Welcome CAP Executive Board

UC San Diego
Jacobs School of Engineering

June 5, 2014

CAP Leadership 2013 - 2014

CAP Chairman:

Rich Goldberg

VP Corporate Quality, Cisco

CAP Vice Chairman:

Mark Ambrose

San Diego Site Executive, Raytheon

Welcome New CAP Members!

CPC Strategy

Fuji Electric

Welcome Distinguished Students

Triton Engineering Student Council
(TESC)

Triton Rocket Club
(TRC)

Human-Powered Submarine Team

UCSD Jacobs | TESC

Triton Engineering Student Council

Congratulation Incoming President
James Natanauan, Computer Engineering ‘15

Thank You Outgoing President
Pooja Makhijani, BioEng ’14

Dean's Report

Albert P. Pisano
Dean

Jacobs School 2020 Strategic Vision

- **Joint Institutes**
  - Education/research collaborations with campus partners
  - Faculty cluster hires build UC San Diego strength in unique strategic themes

- **Agile Research Centers**
  - Jacobs School faculty/industry research partnerships
  - Leverage federal investment with applied research

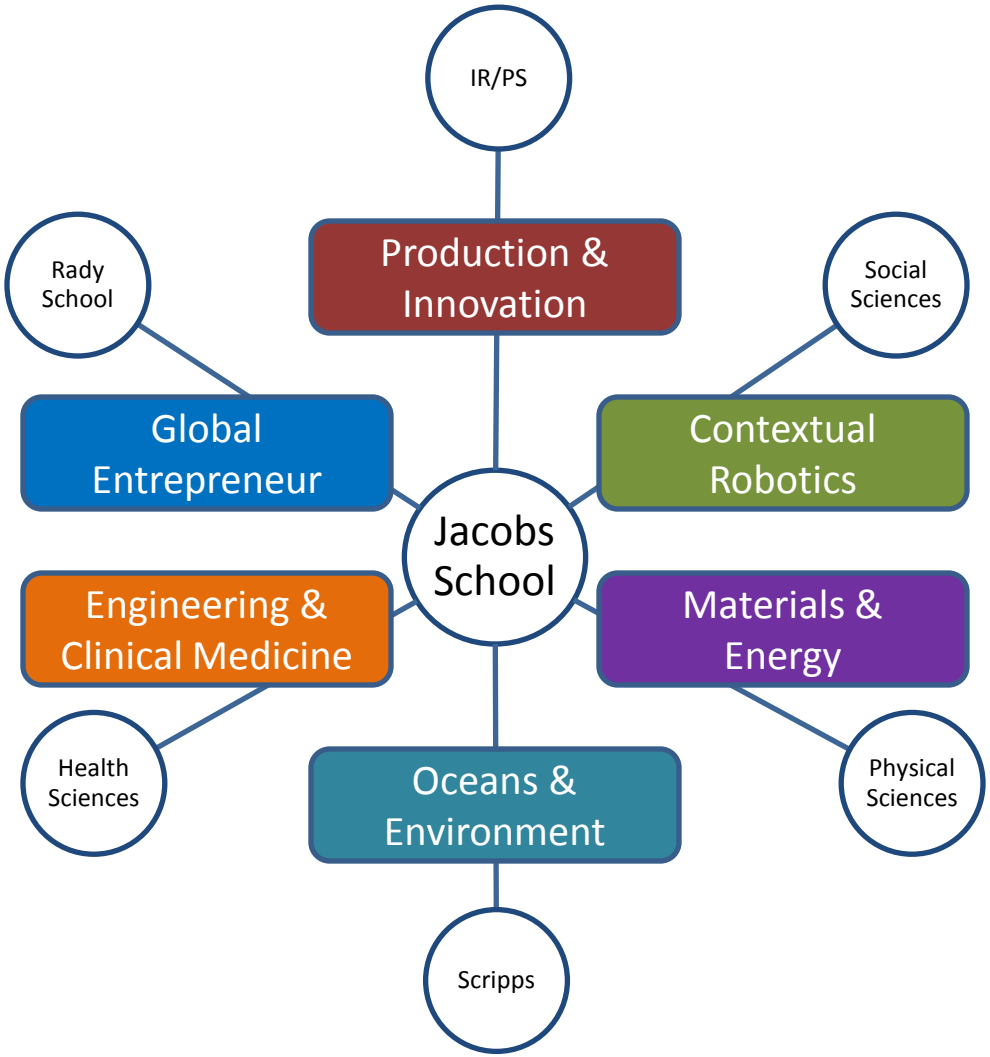
- **Experience Engineering**
  - Design-build-test project courses, beginning in freshman year
  - Inspire students and enhance career preparation

Overarching Values

- **Engineering for the Global Good**

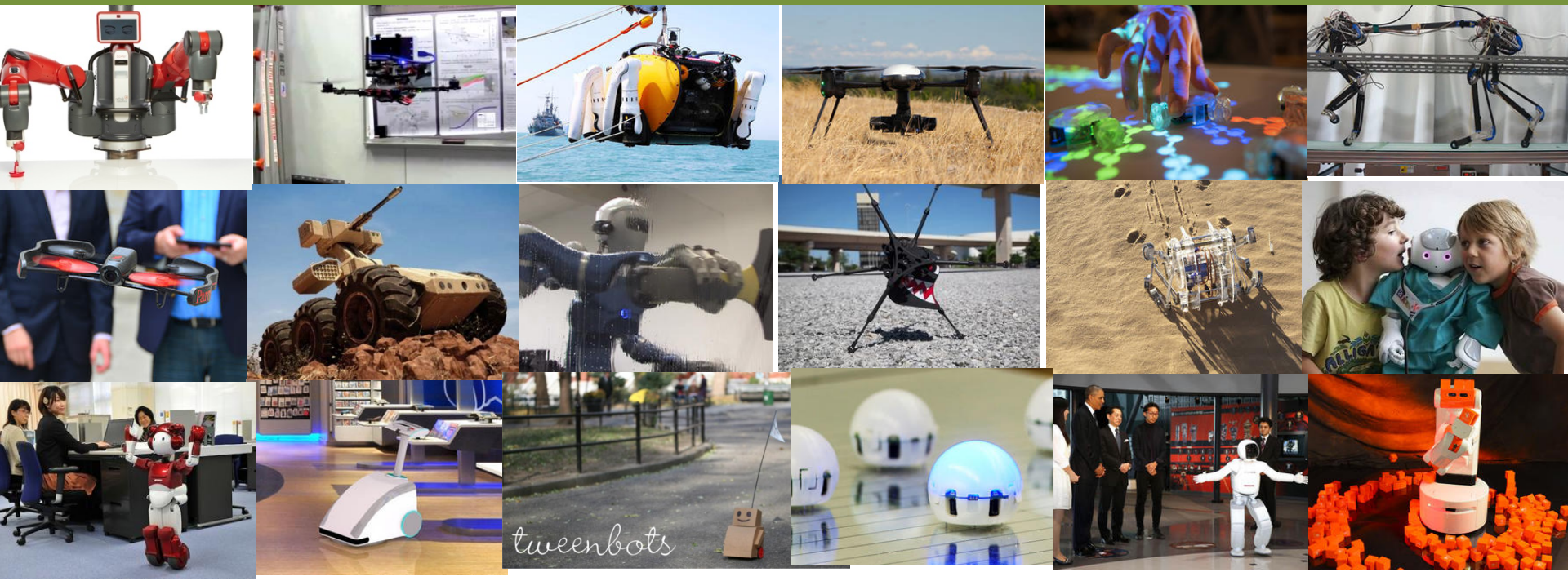
- **Exponential Impact through Entrepreneurism**

Joint Institutes: Build on Unique Strengths with Campus Partners



UC San Diego Contextual Robotics Systems

Workshop - Friday, October 10th 2014



Featured Speakers:

Chancellor Pradeep Khosla, UC San Diego

Vijay Kumar, Assistant Director, Robotics and Cyber-Physical Systems
White House Office of Science and Technology Policy

Matt Grob, Chief Technology Officer, Qualcomm

Agile Research Centers
Technology Enabled. Applications Driven.

- Wearable Sensors
- Extreme Events
- Unmanned Systems
- Extreme Engineering
- Disaster Mitigating Infrastructure
- …….

Value Proposition to Companies

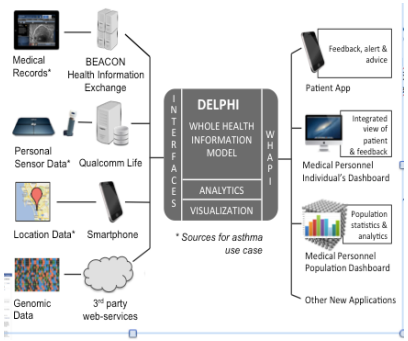
- Pipeline to student talent
- Access to multidisciplinary innovation
- Branding corporate commitment to the field

Center for Wearable Sensors

- **Center Goal:** Develop the world's first "lab on the body" with continuous preventative sensing, using remote monitoring, wireless data transfer, and cloud storage and analytics to provide real time feedback.

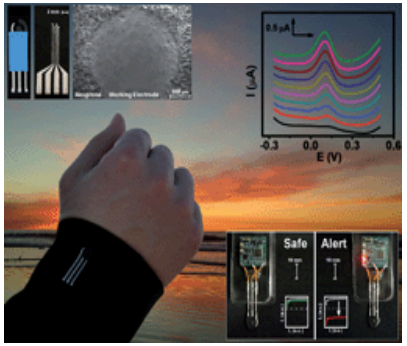
- Converges expertise in bioengineering, biomedicine, materials, and sensors and wireless network technologies.

