscale bioseparations, DNA fingerprinting*
- **Tom Soh** - *electrokinetic and magnetophoretic bioseparation, integrated biosensors, directed evolution, self-assembly, BioMEMS*
- **Kimberly Turner** – *Solid mechanics, dynamics of MEMS devices, biomimetic surfaces, friction and adhesion*
- **Megan Valentine** – *cell division, cellular mechanics, molecular motors*

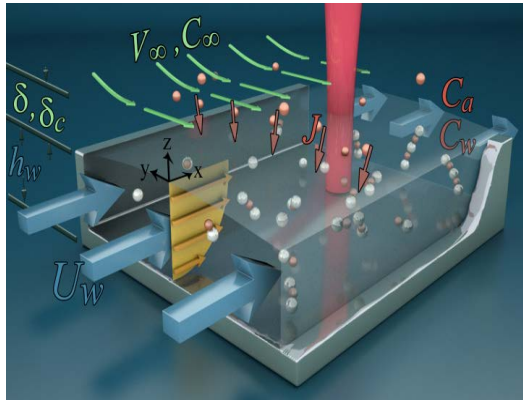


Some Notable Features of the Micro/Nano program

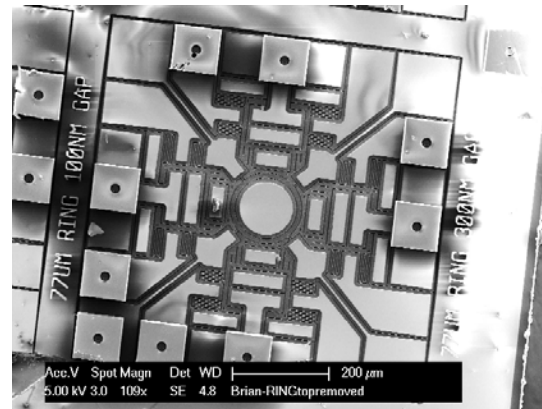
- Cutting edge interdisciplinary research programs
- **Premier micro/nano fabrication infrastructure and experimental facilities, with superb capabilities for bioengineering**
- **Multiple spin-off companies from technology developed by faculty**
- Highly collaborative research environment within UCSB and with industry
- Leadership in the international MEMS/NEMS communities
- **Leadership in UCSB and multi-university Centers (ICB, CNSI, Institute for Energy Efficiency, Center for Stem Cell Biology and Engineering)**



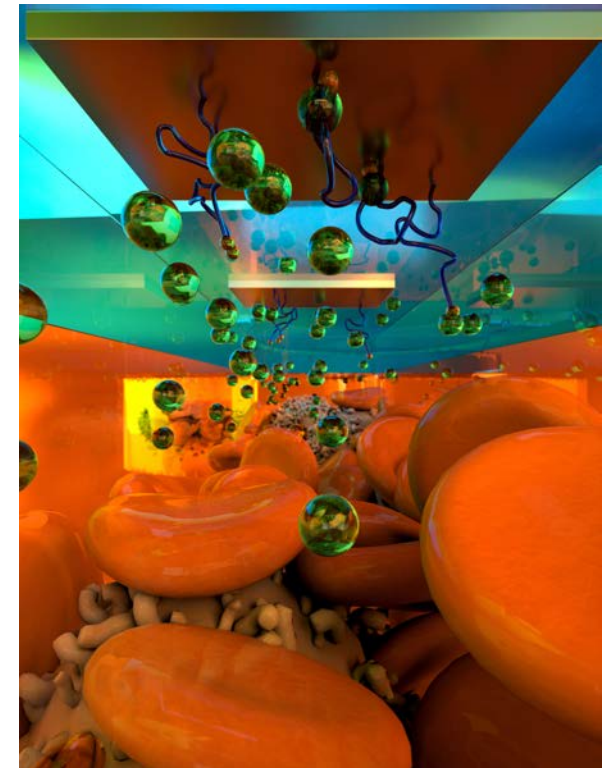
Micro/Nano



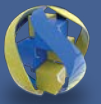
**Microfluidics
and
nanofluidics**



**Solid State
and
Inertial MEMS**



BioMEMS



Lunch and Poster Session (noon-2pm)

Capstone Project Posters

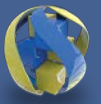
- Representative of 4 types of projects (and inclusive of 6 award winners)
 - Industry
 - Research
 - Student Organizations
 - Independent
- Thanks to Lecturer and Academic Coordinator Steve Laguette!