Healthcare



Fitness

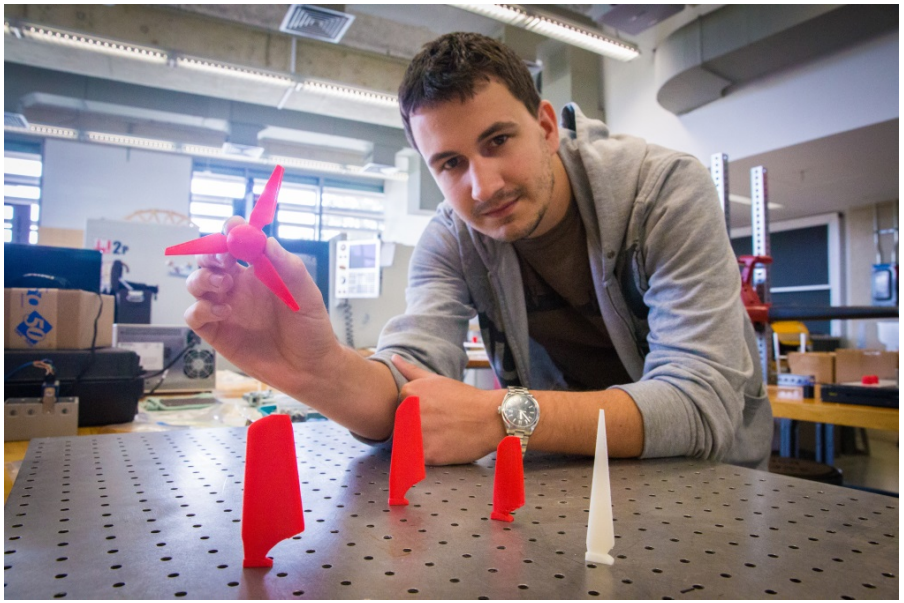
Security/Forensics



Entertainment/Lifestyle

Experience Engineering Initiative

Design-Build-Test Courses, *beginning in Freshman Year*



Structural Engineering 120–Computer Aided Design & Manufacturing

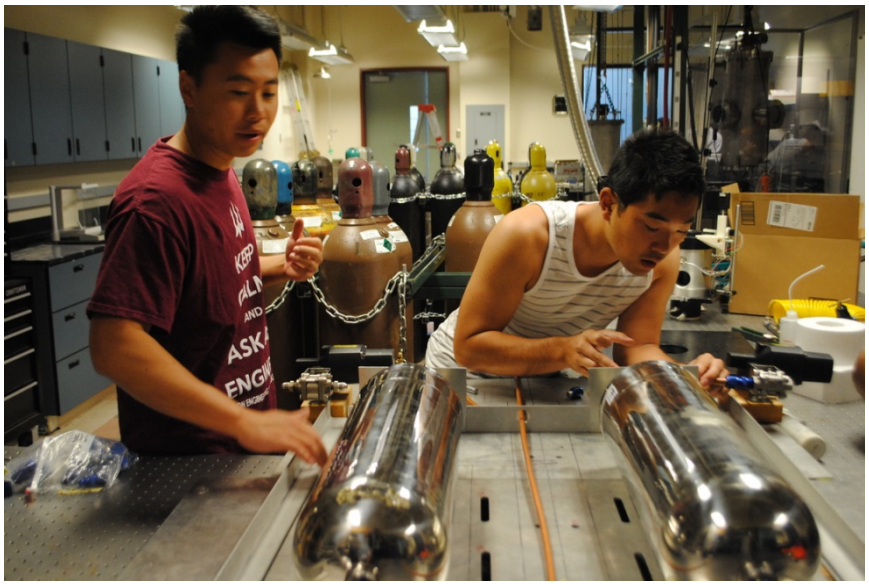
Wind Turbine Project

Students design, model and produce prototypes through 3D printing

Then test performance in wind tunnel and simulated earthquake

Maker Lab (Proposed)

- Rapid Prototyping and Test Equipment
- Freshman and Sophomore Design-Build-Test Courses
- Student Design Competitions
- Prototype Development for Entrepreneurs



Jacobs School 2020 Plan by the Numbers

	2013	2020
Faculty	200	250
Undergraduates	6,500	5,000
Ugrad/Faculty	32:1	20:1
Masters & Ph.D.	1,715	2,500
Graduate/Faculty	8.5:1	10:1

T SENSORS SUMMIT™ FOR TRILLION SENSOR ROADMAP

Ultrahigh volume sensor applications and markets for the coming decade

BIOTECHNOLOGY | BIOINFORMATICS | MEDICINE | NANOMATERIALS | NANOTECHNOLOGY | NETWORKS | DIGITAL MANUFACTURING | INFINITE COMPUTING | COMPUTATIONAL SYSTEMS | ARTIFICIAL INTELLIGENCE | ROBOTICS

UC San Diego
Jacobs School of Engineering

www.tsensorssummit.org

Corporate Affiliates Program

Questions?

Comments?

Faculty Presentation

Professor Jiun-Shyan (J.S.) Chen

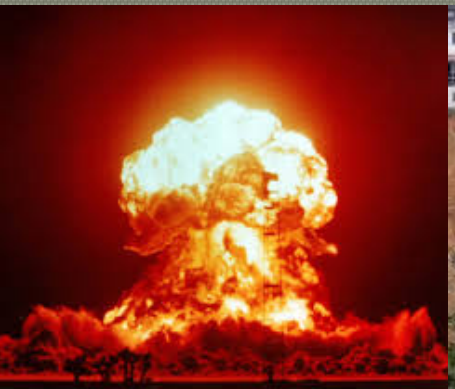
William Prager Chair, Structural Engineering

Center for Extreme Events Research

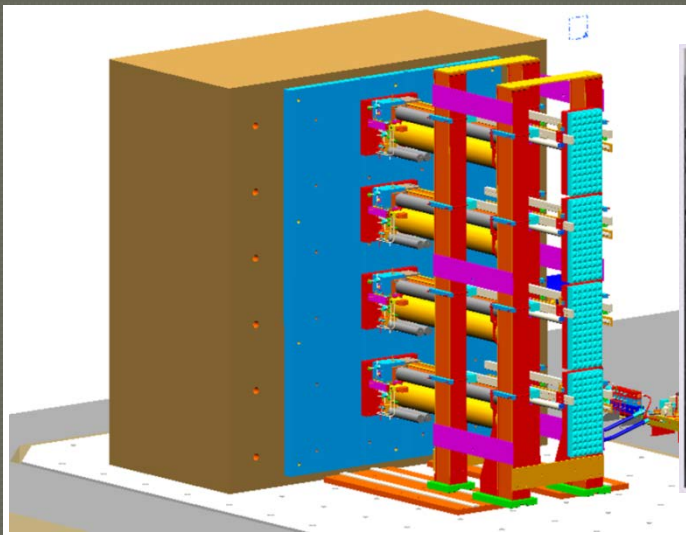
(CEER)

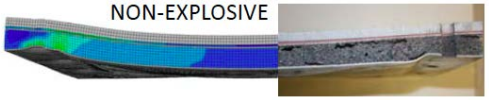
Introduction to Center for Extreme Events Research (CEER)

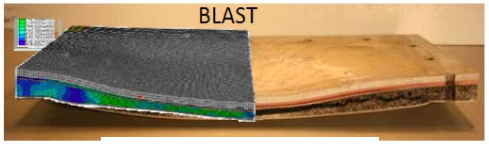
Director: J. S. Chen
Associate Directors: Gilbert Hegemier, Yuri Bazilevs

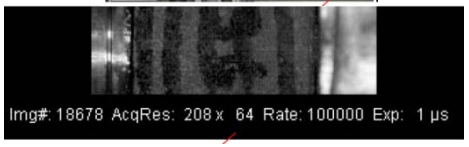


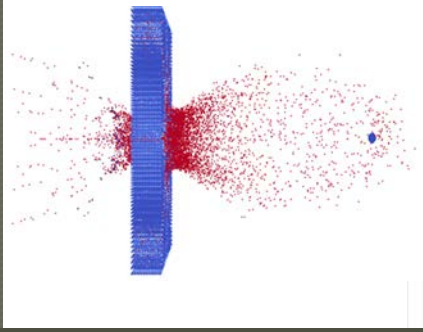

CEER Overview

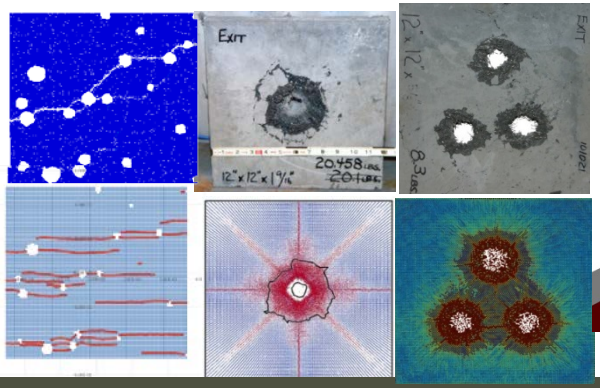


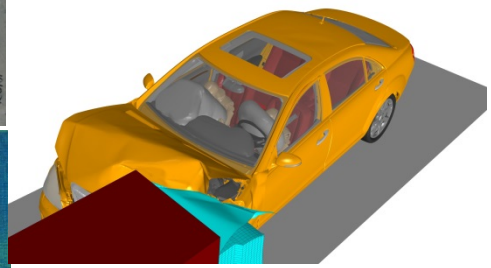


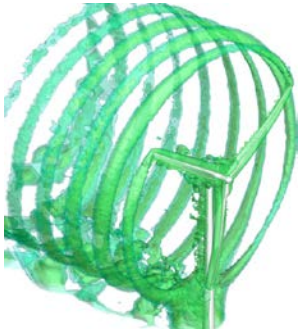




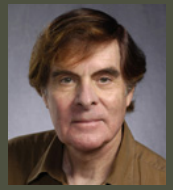


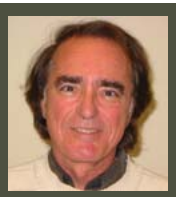






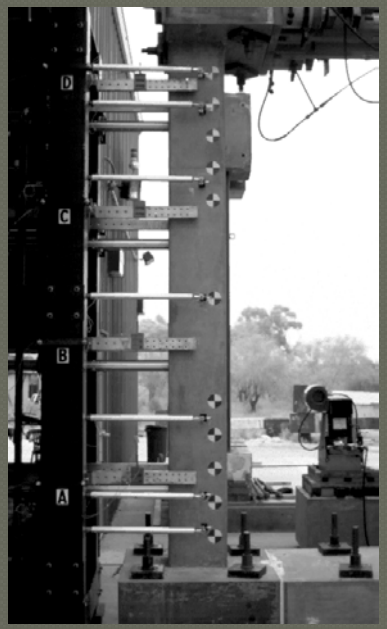
Founding members





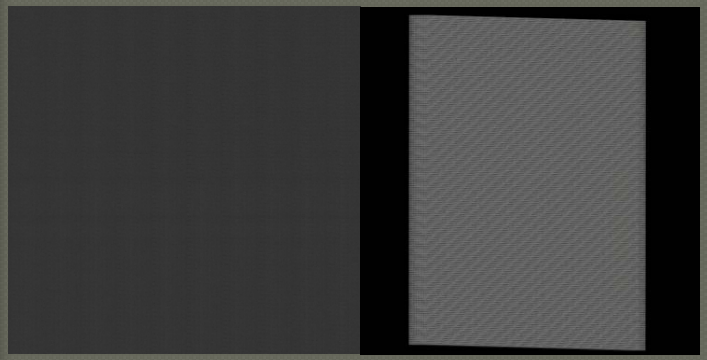
ceer

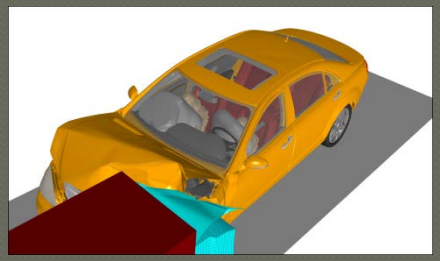
CEER Capabilities

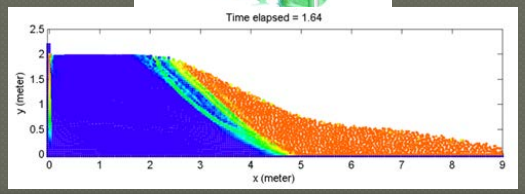


- The CEER's Blast Simulator is the first of its kind in the world, situated at UCSD's Englekirk Structural Engineering Center of the Charles Lee Powell Laboratories. The UCSD blast facility is unique due to the capability of the blast simulator with its six blast generators, its wide range of simulated blast load parameters, and the large number of possible test set-up configurations.
- The CEER's Impact Testing Facilities include a 79 mm gas gun (250 m/s) and a 25 mm gas gun (over 1000 m/s) for research on impact effects on composite materials and aerospace structures, composite structures subjected to penetration and high velocity impacts, and a Split-Hopkinson pressure bar for measuring pressure wave propagation under various impact loading conditions.

CEER Capabilities (cont.)







The unique computational capabilities for Penetration, Fragmentation, and Shock Modeling developed at CEER have been successfully applied to various fragment-impact modeling of high velocity impact and penetration processes, vehicle crash simulation, landslide modeling, homeland security applications and other extreme events simulations.

- The Meshfree Method and Isogeometric Analysis developed at CEER are new frontiers in computational science and engineering, which allow multi-scale, multi-physics investigation of damage and failure processes in infrastructure as well as damage to the human brain and body due to considerable mobility and shocks, in a wide range of extreme events such as manmade disasters, car crashes, sports injuries, among others.

CEER Missions

- **Extreme event protection:** to provide damage assessment of infrastructure and bio-systems subjected to extreme events for effective protection and vulnerability reduction.
- **Extreme event mitigation and recovery:** to provide fast estimation of damage and vulnerability to first responders after extreme events for disaster mitigation and recovery.

CEER Members (tentative)

- Structural Engineering

  Robert Asaro, Yuri Bazilevs, David Benson, Chiara Bisagni, J. S. Chen, Patrick Fox, Gilbert Hegemier, Hyonny Kim
- Mechanical and Aerospace Engineering

  Albert Pisano, Alison Marsden, Sutanu Sarkar, Vitali Nesterenko
- Radiology

  Shantanu Sinha
- Mathematics

  Randolph Bank, Li-Tien Cheng, Michael Holst
- San Diego Supercomputer Center

  Amitava Majumdar, Mahidar Tatineni

CEER Partners (tentative)

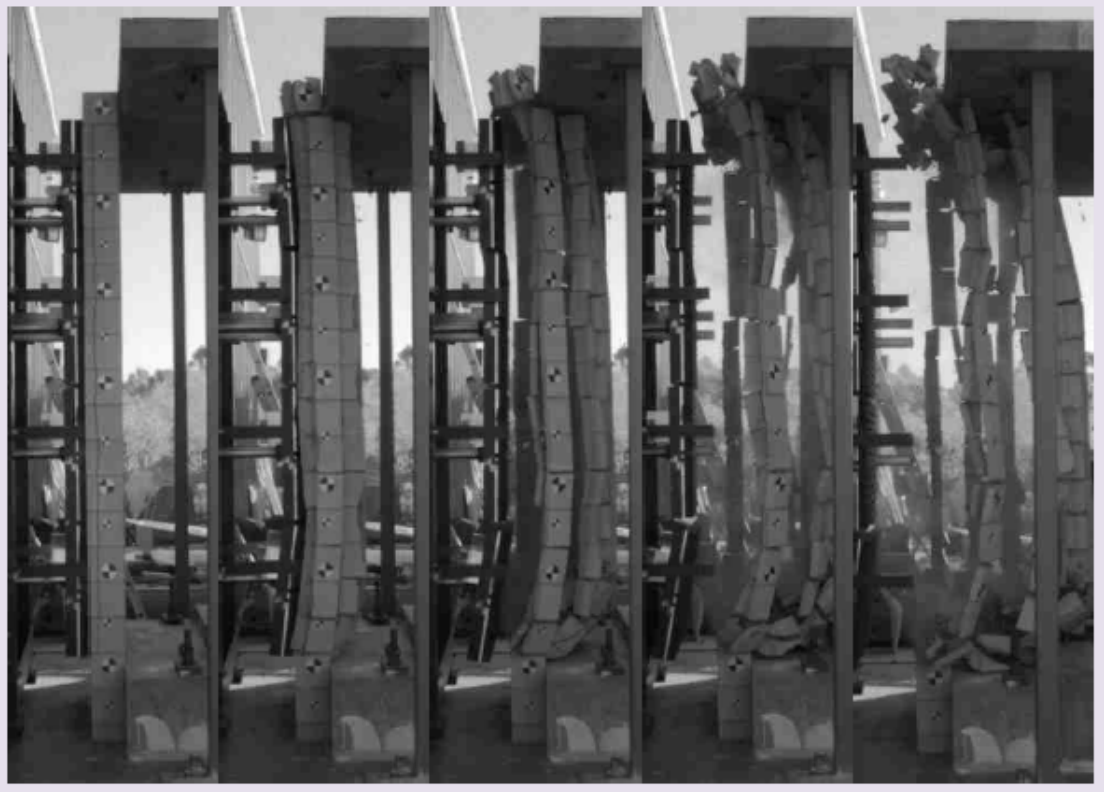
- Government Agencies
  - U.S. Army Engineer Research & Development Center
  - Sandia National Laboratories
  - Lawrence Livermore National Laboratory
  - Combating Terrorism Technical Support Office
- Industries
  - Karagozian & Case
  - Weidlinger Associates
  - Leidos (formerly SAIC)
  - Applied Research Associates
- Universities
  - California Institute of Technology
  - Georgia Institute of Technology
  - Purdue University
  - Northwestern University
  - Energetic Materials Research and Testing Center of New Mexico Tech

Current Funding Agencies

Blast Simulator

- The blast simulator was commissioned in 2004.
- It simulates full scale explosive loads up to 12,000 psi-msec in 2 to 4 ms.
- Impact load can be seen and recorded with high speed (5000-10,000 frames per second) Phantom cameras
- The simulator was initially designed and constructed as part of the Explosive Loading Laboratory Testing Program funded by the Technical Support Working Group (TSWG).
- Blast simulator research is funded by various DOD agencies including TSWG, ONR, AFRL at Eglin AFB, and the Navy as well as defense contractors Simpson Gumpertz and Heger, Inc. (SGH) and Protective Technologies Group (PTG).