Research Posters

- Selection of research posters
- Six focus areas are represented

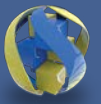
Posters about History and Opportunity

- Vision for the Innovation Lab
- Department history



History Session

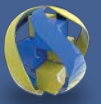
- i. Department History by *John Bruch, Gene Lucas, Bob Odette and Kimberly Turner*
- ii. Student Perspectives by *Dave Messner, Greg Dahlen, Nora Dakessian, and special guests*



Keynote Presentations

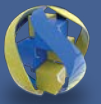
“Alumni Perspectives on ME Careers”

- Keynote Speaker: *Mihailo Jovanovic*, Professor, University of Minnesota
- Keynote Speaker: *Kevin Ness*, Founder & CTO, 10X Technologies, Pleasanton, CA
- Keynote Speaker: *Stephen Neushul*, Founder & CEO, iCRco, Goleta, CA



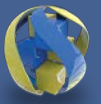
ME Distinguished Alumni Award

- Program to Recognize Mechanical Engineering Alumni
 - Made exemplary contributions in their professional field
 - Distinguished themselves for dedicated service and leadership
- Nomination Process (Annual)
 - Submitted by : Alumni, Faculty, Staff and Industrial Advisory Board
 - 1-page bio-sketch and a paragraph with nomination rationale
 - Nominations will be retained for future years
- Selection Process
 - ME Awards Committee: Faculty, Industrial Advisory Board and previous awardees
- Award Ceremony
 - In conjunction with Department's Convocation Event
 - Annually in early October



ME Distinguished Alumni Award Inaugural Class

- Prof. Mihailo Jovanovic (University of Minnesota)
 - In recognition for outstanding scientific contributions to fluid dynamics, control and optimization
- Dr. Kevin Ness (10x Technologies)
 - In recognition for outstanding contributions to microfluidics and PCR
- Mr. Stephen Neushul (iCRco)
 - In recognition for outstanding contributions to non-destructive testing and for the development of X-ray scanning systems

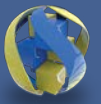


Concluding Remarks

Outline

- A short history of the ME Department
- Who we are today
 - Overview
 - Teaching Themes
 - Research Reports
- **Where we are going**





ME Stakeholders: Thank you!

All Stakeholders over last 50 years

- Students
- Staff
- Faculty
- Alumni
- Industrial Advisory Board
- Friends, Supporters and Donors



Capstone Design Supporters: Thank you!

Implantech

PDT



NORTHROP GRUMMAN
DEFINING THE FUTURE

LCOGT.net



inogen

SPECTRAFLUIDICS, INC.
ADVANCED CHEMICAL DETECTION SYSTEMS

**Lawrence Livermore
National Laboratory**



LAUNCHPOINT

Clipper



NUVASIVE
Creative Spine Technology®

BEI
INDUSTRIAL ENCODERS

TRIKKE

Medtronic

msi
Marine Science Institute



SE-IR Corporation



AVS
Advanced Vision Science, Inc.
A Clear Vision For Life Sciences

ATK
ATK SPACE SYSTEMS

FLIR



RENCO

**Boston
Scientific**

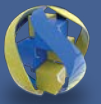
**ARTISAN
VEHICLE SYSTEMS**

Raytheon



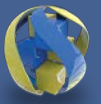
ASC APPLIED SILICONE
CORPORATION

CONMED
LINVATEC



Event Organizers: Thank you!

- Organizers:
 - Shawnee Oren: logistics
 - Jesi Vasquez: logistics
 - Deanna Hearth: logistics
 - Dave Bothman: historical data and posters
 - John Lofthus: alumni contacts
 - Brandon Mowery: planning
 - Bassam Bamieh: planning
 - Carl Meinhart: planning
 - Bob Odette: history session

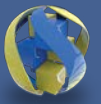


Keep in touch with us!

How you can help us:

- i. For our students: need internships and jobs --- hire Gauchos! Cultivate talent and work with young Engineers!
- ii. For our classes: guest lecturers, mentors, lecturers --- we need your Engineering talent, experience and enthusiasm!
- iii. For our Capstone Design Project: ideas, technical supervision, graders, equipment and financial support
- iv. For our research: partners for proposals (NSF, NASA, DoD)
- v. Send in nominations for Distinguished Alumnus Award

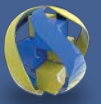
To follow up, please email chairasst-me@engineering.ucsb.edu, connect to our linkedin group + be a member of UCSB Alumni Assoc.