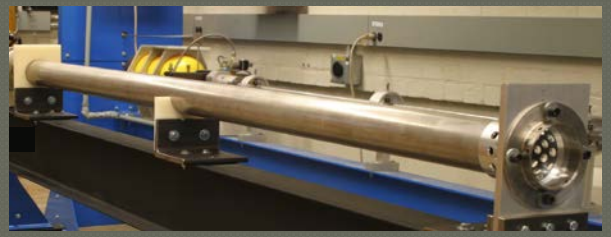
Unreinforced Masonry Wall under Blast Load

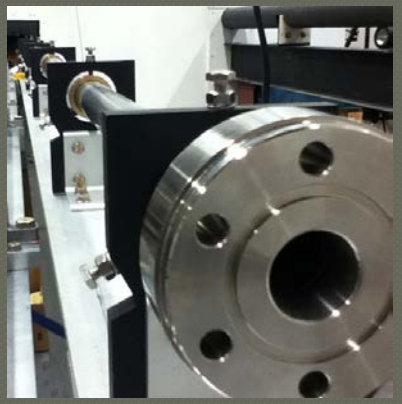


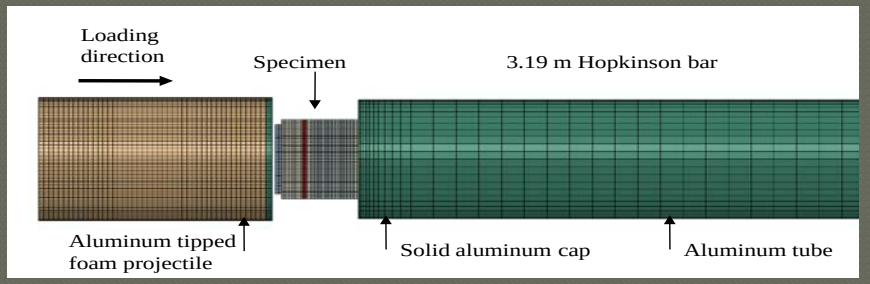
Unreinforced masonry (URM) wall at 5, 35, 65, 95, and 125 msec after 150 psi-msec blast simulator impact. Structural response progression captured by high speed (up to 10,000 fps) Phantom cameras.

Impact Testing Facility

- Gas guns – for projectile impact and penetration research
  - 79 mm bore gun – max vel. 250 m/s
  - 25.4 mm bore gun w/6.7 m (22 ft.) barrel – expected max vel. 1000-2000 m/s
  - source of high-speed dynamic loading
    - launch flyer plate and other projectiles
    - impact onto specimens mounted to Hopkinson bar
- Hopkinson bars
  - 76.2 mm dia. x 3.2 m length (126 in.)
  - SHPB: 25.4 mm dia. x 1.27 m length (50.5 in.)
  - use for studying projectile properties and developing models

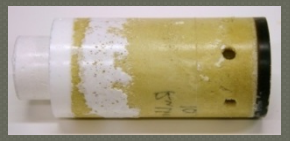






Dynamic Load Pulse Generation

- Fast-rate loading to excite dynamic response
  - Similar to explosive blast loading
- Use impact to impart desired impulse/ momentum
- Match total impulse and tune loading history via:
  - Projectile mass and geometry
  - Velocity
  - Pulse shaping media



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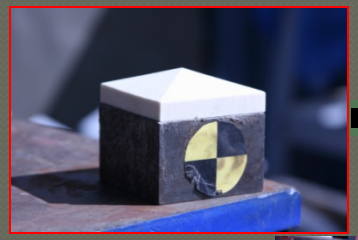
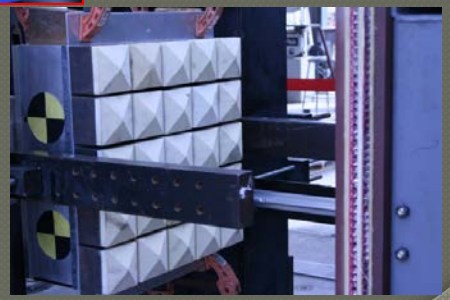
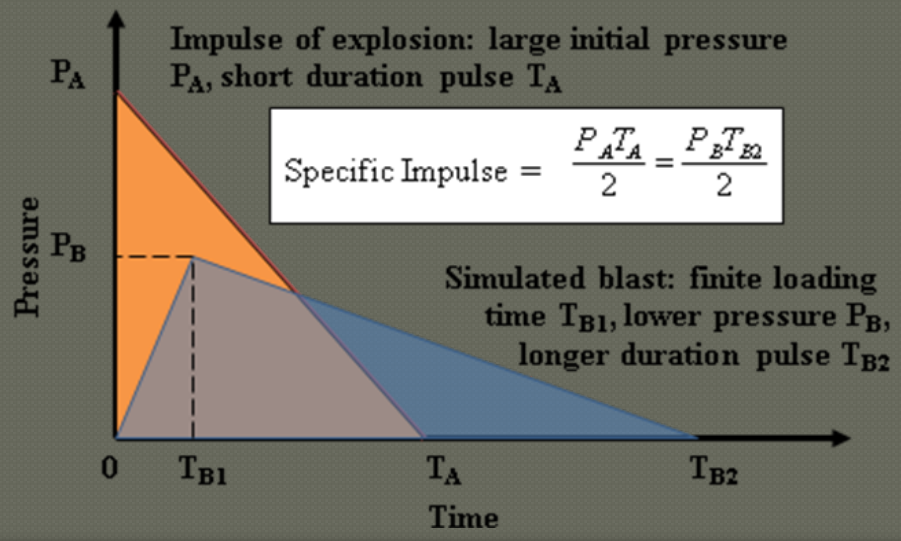
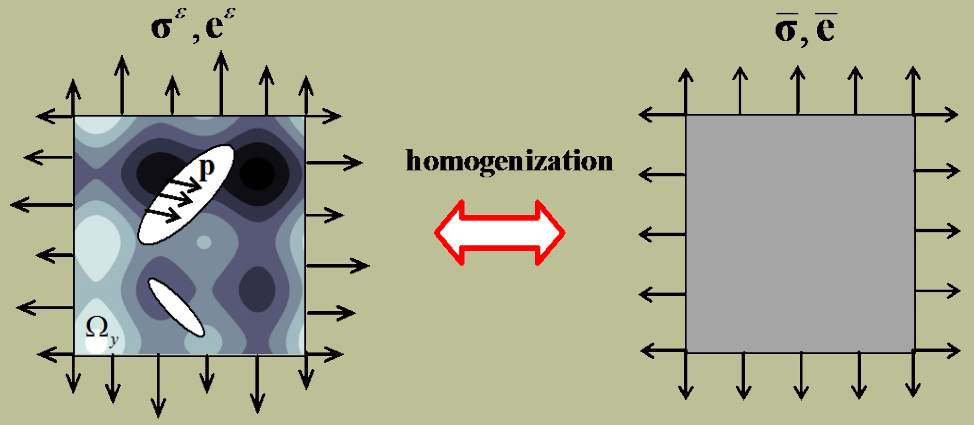


Scalable

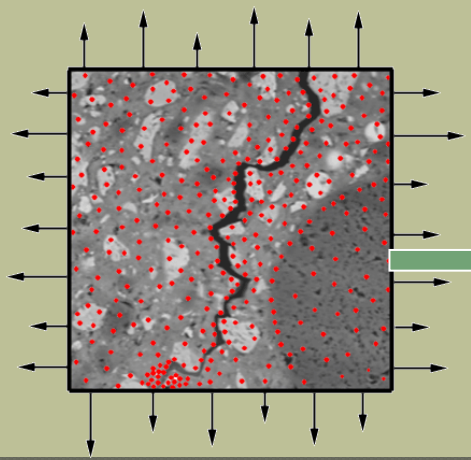


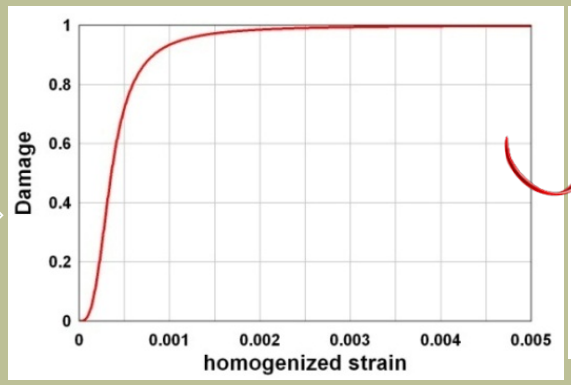


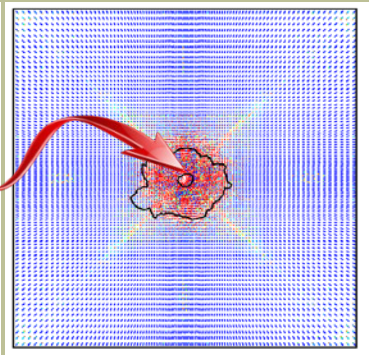
Multi-scale Meshfree Modeling of Damage Processes



$$\bar{\Psi} = \frac{1}{|V_y|}\left(\int_{\Omega_Y} \Psi^{\varepsilon} d\Omega + \frac{1}{2}\int_{\Gamma_c} \mathbf{u}\cdot\mathbf{p} dS\right)$$

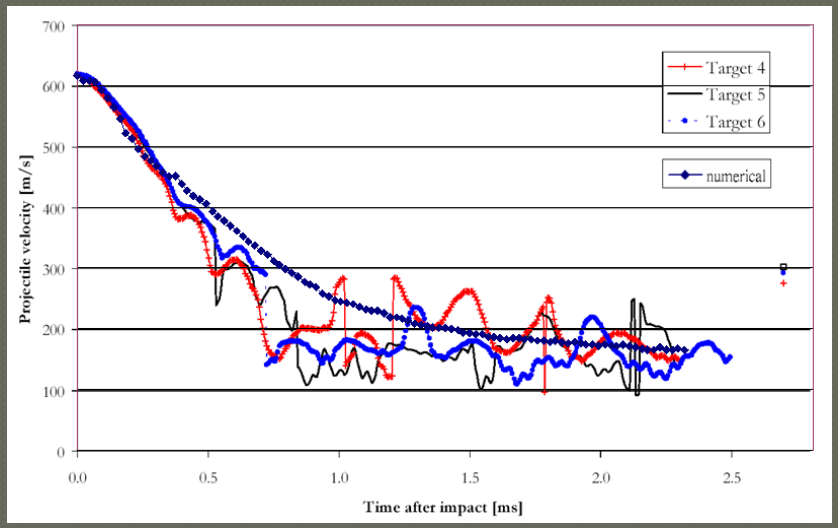


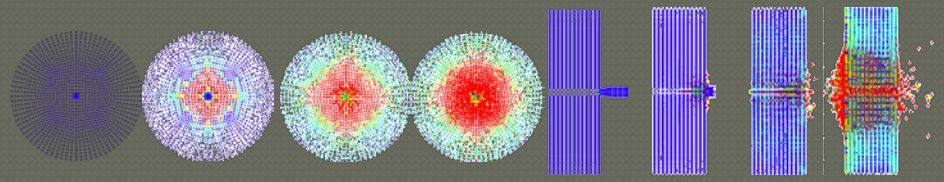


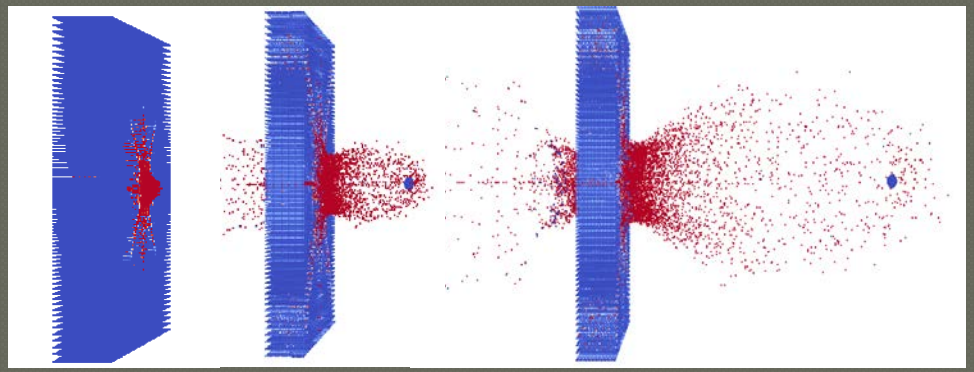


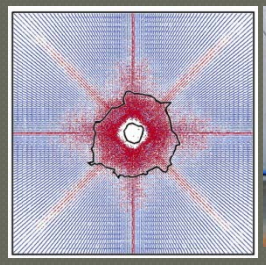
Meshfree Modeling of Fragment Impact of Concrete Block

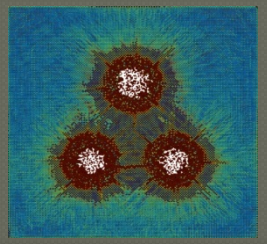
M. Unosson and L. Nilsson (2006), Int. J Impact Engrg. vol 32 pp 1068- 1085