Future Initiatives and Priorities

We ask for your engagement and private support to help us achieve our three missions over the next 20 years:

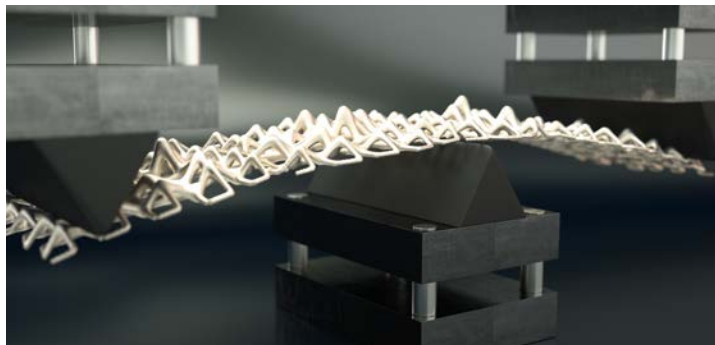
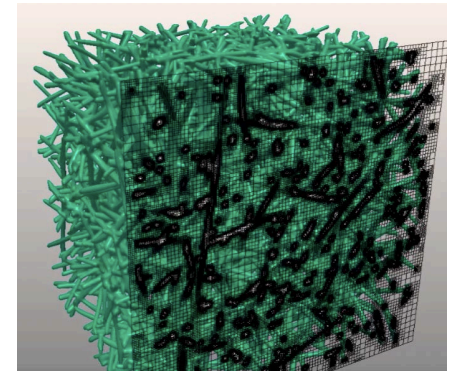
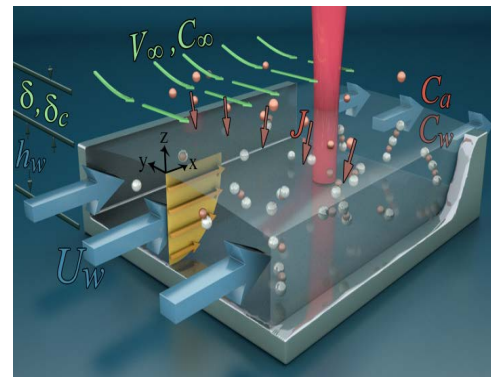
- Research
- Education
- Public Service

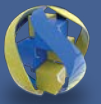


Research Priority

Goal: Help us envision what research areas will define ME in 20 years and help ME@UCSB lead in these areas

Means: endowed student and postdoc fellowships, or endowed chairs

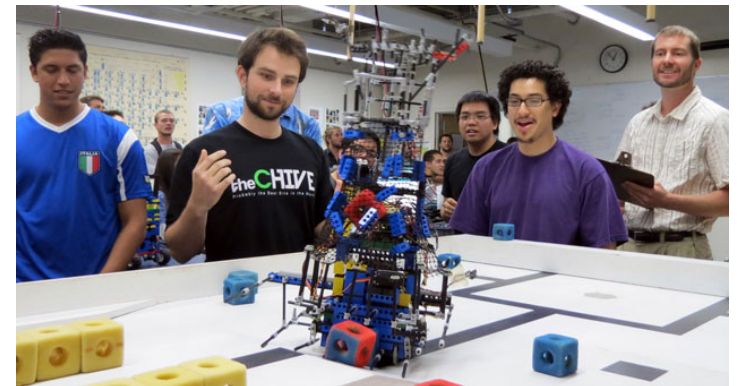




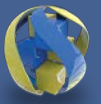
Education Priority: ME Innovation Lab

Goal: Help us imagine and develop a state-of-the-art *Design and Innovation Lab* for future ME, interdisciplinary and entrepreneurial projects

Means: (phase 1) help us improve our current labs, and (phase 2) help us fund a new space to house our future state-of-the-art Lab



(Gina Potthoff / Noozhawk photo)



Public Service Priority

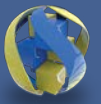
Goal: Help us envision and develop outreach activities and collaborations with our stakeholders and the community

Means:

- i. Collaborations with local schools
 - Robotics competitions
 - Dos Pueblos Engineering Academy
- ii. International partnerships (Engineers without Borders)
- iii. Remote/online learning for local industry and alumni



Sorghum Press Project, EWB Capstone 2012



UC Santa Barbara Mechanical Engineering Top Ten



Unique location: healthy lifestyle near ocean and mountains, extensive cultural offerings, great weather!

10. Outstanding students, faculty, and staff
9. State-of-the-art laboratories and computing facilities
8. Prominent research centers with stimulating seminars and workshops
7. Thriving student organizations and student life
6. Proud tradition of successful students' placement
5. Multiple student awards and fellowships
4. Brand new 5-year Combined BS/MS, to complement our competitive degrees
3. Creation and involvement with exciting start-ups
2. Deep long-term commitment to interdisciplinary research and teaching
1. **Outstanding alumni network and local ME professional community**