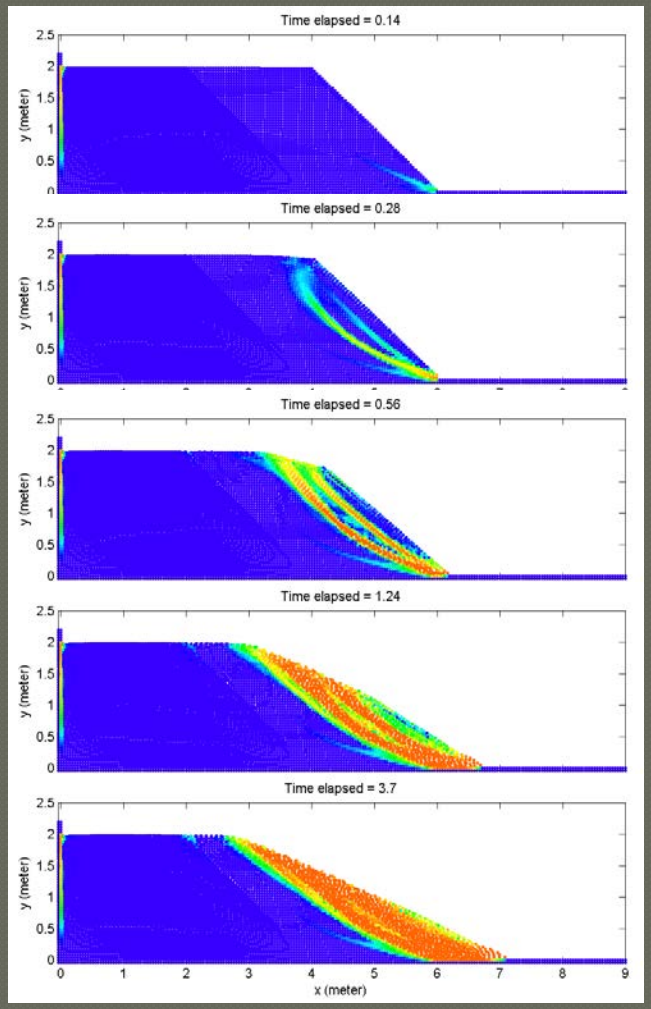




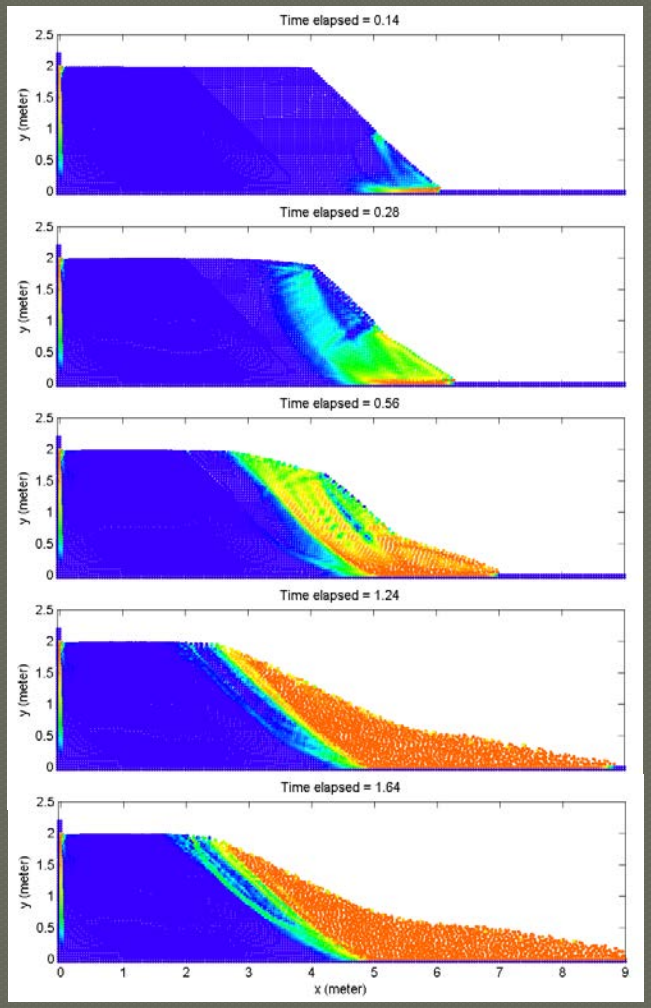


Meshfree Modeling of Landslide

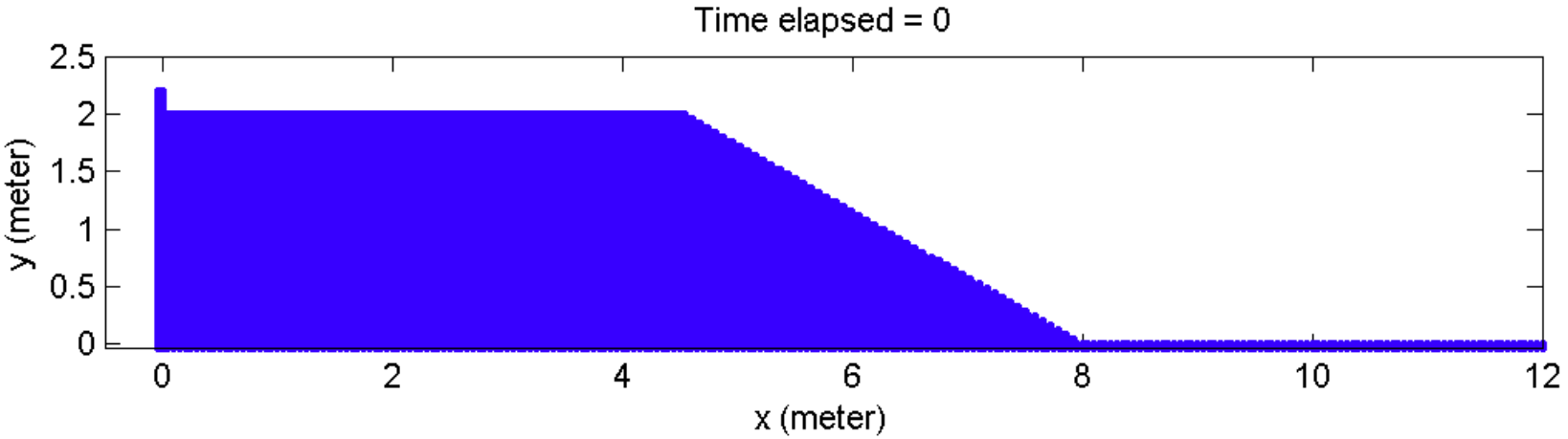
Saturated Slope Without Water



One Meter Submerged



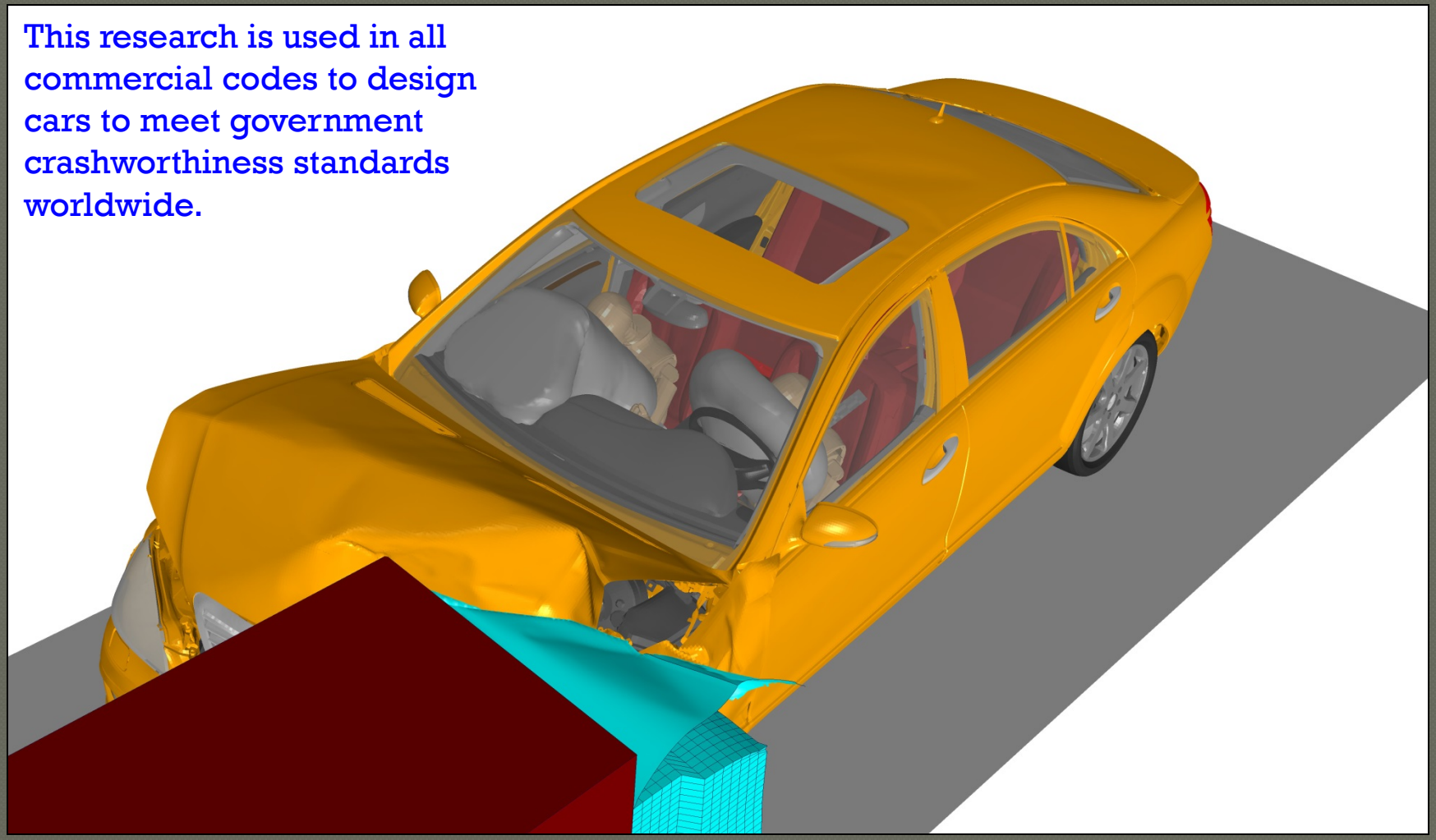
Courtesy of Professor Pai-Chen Guan, National Taiwan Ocean University



Displacement history:
San Fernando Earthquake, (1971)
Source : 34.40N 118.40W Depth 8.4 km
peak ground acceleration: 1.251g
Measured at Pacoima Dam

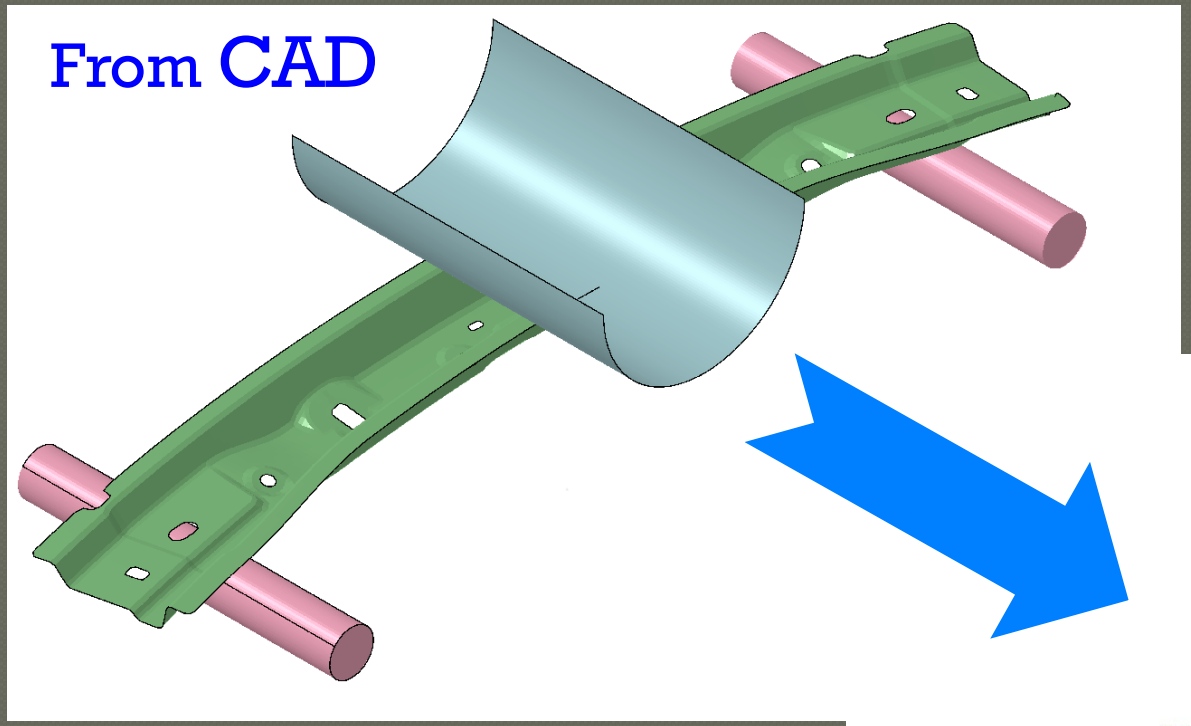
Single Surface Contact Algorithm for Crash Simulation

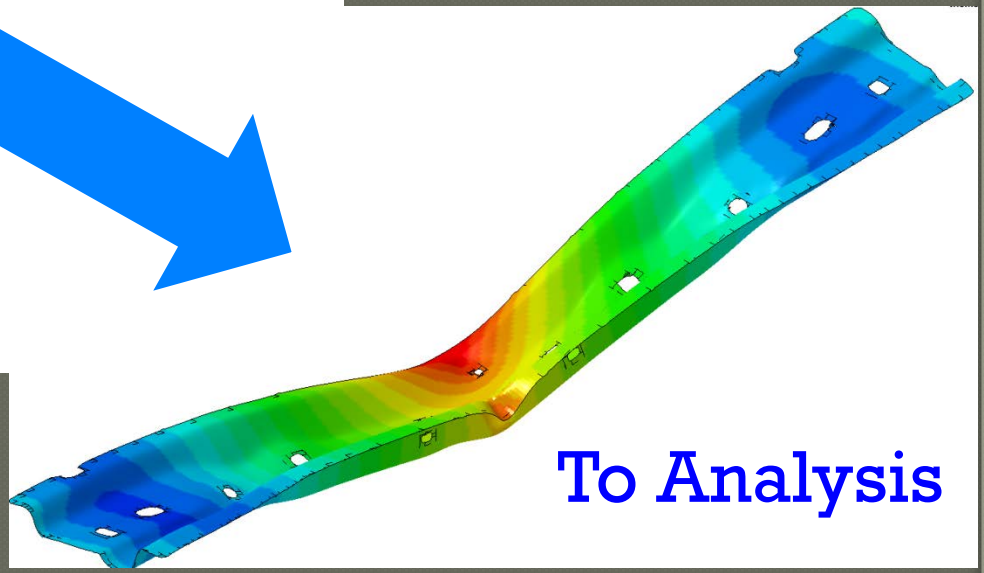
This research is used in all commercial codes to design cars to meet government crashworthiness standards worldwide.



Courtesy of Mercedes-Benz

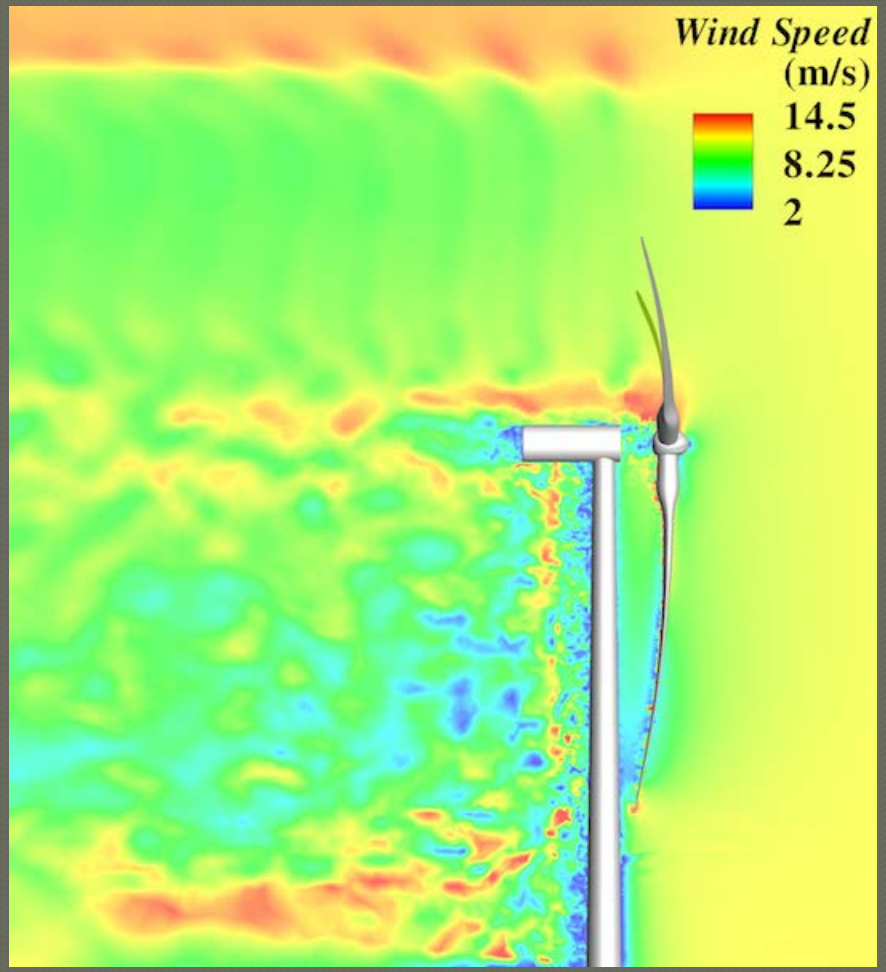
Isogeometric Analysis of Bumper Buckling

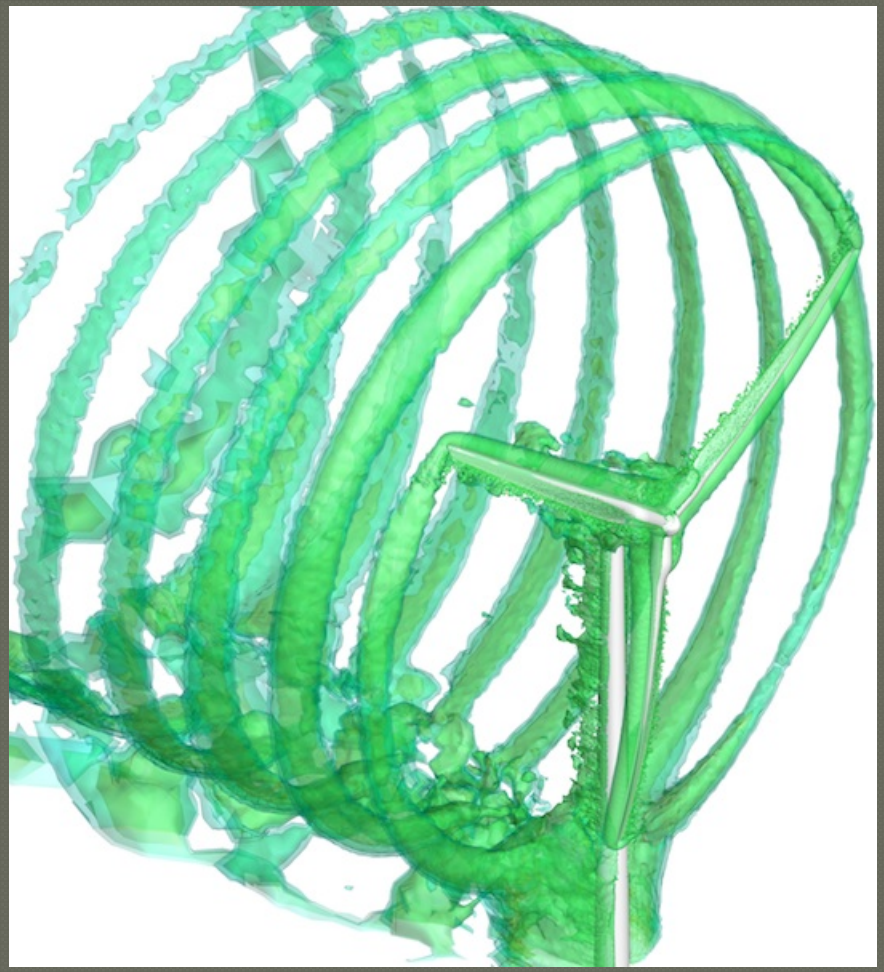




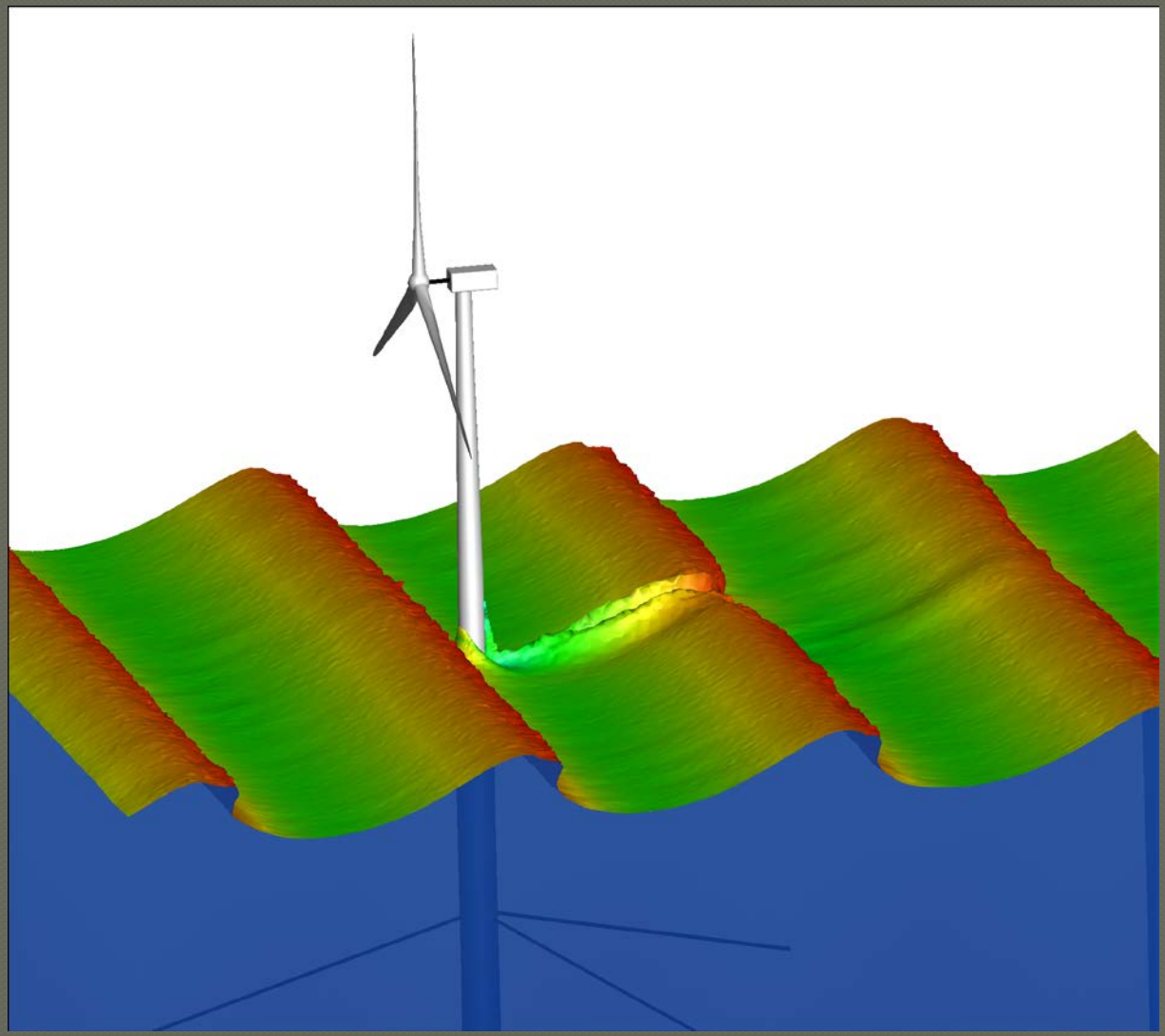
Isogeometric analysis (IGA) with trimmed NURBS allows the direct import of exact CAD geometry for analysis, improving accuracy and reducing time and costs.

Simulation of Wind Turbines Under Extreme Conditions

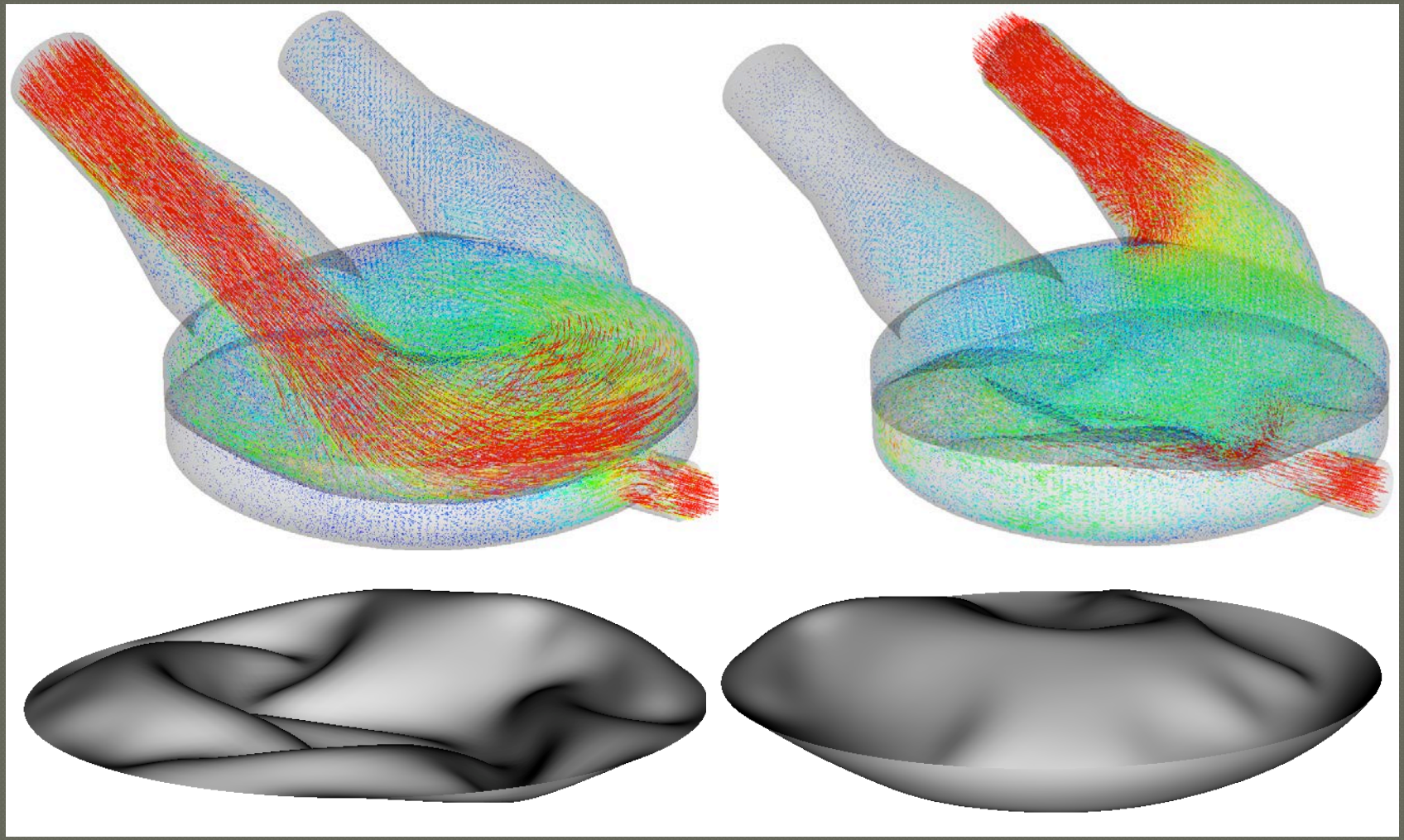




Offshore Floating Designs in Rough Seas at Full Scale



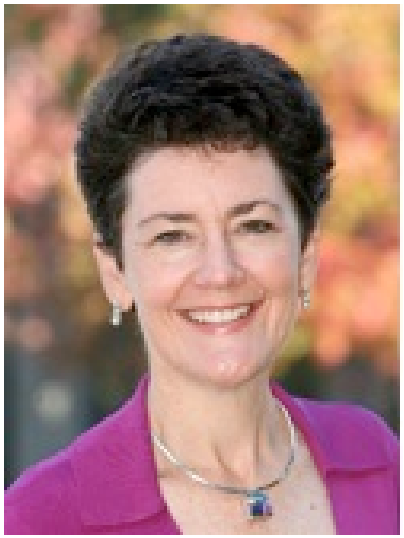
Modeling of Artificial Hearts for Pediatric Populations



Opportunities

- Protecting the nation's infrastructure (e.g., key bridges or government buildings) from terrorist attacks and natural disasters is a major national security concern. This creates the need for advanced research and education to support the design of blast-resistant structures, as well as retrofitting of existing infrastructure to minimize damage due to dissasters.
- Protecting brain and body injury from extreme loading (due to bomb blast, car crash, collision on athletes, etc.) and its prevention or mitigation, is of great importance to the military as well as civilian sectors.
- Protection of nation's energy generation facilities (wind turbines, nuclear power plants, hydraulic power plants, dam and water supply systems, mining tunnels) against natural and manmade disasters are of critical importance to the sustainability of our society, the productivity of our industry, and the safety of our nation. They require different levels of damage-resistant design and disaster mitigation.

CAP Business



Anne O'Donnell
Director
Corporate Affiliates Program
Jacobs School of Engineering

UCSD Jacobs | School of Engineering

RESEARCH EXPO

April 17, 2014

Thank You to our Corporate Affiliates Program Members and Research Expo Key Sponsors

This year marked a record high for participation with over 600 attendees

ViaSat® QUALCOMM® leidos

Master of Advanced Study Updates

A master's degree for engineering professionals

AY 2013-14 Highlights

It's all about the numbers!

115 Total students enrolled in 3 MAS programs

- Architecture-based Enterprise Systems Engineering
- Medical Device Engineering
- Wireless Embedded Systems

75 Students will receive their master's degree this Spring/Summer 2014 while working full-time

132 Students graduated from the AESE MAS program since 2010

Representation from more than 45 local companies

AND…

Master of Advanced Study Updates

A master's degree for engineering professionals

AY 2013-14 Highlights

It's all about the numbers!

1 NEW MAS PROGRAM!!

- Data Science and Engineering

Y1 Fall	Y1 Winter	Y1 Spring
DSE 200: Python for Data Analysis (4 units) **DSE 290:** Case studies in Data Science (2 units)	**DSE 201:** Data Management Systems (4 units) **DSE 210:** Probability and Statistics using Python (4 units)	**DSE 220:** Machine Learning (4 units) **DSE 230:** Data Science using Hadoop and Spark (4 Units)
Y2 Fall	**Y2 Winter**	**Y2 Spring**
DSE 203: Data Integration & ETL (4 units) **DSE XXX**: Elective	**DSE XXX**: Elective Data Science Design Capstone Project **DSE 260** (2 units)	**DSE 260** (2 units)

Senior Design Projects

MAE students will be presenting their senior level design projects:

When:

Thursday, June 12, 2014

Where:

Aerospace Engineering, MAE 155B
Poster in Room EBU II-127 and Flight test in Warren Field

Environmental Engineering, MAE 126B
Posters and Hardware in EBU II-339

Mechanical Engineering, MAE 156B
Posters and Hardware in EBU II-312 and 315 Project webpages can be seen at: www.mae156Bprojects.ucsd.edu

Team Internship Program 2014

Annual TIP Training Day
Saturday June 7th, 2014
8:00am – 2:00pm

Students will attend a conference style training workshop on team dynamics, leadership, and business basics

CAP *year in review*

67 Dedicated Partners

58 Recruiting Events

9 New Members

8 Engineering Competitions

1 New Dean and
3 New Associate Deans

Record Research Expo
Participation

CAP Business:

Dates to Remember:

Monday, September 22, 2014 — **CAP Executive 'Spirit of Solar' Cruise**

Mid-September, 2014 — Center for Wearable Sensors Workshop

Thursday, October 30, 2014 — **CAP Executive Board Meeting**

Friday, October 10, 2014 — Contextual Robotics Systems Workshop

Wed-Thu, November 12-13, 2014 — Trillion Sensors Summit – San Diego


Thank you CAP Executive Board!
UC San Diego
Jacobs School of Engineering
June 5, 2014